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Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System

E. Savage, J. Hegarty, E. Weathers, L. Mulligan, A. O'Reilly, J. Cronly, C. Condon, V. McCarthy, E. Lehane, C. Bradley, I. Hartigan, A. Horgan, J. Browne, A. Murphy, J. Cronin, M. Flynn, J. Drennan

University College Cork

Report prepared for the Clinical Strategy and Programmes Division (CSPD) of the Health Service Executive to support the work of integrated clinical care programmes

July 2015

Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System

Authors

Eileen Savage,[1] Josephine Hegarty,[1] Elizabeth Weathers,[1] Lydia Mulligan,[1] Anthony O Reilly,[1] Jennifer Cronly,[1] Carol Condon,[1] Vera McCarthy,[1] Elaine Lehane,[1] Irene Hartigan, Aine Horgan,[1] Colin Bradley,[2] John Browne,[3] Aileen Murphy,[4] Jodi Cronin,[5] Maura Flynn,[6] Jonathan Drennan[7]

[1] School of Nursing & Midwifery University College Cork, Ireland
[2] Department of General Practice, School of Medicine, University College Cork, Ireland
[3] Department of Epidemiology & Public Health, School of Medicine, University College Cork, Ireland
[4] School of Economics, University College Cork, Ireland
[5] Centre for Policy Studies, University College Cork, Ireland
[6] Boston Scientific Library, University College Cork, Ireland
[7] Centre for Innovation and Leadership in Health Sciences, University of Southampton, UK. (International collaborator)

HSE Steering Committee for this project:

Dr. Orlaith O Reilly, National Clinical Lead for Health and Wellbeing

Dr. Patricia McDonald , Consultant in Public Health Medicine Environment and Health Group, HSE East

Dr. Carmel Mullaney, Specialist in Public Health Medicine

Ms. Valerie Twomey, Senior Programme Manager for the HSE's Integrated Care Programme for Prevention and Management of Chronic Disease

Mr. David Walsh, Chief Officer of Community Health care Organisation & covering South, Dublin, Kildare and West Wicklow

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Contents

List of Abbreviations

BMJ	**British Medical Journal**
BP	**Blood Pressure**
CAP	**Capitation model**
CBA	**Cost-benefit analysis**
CCM	**Chronic Care Model**
CDM	**Chronic Disease Management**
CDSMP	**Chronic Disease Self-Management Programme**
CEA	**Cost effectiveness analysis**
CG	**Control Group**
CHD	**Coronary Heart Disease**
CHF	**Chronic Heart Failure**
CINAHL	**Cumulative Index to Nursing and Allied Health Literature**
CIS	**Clinical Information Systems**
CMA	**Cost minimisation analysis**
COPD	**Chronic obstructive pulmonary disease**
CPCRS	**Clinical Pharmacy Cardiac Risk Service**
CUA	**Cost-utility analysis**
CVD	**Cardiovascular Disease**
DALY	**Disability-adjusted life year**
DAM	**Decision analytical model**
DMPs	**Disease Management Programmes**
DR	**Discount rate**
DRGs	**Diagnostic Related Groups**
ED	**Emergency Department**
EDISSE	**Evaluation of Dutch Integrated Stroke Service Experiments**
EE	**Economic evaluation**
FDM	**Family doctor model**
GCI	**Guidelines Composite Indicator**
HbA1C	**Glycated Haemoglobin**
HSE	**Health Service Executive**
HCPs	**Health Care Providers/Practitioners**
HYE	**Health years equivalent**
ICER	**Incremental cost-effectiveness ratio**
ICPs	**Integrated Care Programmes**
ICT	**Integrated Care Technology**
IG	**Intervention Group**
KPCO	**Kaiser Permanente Colorado**
LOS	**Length of stay**
LYG	**Life-years gained**
MDT	**Multidisciplinary team**
MR	**Mortality rate**
OSM	**Only Specialist model**
PC	**Primary Care**
PSA	**Probabilistic sensitivity analysis**
QALE	**Quality adjusted life expectancy**
QALY	**Quality-adjusted life year**
RCTs	**Randomised Controlled Trials**
SA	**Sensitivity Analysis**
SMS	**Self –Management Support**

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Executive Summary

Based on a clinical and economic systematic review of the international literature, this report presents the evidence on integrated care programmes and generic models of care designed for chronic disease prevention and management. This evidence will support the work of integrated clinical care programmes in Ireland through the Clinical Strategy and Programmes Division of the HSE.

Our analysis leads to the conclusion that:

A well-designed generic model of chronic disease prevention and management within an integrated care approach to service delivery can lead to positive clinical, process and service utilization outcomes. The economic benefits relate to reduced costs associated with reductions in hospital admissions (inpatient and outpatient).

Definitions

A synthesis of definitions gleaned from this review offers the following pragmatic definitions:

Integrated Care is an organizing principle characterised by a smooth, holistic, continuous and seamless journey between services tailored to the needs of service users. The ultimate goal of integrated care is to improve the quality and efficiency of care and services, and to avoid fragmentation. The methods for achieving integrated care are through care co-ordination, collaboration, shared care, and multidisciplinary working.

Four levels of integrated care exist as follows:

1. **Clinical integration** is defined as "The coordination of person-focused care in a single process across time, place and discipline" (Valentjin et al. 2013, p.7). The focus is on the point of care delivery with the service user with consideration to the extent to which services are integrated in a co-ordinated way across various professional and organisational boundaries.
2. **Professional integration** is defined as "Inter professional partnerships based on shared competences, roles, responsibilities and accountability to deliver a comprehensive continuum of care to a defined population" (Valentjin et al. 2013, p.7).
3. **Organisational integration** is defined as "Inter-organisational relationships (e.g., contracting, strategic alliances, knowledge networks, mergers), including common governance mechanisms, to deliver comprehensive services to a defined population" (Valentjin et al. 2013, p. 6).

4. **System integration** focuses on system integration across the full spectrum of health and social care services targeting the whole population. It involves alignment of regulation, incentives and policies at both administrative and organisational level (Fulop et al. 2005).

The most common approach to ICPs has been at clinical level (i.e. patient care coordination across various professional and organisational boundaries). ICPs at professional level (i.e. shared competences, roles, responsibilities and accountability) were less common. ICPs identified as least common were at organisational (i.e. interorganisational relationships, shared governance) and systems (i.e. targeting whole population) levels.

Generic Model of Care: According to the National Board of Health (2007) in Denmark, the purpose of generic models of care is to provide an overall framework for the content of national programmes with elements that can be shared and that are transferable across different types of diseases.

At clinical level, a generic model of care involves a proactive structured, scheduled, co-ordinated and continuous approach to care with specific consideration to the nature of the condition(s) and risk stratification of individuals and populations; designed to prevent or manage one or more chronic conditions in individuals and populations.

Key Findings

A summary of the key messages from all of the findings are presented in Chapter 6. The key findings from the review specifically relevant to the implementation of integrated national clinical programmes for chronic disease prevention and management are as follows.

Chronic disease prevention and management

- The prevention and management of chronic diseases through integrated care and generic models of care is predominantly primary care GP led supported by primary care specialists and secondary care specialist services.

- Chronic disease management programmes within the context of national clinical programmes across many European countries have a strong emphasis on primary care, strengthening of ambulatory care, and strengthening the role of nursing in primary care.

- Specialist nurses embedded in primary care disease specific prevention and management is growing across Europe and internationally with an emphasis on: scheduled primary care visits; patient education and self-management support; treatment modification and adjustment; specialist education and support for primary care teams; and care co-ordination between primary and secondary care services.

- A priority for the implementation of a generic model of care in primary care is intensive and proactive follow-up targeting those at high risk of complications rather than targeting the overall population of patients with low frequency of contact. The role of specialist nurse in primary care is key to the case management of high risk patients.

- Priorities for implementing integrated care contributing to improvements in health outcomes, care processes and service utilisation are:

  (i) nurse led/specialist care in primary care with a link into secondary care specialist services;
  (ii) shared or centralised information systems between primary and secondary care services e.g. medical records, tracking and recall systems, disease registers;
  (iii) shared clinical decision support tools such as clinical guidelines.

Economic evaluation

- The economic evidence shows that the existing health infrastructure and systems within a country influence the health outcomes and cost effectiveness of the implementation of integrated care programmes, the Netherlands cited as a successful case exemplar.
- The main cost driver is admission to hospital and it is reductions in admissions (inpatient and outpatient) which contributed to reduced costs across the interventions considered.

Implementing and evaluating national clinical programmes

- A phased and pilot approach to implementing integrated care and generic approaches to disease management is common in European countries.
- Although most interventions reviewed involved RCTs, a mixed method approach to evaluation is common for national programmes in European countries and elsewhere.

Recommendations for Policy Makers and Clinicians

Our recommendations are intended to be pragmatic and supportive to policy makers and clinicians directly involved in chronic disease prevention and management. The recommendations are categorised into:

- Primary care services
- Clinical care
- Economic implications

Primary Care Services

1. The principal point of care for chronic disease prevention and management needs to be located in primary care, supported by specialist health care professionals and secondary care specialist services; the evidence supports the employment of disease specific specialist nurses situated in primary care with a link into the secondary care specialist services (see Recommendation 4).

2. Shift from 'individual patient' care to include a population based philosophy and approach to chronic disease prevention and management with an added emphasis on primary prevention for health and wellbeing in keeping with the vision for the *'Healthy Ireland'* strategy (Department of Health 2013). Population based philosophy and approach emphasises groups of people e.g. individuals with diabetes, COPD or multimorbidity.

3. Identification of high-risk population groups using risk stratification techniques followed with implementation of targeted interventions.

4. Strengthen the role of nursing in disease-specific prevention and management by increasing the number of specialist nurses working across clusters of primary care practices and who will support integrated care between primary care and secondary care specialist services.

5. Health service reform towards primary care is best implemented using a phased and pilot approach with a longer goal of scaling up to larger populations and to national level. Evaluation of programmes needs to be built into implementation using mixed methods. Careful selection of primary outcomes is needed with

consideration to those identified by the Core Outcome Measures in Effectiveness Trials (COMET) Initiative.[1]

Clinical Care Delivery

6. Clinical care delivery in primary care needs to be implemented with the 'critical ingredients' for successful integrated services and models of care:
    - specialist nurses (disease specific)
    - shared and centralised information systems
    - shared clinical decision support tools

7. Move towards a strong presence of clinical nurse specialists in the community working across a cluster of primary care practices including
    - scheduled visits and consultations with patients in GP practices
    - providing self-management education and support for a select group of high risk patients (as identified by the GP) in line with risk stratification guidelines
    - structured telephonic support for patients
    - acting as a specialist resource in educating and supporting GPs, practice nurses (as generalists) on disease specific aspects of care,
    - supporting practice redesign (e.g. implementation of guidelines, auditing)
    - coordinating role between primary and secondary care specialist services.

8. Shared and centralised information systems are needed with consideration to:
    - adequate infrastructure and support for information systems shared across and within services i.e. primary care and hospital sector
    - addressing the current deficiencies in Ireland with the hospital sector in particular known to be more inadequate and fragmented than primary care services
    - priority areas identified in the recent eHealth strategy applicable to evidence from our review e.g. online referrals and scheduling, patient summary records and open access to health information
    - additional areas identified from this review i.e. electronic patient records, disease registers, patient registers, and electronic access to decision support tools such as clinical guidelines
    - ensuring easy and secure internet access across services
    - competence based education and training of health care professionals in eHealth

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[1] The COMET Initiative aims to develop agreed standardised sets of outcomes, known as a 'core outcome set.' These sets should represent the minimum that should be measured and reported in all clinical trials, audits of practice or other forms of research for a specific condition. They do not imply that outcomes in a particular study should be restricted to those in the core outcome set. Rather, there is an expectation that the core outcomes will be collected and reported to allow the results of trials and other studies to be compared, contrasted and combined as appropriate; and that researchers will continue to collect and explore other outcomes as well. More information from: http://www.comet-initiative.org/.

- adequate infrastructure and support for information systems shared with patients e.g. tele-monitoring.

9. Self-care and self-management support is crucial – patients should be actively involved in the development and implementation of their individualised care plans. Self-management needs to be promoted across systems to empower patients, and ensure the provision of patient-centred individualised care.

10. Implement standardised clinical decision making tools across and within primary care services and across primary care and secondary care services. These include but are not limited to clinical guidelines, protocols, regulatory standards of care, and e-prescribing. Consideration needs to be given to:
    - empowering patients to engage in decision making regarding their own health
    - person centred, tailored and individualised care plans
    - addressing the complexity of chronic disease management for individuals with multiple conditions i.e. multimorbidity
    - the evidence base
    - optimising the potential of networks so that the multidisciplinary team members can work and learn together.

Economic implications

11. Longitudinal full economic evaluations (i.e. over a longer term e.g. 5 years) should be planned to run concurrently with the implementation of integrated models of care whilst being cognisant of set up costs (the level of investment and structural reform required for implementation) and ongoing maintenance costs (e.g. patient, community and hospital costs).

Chapter 1

Introduction

Background

This clinical and economic systematic review provides evidence to support the work of integrated clinical care programmes in Ireland through the Clinical Strategy and Programmes Division of the Health Service Executive (HSE). The Clinical Strategy and Programmes Division (CSPD) was established by the HSE to improve and standardise patient care throughout the organisation by bringing together clinical disciplines and enabling them to share innovative solutions to deliver greater benefits to every user of HSE services. The purpose of the Division is to design and specify standardised models of care, guidelines, pathways and associated strategies for the delivery of integrated clinical care. An Integrated Care Programme is one which outlines a framework for the management and delivery of health services which ensure that clients receive a continuum of preventative, diagnostic, care and support services, according to their needs over time and across different levels of the health system. The Clinical Strategy and Programmes Division have established a number of National Clinical Programmes and each Programme is based on three broad objectives:

- To improve the quality of care we deliver to all users of HSE services
- To improve access to all services for patients and clients
- To improve value for the patient and for the health care system

The role of the National Clinical Programmes is to nationally standardise models of care ensuring that they take account of the best evidence available, both nationally and internationally. Each programme must analyse available data and information. Such analysis will inform the body of evidence when identifying the issues that need to be addressed as part of the programme work plan. When issues have been clearly identified the programmes must develop evidence based solutions.

The supporting models of care will incorporate cross service, multi-disciplinary care and support which will facilitate the maintenance of health and the delivery of appropriate high quality, evidence based care, delivered in a co-ordinated manner which feels seamless to the user.

It is planned to develop 5 Integrated Care Programmes for implementation nationally, one of which is chronic disease prevention and management

Chronic Disease Prevention and Management in Ireland

Chronic disease is a global health problem and one of the largest causes of death in the world. In Ireland, chronic diseases are associated with 86% of mortality and 77% of the overall disease burden. Seventy per cent of health service utilisation in Ireland is associated with chronic diseases (Department of Health 2012). Amongst the highest ranking conditions in this country are hypertension, ischaemic heart disease, diabetes, and osteoarthritis (O Shea et al. 2013; Balanda et al. 2010) all of which increase in prevalence with advancing years. It has been estimated that by 2020, the prevalence of chronic diseases will have increased by 40% since 2007 (Balanda et al. 2010).

Health Service Reform

The need for and promise of health services reform in Ireland to tackle the growing burden of chronic illnesses has been raised for many years in policy and strategy frameworks with an emphasis on moving to integrated and primary care service provision. These frameworks include:

- **Quality and Fairness: A Health System for You (Department of Health and Children 2001a)**
- **Primary Care: A New Direction (Department of Health and Children 2001b)**
- **Tackling Chronic Disease: a Policy Framework for the Management of Chronic Disease (Department of Health & Children 2008)**
- **HSE Transformation Programme - The Health Service Executive 4.1 Chronic illness Framework (Health Service Executive 2008)**
- **The Health Promotion Strategic Framework (Health Service Executive 2011)**
- **Future Health: A Strategic Framework for Reform of the Health Service 2012-2015 (Department of Health 2012)**
- **Community Healthcare Organisations: Report and Recommendations of the Integrated Service Area Group (Health Service Executive 2014)**

One of the four pillars of the Department of Health's (2012) strategic framework for the reform of health services (*Future Health)* is 'service reform' involving a move away from "the current hospital-centric model of care towards a new model of integrated care that treats patients at the lowest level of complexity that is safe, timely, efficient and as close to home as possible" (p.16). To support this reform, and as noted in the background to this review, National Clinical Programmes are being developed through the Clinical Strategy and Programmes (CSP) Division of the HSE. To date, approximately 30 clinical programmes relating to individual chronic diseases such as COPD, diabetes, and asthma have been developed, as well as a Clinical Programme in the Prevention of Chronic Disease has also been developed. The need to address the growing prevalence of co-morbidity in the population of Ireland is also a priority in *Future Health.* The findings from a recent study showed that in one general practice, 90% patients with diabetes had at least one additional chronic condition and 25% had 4 or more conditions (Teljeur et al. 2013). In another study, 60% of patients with chronic respiratory disease attending one general practice had at least one co-existing chronic disease (O' Kelly et al. 2011).

The move in Ireland towards integrated service delivery and structured models of care for managing chronic diseases is consistent with developments in other countries (Nolte & Knai 2015). A major challenge in tackling chronic diseases in many countries including Ireland is that health care systems are predominately hospital centric and acute care oriented. Health care is characterised by a fragmented approach to service delivery with a disconnect between primary care and acute care services (Department of Health 2012). The enhancement of primary care is critical to addressing these problems. As stated in *Future Health:*

> **"Integrated care will require the development of capacity in primary care, specialised community services and in social care. It implies, especially in a resource constrained system, a clear transfer of capacity to non-institutional care and the necessary and consequent downsizing of activity undertaken in acute hospitals" (Department of Health 2012, p.18).**

Irish Studies

In recent years there has been a growing body of research in Ireland relevant to chronic disease management in primary care including:

- national surveys on the provision of chronic disease management in primary care practices from the perspectives of GPs, practice nurses, hospital consultants and patients (Darker et al. 2015)[2]
- the efficacy of COPD outreach in reducing hospital length of stay and improving quality of life (Sahadevan et al. 2015)
- the effectiveness of structured pulmonary rehabilitation education for individuals with COPD, delivered in GP practices (Casey et al. 2013)
- national audit of stroke care (Irish Heart Foundation 2008)
- national survey on resources and needs for optimal stroke care and prevention (Whitford et al. 2009)
- a qualitative exploration of the interface between primary care and specialist epilepsy services in Ireland (Varley et al. 2010)
- an audit of clinical information management of epilepsy (Varley et al. 2011)
- the quality of primary care led diabetes management (Mc Hugh et al. 2011) and standards of diabetes care (O' Connor et al. 2007)
- barriers and facilitators to structured (O' Connor et al. 2013) and integrated (Mc Hugh et al. 2013) diabetes care
- an automated analysis of electronic health records on process and outcomes of structured diabetes care in GP practices (Hill & Bradley 2012)
- a survey on the role, attitudes and concerns of practice nurses regarding the management of patients with type 2 diabetes (Mannion & Mardsen 2012).

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[2] This report draws together the findings from 4 previous reports focusing on GPs (Darker et al.2011), practice nurses (Darker et al. 2014a), hospital consultants (Darker et al. 2014b) and patients (Darker et al. 2014c).

Evidence of Good Practices and Initiatives

Taken together, some of the findings from the above studies are positive in terms of such as: a reduction in average length of hospital stay in a COPD outreach programme incorporating home visits by specialist respiratory nurse and physiotherapist (Sahadevan et al. 2015); improvements in health status of individuals with COPD following a structured education pulmonary rehabilitation programme delivered by trained practice nurses and physiotherapists in 16 GP practices (Casey et al. 2013); good IT infrastructure in primary care practices (Darker et al. 2015); high quality data management in diabetes care including use of information technology as evident in 23 GP practices (Hill & Bradley 2012); routine use of evidence based treatment guidelines for managing asthma or COPD, hypertension and diabetes by most GPs (71%-79%) and practice nurses (79.3% to 86.6%); good standards of type 2 diabetes care with lower HbA1c values associated with computerised practices and shared care (O' Connor et al. 2007), the development of GP special interest groups in diabetes care similar to those in the UK NHS towards greater emphasis on primary care services (Mc Hugh et al. 2011), and good working relationships between primary and secondary care teams with reference to diabetes care (Mc Hugh et al. 2013).

Gaps in CDM

Although there are pockets of good practice in primary care, most evidence points to multiple gaps in CDM. Darker et al.'s (2015, 2014a,b,c; 2011) national surveys offer a comprehensive picture of these gaps. GP audits of clinical performance were found to be low with Ireland ranked second lowest compared to other countries (e.g. 25% of GPs in Ireland & 92% in the UK). Improvements can be expected since the Medical Council (2011) requires all doctors to engage in one clinical audit annually. The use of registers to identify and track patients with chronic diseases as well as the use of tracking systems to remind patients about visits were found to be deficient amongst hospital consultants (24.8% & 24%) and GPs (30% & 19%). A greater percentage of practice nurses were found to use registers and reminder tracking systems, reported by 58.1% and 36.3% respectively. Availability of electronic patient records was also found to be lowest among hospital consultants (37.3%) compared to GPs (83.1%) and practice nurses (97.2%). Gaps in patient care continuity were evident regarding telephone follow up with patients between visits with few practice nurses (39.2%), GPs (31%) or hospital consultants (27%) reporting this practice (Darker et al. 2014a).

Self-management or self-care by individuals with chronic diseases has been included in *Future Health* as one of the main elements of chronic disease management programmes in reorientation of health care towards primary care and integrated services (Department of Health 2012). The findings of Darker et al.'s (2014a,b,c; 2011) surveys indicate that patient support for self-management is suboptimal. A low percentage of patients surveyed were consistently involved in treatment plans (33.3%) or goals (26.8%), or were given treatment choices (25.6%). Few were encouraged to attend groups or classes to help them manage their conditions (13.8%). There was greater involvement evident from practice nurses (74.9%) compared to GPs (61%) or hospital consultants (68.4%). Notably, far fewer hospital consultants (13.9%) referred patients outside their practices for education on chronic diseases compared to referrals by practice nurses (49.8%) or by GPs (52%).[3] Although not reported, it is likely that consultants referred patients to clinical nurse specialists in hospital settings since the majority (87.9%) reported having specialist nurses in their services which contrasted with primary care practices, none of which were found to have specialist nurses as health care providers. This finding suggests that little had changed from an earlier survey by the Health Service Executive (2006) which found that nurse delivered chronic disease management patient support programmes were primarily hospital based with only some community involvement (29 out of 141 programmes). Community involvement was in the form of nursing outreach home visits, telephonic support, drop-in visits or outpatient clinics. Models of care involving hospitals and primary care (n=23) included liaising with primary care practices about patients or involved shared care between services. Only 8 nurse delivered programmes were situated in primary care most of which were in GP practices relating to structured diabetes care or secondary prevention of heart disease (Heartwatch programme).

Barriers to Shared and Primary Care CDM

There is evidence that both primary care and specialist health care professionals desire and are willing to engage in shared care. For example, Darker et al. (2014a,b; 2011) found that the vast majority of GPs (n=367, 98%), practice nurses (n=333, 98.8%), and hospital consultants (n=221, 97.4%) would support a shared care initiative for CDM. However, fewer GPs (n=258, 69%) believed there was a place for CDM shared care between general practice and hospitals compared to hospital consultants (n=217, 96.4%) and practice nurses (n=330, 98.2%). Support for shared care in CDM in Ireland has also been identified by other researchers specific to diabetes (Mc Hugh et al. 2013) and epilepsy (Varley et al. 2010).

There is consistent evidence of deficits in shared care between primary and specialist services. Less than half of the hospital consultants (44.7%) and GPs (45%), and just over half of practice nurses (53.4%) surveyed by Darker et al. (2014a,b; 2011) reported being involved in any shared care for CDM. In a survey on stroke care, a lack of communication from specialist services was highlighted by the majority of GPs with no routine liaison prior to discharge (85%) or following discharge (79%) (Whitford et al. 2009). Poor communication and slow exchange of information from specialist services to GPs have also been reported for epilepsy care (Varley et al. 2010), and diabetes care (Mc Hugh et al. 2013). Mc Hugh et al. noted that the main barriers to integrated care and primary care led services were at the level of health systems rather than at organisational, professional or patient levels. These barriers included lack of remuneration for CDM in general practice and difficulties in care co-ordination across primary and secondary services.

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[3] Data from GPs and practice nurses related to diabetes only.

Other barriers reported in Irish studies and that need to be addressed in the reorientation of services include: inadequate staffing and increased workloads/time in primary care (Darker et al. 2015; Mc Hugh et al. 2013; O' Connor et al. 2013; Mannion & Marsden 2012; Varley et al. 2010; Whitford et al. 2009); inadequate availability of and access to specialist services/professionals for advice or support (Darker et al. 2015; Mc Hugh et al. 2013; O' Connor et al. 2013; Mannion & Marsden 2012; Varley et al. 2010; Whitford et al. 2009); lack of disease specific knowledge and confidence for managing specific chronic diseases among primary care providers (Darker et al. 2011, 2014a; Mannion & Marsden 2012; Varley et al. 2010); lack of evidence based guidelines, protocols or clinical pathways (O' Connor et al. 2013; Varley et al. 2010; Whitford et al. 2009); inadequate ICT infrastructure to support care continuity (O' Connor et al. 2013; Varley et al. 2011; Varley et al. 2010); lack of clearly defined roles across multidisciplinary teams (Mc Hugh et al. 2013; Varley et al. 2010).

Improving CDM

The need for fundamental changes or a complete rebuild of the Irish health care system in order to improve current approaches to CDM has been expressed by the vast majority (over 90%) of GPs, practice nurses, and hospital consultants respectively in Darker et al.'s (2015) surveys. Similar percentages of each group viewed resources relating to funding and for CDM clinics as important or extremely important. Funding resources included payment for patients with chronic diseases and targeted funding for GPs similar to the NHS in the UK. Responses on CDM clinics related to the need for GP led clinics, specialist nurse led clinics and increased practice nurse time for GP led clinics. Conclusions and recommendations made by Darker et al. (2014a, 2015) are that:

- care integration in CDM is best located in general practice
- general practice should be strengthened as the hub for CDM with spokes of speciality care feeding in
- a well resourced integrated clinical information systems within and across services needs to be put in place with particular attention to deficits in the hospital sector
- regional models for shared care between primary and secondary care services need to be developed
- practice nurses are ideally suited for CCM
- more practice nurses need to be recruited and trained in CDM

The need for resources and support for CDM in primary care has been raised by other researchers including shared protocols and information systems to facilitate integrated care (Mc Hugh et al. 2013; O' Connor et al. 2013; Varley et al. 2010). The need for enhanced training of primary care providers in chronic disease management was raised by Varley et al. (2010) with reference to epilepsy. Similar to Darker et al. (2015) these researchers identified general practice nurses as being well situated to manage much of the follow up chronic care. However, they noted the need for specialist nurses to support practice nurses (Varley et al. 2010), a recommendation also made by Mannion and Marsden 2012) in relation to diabetes care. Mannion and Marsden made a point of noting that practice nurses viewed themselves as generalists whereas they viewed the role of specialist nurses as being one of support, mainly in the provision of education and setting up specialist diabetes clinics in general practices.

Reviewing the Evidence to Support Integrated Care

The research conducted in Ireland in recent years provides a useful platform from which to address current deficits in CDM and move towards integrated care. There remains a gap in evidence however for the Irish context in terms of what models work best and why. Although a substantial body of evidence on integrated care programmes for chronic diseases over the past 15 years in the international literature exists, this has varied in questions and areas addressed. Two recent reviews commissioned by the Department of Health examined the mechanisms and structures used to integrate general health services funded by universal health insurance with services funded by general taxation: (i) social care services (Pike & Mongan 2014) and (ii) public health services (Sutton & Long 2014). Although some evidence on integrated care for CDM was reviewed, this was to support the Department of Health in the introduction of a single tier health service in Ireland, supported by universal health insurance. To date, there has been no comprehensive review addressing clinical or economic questions to support the development of a National Clinical Programme relevant to the work of Clinical Strategy and Programmes Division of the HSE in Ireland. In addition to a clinical evaluation, an economic evaluation is essential to allow comparative health interventions be evaluated in order to address the issue of efficient resource allocation. It is widely accepted that on their own, economic evaluations are not sufficient to inform decision making, but that they are a necessary component of the decision-making process (Centre for Reviews & Dissemination 2008).

Aim of Review

The broad aim of the review was to address the following overall research question:

What features of an integrated care programme and model of care for chronic disease would be the most effective, represent the best value and could be implemented in the Irish context?

Structure of Review

Following on from this Introduction chapter, the review comprises 5 chapters. In Chapter 2, the methods for the clinical systematic review are presented following which the results are presented in Chapter 3. The economic review methods and results are presented in Chapter 4. In Chapter 5, the results of both the clinical and economic review are discussed including its strengths and limitations. The final chapter closes with reference to the main conclusions and recommendations.

Chapter 2

◆

Clinical Review Methods

Introduction

As specified by the HSE, the output of this project was to:

Deliver a systematic literature review on integrated care for chronic disease prevention and management with a specific focus on patient outcomes and economic effectiveness.

Review Questions

The review addressed the following questions.

Table 1 Review questions

	Integrated Care Programmes (ICPs)	*Generic Models of Care*
Q.1	What is the spectrum of definitions that exist for chronic disease ICPs?	What is the spectrum of definitions that exist for chronic disease models of care?
Q.2	What is the spectrum of ICPs for chronic disease prevention / management?	What is the spectrum of generic models of care for chronic disease prevention / management?
Q.3	What features characterise ICPs for chronic disease prevention/management?	What features characterise generic models of care for chronic disease prevention /management?
Q.4	What are the shared features and differences between ICPs?	What are the shared features and differences between generic models of care?
Q.5	What chronic diseases are examined singly or in combination in ICPs?	What chronic diseases are examined singly or in combination in generic models of care?
Q.6	What is the range of outcomes (e.g. clinical, patient, service) examined in the ICPs for chronic disease prevention/ management, and what is the level of change or resulting impact?	What is the range of outcomes (e.g. clinical, patient, service) examined in the generic models of care for chronic disease prevention / management, and what is the level of change or resulting impact?
Q.7	What ICPs are effective in improving patient outcomes and what are the results on patient outcomes?	What generic models of care are effective in improving patient outcomes and what are the results on patient outcomes?
Q.8	What features/components of ICPs are associated with improved results?	What features/components of generic models of care are associated with improved results?
Q.9	What level of evaluation has been used for ICPs for chronic disease prevention/ management?	What level of evaluation has been used for generic models of care for chronic disease prevention /management?
Q.10 & Q.11	What are the barriers or enablers for implementation of ICPs for chronic disease prevention and/or management identified?	What are the barriers or enablers for implementation of generic models of care for chronic disease prevention and/or management identified?

Review Methods

This desk-based secondary research was undertaken using systematic review methodology guided by the principles of conducting systematic reviews (Higgins & Green 2011; Centre for Systematic Reviews & Dissemination 2008).

Selection Criteria for Studies

The PICOS framework was used to support selection criteria but with a minor adaptation to include context (Davies 2011), i.e. PICOCS (Box 1).

Box 1: PICOCS framework guiding selection criteria

Population:	Adults (≥18 years) diagnosed with at least one or more chronic illness(es) including but not limited to cardiovascular/ respiratory/ diabetes/musculoskeletal; Adults at risk of developing chronic illness (i.e. the focus being on prevention programmes)
Interventions:	(i) Integrated care programmes aimed to enhance co-ordination and continuity of health care, thereby addressing or avoiding fragmentation of services in preventing and/or managing single or multiple chronic diseases. (ii) Generic models of care that apply to a range of chronic diseases specific to preventing and/or managing either a single disease or more than one disease (i.e. multi-morbidity) in the same patient or in a population
Comparator:	No intervention/usual or standard care or service delivery/another model or programme of care or integration
Outcomes:	Any measure of patient centred, process or service outcomes Any measures/reporting of barriers and enablers relating to implementation of generic models of care or integrated care programmes for CDM
Contexts:	Any adult health care context that crossed boundaries of health care -primary, secondary and/or tertiary
Studies:	Meta-reviews,[a] meta-analyses, meta-synthesis, systematic reviews, & randomised controlled trials (RCTs).[4] In addition, peer reviewed papers, evidence based policy documents or mixed method studies reporting on the implementation or evaluation of programmes/models in individual or multiple countries. Published between Jan.1st 2005 and 31st March 2015. Written in the English language.

[a] Meta-reviews are systematic reviews of systematic reviews.

Papers were excluded if they reported on:

- ICPs or models of care on chronic or long term conditions not specific to a chronic disease e.g. health care services in general, care of older adults in general, palliative care, chronic mental health problems/conditions, chronic communicable diseases; chronic symptoms (e.g. chronic pain, back pain, fatigue)
- children with or at risk of chronic diseases aged less than 18 years
- countries with a medium or lower Human Development Index (UN Human Development Programme at http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components
- RCTs at protocol, pilot or feasibility stage (although some linked papers included).

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[4] Note: if an RCT was reported within an included systematic review, the paper reporting on the RCT was not included again unless any additional pertinent data needed to be included in this report. If this was the case then the paper was included.

Search Strategy

A full search strategy was developed using search strings with various combinations of free text words and subject headings descriptors relevant to *CINAHL* and *MEDLINE* which were the main databases used. The search strings were categorised into 4 groups as follows:

- Chronic Diseases
- Chronic Disease Prevention and/or Management
- Models of Care
- Integrated Care

The Cochrane Library was searched to identify papers within the *Cochrane Database of Systematic Reviews*, and trials within the *Cochrane Central Register of Controlled Trials (CENTRAL).* The Cochrane Library also provided access to searching the *Database of Abstracts of Reviews of Effects (DARE),* and the *Health Technology Assessment Database.*

The grey literature search included: Open Grey; Grey Literature Report (in New York Academy of Medicine), WHO, The Agency for Health care Research and Quality (AHQR), The Kings Fund, and Lenus, the Irish health repository.

The full search terms and combinations are presented in Appendices 1 (*CINAHL),* 2 *(MEDLINE),* 3 *(*Cochrane Library) and 4 (Grey Literature).

Reference lists of all papers identified as eligible for inclusion were screened for additional potentially eligible papers. In addition, a select search for 'models of care' relevant to chronic disease prevention or management was undertaken (Box 2). This search was undertaken following initial data extraction from which titles of generic model of care were identified. The rationale for undertaking this search was to locate additional papers possibly missed in the main search strategy. We did not conduct a search on the 'Chronic Care Model' because the search strings applied in *CINAHL* and *MEDLINE* included relevant terms.

Study Selection and Review Process

All potentially eligible papers identified in the search strategy were exported to Endnote (Version 7) where duplicates were identified and removed. The papers were initially screened by titles and abstracts independently by the research team (in pairs) to determine whether the papers merited a full text review. The full texts were obtained and independently evaluated by paired members of the review team. All team members were involved in this process with a relatively equal number of papers allocated to each pair. Disagreements were resolved by consensus within each paired team and if necessary involved a third reviewer. A record has been maintained of all decisions made during this process.

Search Output

The search output yielded a total of 6,179 records which eventually narrowed down to 94 papers for inclusion. These 93 papers represented 74 studies in total (Figure 1). This search output is inclusive of select search for individual models of care (Box 2).

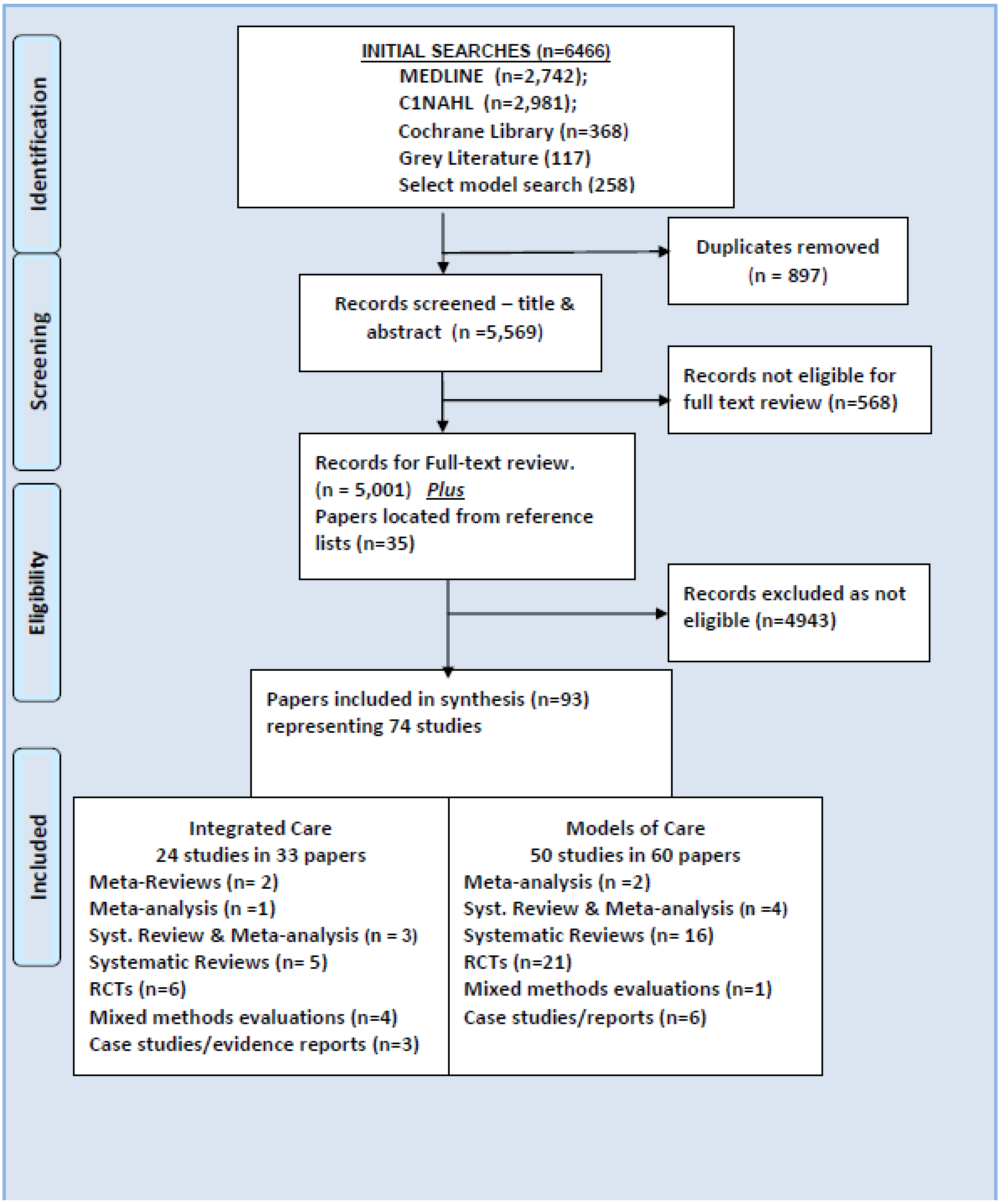

Figure 1 Flow chart of search process and results

Box 2 Search for generic models of care in CINAHL & MEDLINE

Mode	Additional papers screened[1]	Papers included
Kaiser Permanente	75	0
Phoenix Care	0	0
Patient Centred Medical Home	24	2
The Innovative Care for Chronic Conditions (ICCC)	302[2]= 45 with PT limits	0
Expert patient programme	11	0
Chronic Disease Self Management Programme	45	0
Improving Chronic Illness Care (ICIC)	13	0
Transitional care model	12	0
Evercare	9	0
Public health model	18	0
Continuity of care model	4	0
Guided care model	43	0
House of care	16	0

[1] **Searched in Title only. Limited to publication type (PT) due to volume retrieved**

Audit Trail

An audit trail was kept to ensure transparency in terms of total number of papers gleaned from each search strategy source i.e. databases, websites (Appendices 1, 2,3 & 4). All searches were saved in an EBSCO account which facilitated additional searching for new papers over the course of the review (e.g. models of care). All references were managed and categorized using the bibliographic software *Endnote* to facilitate documentation of the search process, streamline document management, remove duplications, and make the generation of reference lists for the final report easier.

Data Extraction

The review questions guided data extraction. In addition, data were extracted on authors, year and country of publication, type of study, and aim of study. Separate data extraction tables were developed for integrated care programmes (Appendices 5 & 6) and for generic models of care (Appendices 7 & 8). The table on integrated care programmes clustered studies around diseases (Appendix 5) and countries (Appendix 6). The table on generic models of care clustered studies around the different types of models reviewed (Appendix 7) and countries (Appendix 8). Data extraction and crosschecking were limited to four members of the team (LM, AOR, EW, ES) to ensure consistency. Data were also extracted for quality appraisal, which is detailed separately below.

Quality Appraisal

For the quality appraisal process, studies were stratified and grouped according to study type i.e. RCTs and systematic reviews, meta-analyses or meta-reviews and then allocated to paired reviewers. The paired reviewers assessed each paper independently. Data were extracted in tabular format using the relevant quality criteria. Both assessors in each pair compared and discussed assessment results to determine level of agreement of scoring. When consensus was not reached, a third reviewer was consulted and quality scores were agreed between all three.

Randomised controlled trials

The quality assessment of RCTs was guided by *Cochrane Handbook of Systematic Reviews* (Chapter 8). Both internal and external validity were assessed. For internal validity, the Cochrane Collaboration's Tool for Assessing Risk of Bias in RCTs was used (Higgins & Greene 2011, see Appendix 9). This risk of bias tool covers the following six domains:

- Random sequence generation (selection bias)
- Allocation concealment (selection bias)
- Blinding of participants and researchers (performance bias)
- Blinding of outcome assessment (detection bias)
- Incomplete outcome data (attrition bias)
- Selective reporting (reporting bias)
- Other bias

Response options were ***low risk, high risk,*** or ***unclear risk***.

The external validity of RCTs was assessed using six items adapted from Foy et al. (2010):

- Was there a representative study population?
- Could the intervention be replicated?
- Could the intervention be sustained?
- Were the outcome measures important for patients and clinical practice?
- Was there long-term follow up on outcomes?
- Is there evidence of the mechanism of action of the intervention?

An additional item was added to assess the external validity of the RCTs with consideration to translating the results to the Irish health care services:

- Could this intervention be applied to an Irish health care context?

Systematic reviews, meta-analyses and meta-reviews

The 'Assessment of Multiple Systematic Reviews' (AMSTAR) was used to assess the quality of systematic reviews/meta-analyses and meta-reviews (Shea et al. 2007; see Appendix 10). This tool has demonstrated good agreement, reliability, construct validity, and feasibility (Shea et al. 2009). The tool consists of 11 items that measure the methodological quality of systematic reviews. The response options include *Yes, No, Can't answer*, or *Not applicable*. '*Can't answer'* is chosen when the item is relevant but not described within the paper by the authors, whereas 'not applicable' is used when the item is not relevant.

The items are as follows:

1. Was an 'a priori' design provided?
2. Was there duplicate study selection and data extraction?
3. Was a comprehensive literature search performed?
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?

5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies provided?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately in formulating conclusions?
9. Were the methods used to combine the findings of studies appropriate?
10. Was the likelihood of publication bias assessed? *(Only applicable to meta-analyses)*
11. Was the conflict of interest included?

Data Synthesis

The evidence was combined and summarized using a narrative synthesis. The heterogeneity of the interventions reviewed and associated outcomes prevented the performance of a meta-analysis. The synthesis of the evidence is presented in a narrative format in Chapter 3.

Chapter 3

Clinical Review Findings

Introduction

The findings of the clinical component of the review are presented in this chapter and are divided into the two main sections, that is, integrated care programmes (ICPs) and generic models of care for CDM.

Integrated Care Programmes

Characteristics of Studies on ICPs

33 papers were reviewed of which 25 represented 17 studies reported as meta-reviews, meta-analyses, systematic reviews or RCTs. The remaining 9 papers were peer reviewed or grey literature sources representing 7 studies which were mixed methods or case reports on the implementation and evaluation of ICPs in one or more country. The types of evidence are presented in Table 2.

Summary points

- ○ Evidence sourced from 33 papers on 24 studies
- ○ 9 chronic diseases explicitly addressed: mostly diabetes
- ○ UK & Netherlands most frequent country of origin
- ○ Least evidence available on definitions of integrated care followed by implementation barriers or enablers

For ease of presentation, all papers are reported as studies.

Table 2 Category of evidence reported for ICPs

MR[a]	MA[b]	SR[c] & MA	SR	RCTs	CS/R[d]	MM[e]	Total
2	1	3[f]	5[g]	6[h]	3	4[i]	24

a Meta review; b Meta-analysis; c Systematic review; d Case study/report; e Mixed method study; f Reported in 5 papers; g Reported in 6 papers; h Reported in 11 papers; i Reported in 5 papers.

As shown in Table 2, most evidence was sourced from syntheses of secondary data, most of which related to RCTs. (see Figure 2 below).

The country of origin for most primary authors of studies reviewed was the UK (n=8) followed by the Netherlands (n=5). The primary authors of the remaining studies were from Australia, Canada, Denmark, Ireland, New Zealand, Norway, Spain, Switzerland and USA.

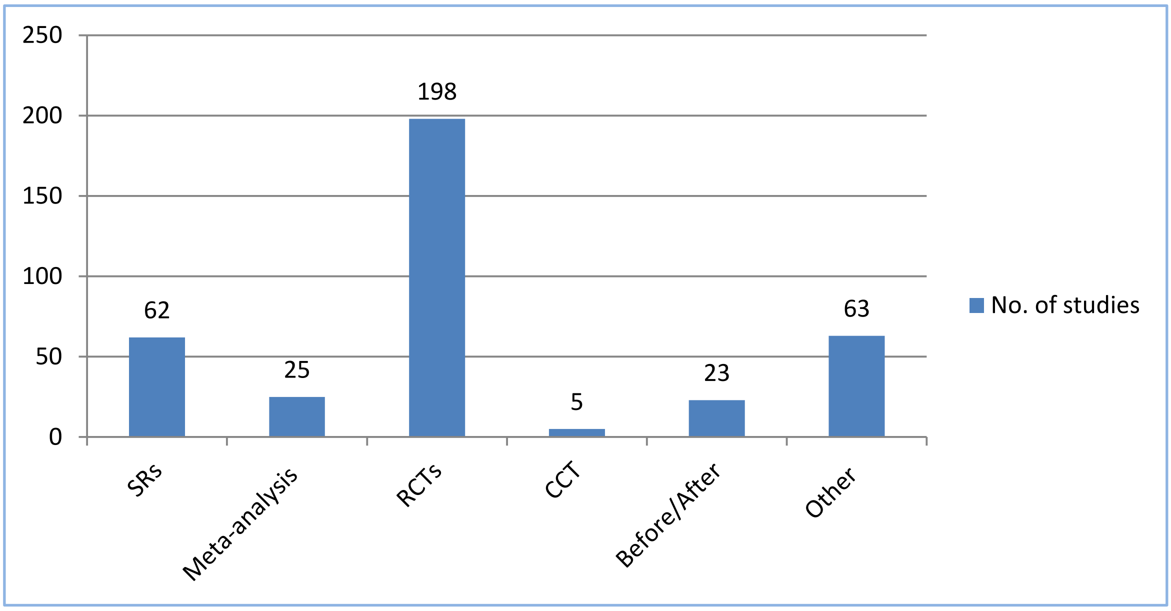

Figure 2 ***Studies included in evidence synthesis papers on ICPs***

What chronic diseases are examined singly or in combination in integrated care programmes?

Nine chronic diseases were explicitly examined across papers reviewed; diabetes and COPD being the most common (Figure 3). In some papers, reference to multimorbidity or other 'general chronic conditions' was made without further detail.

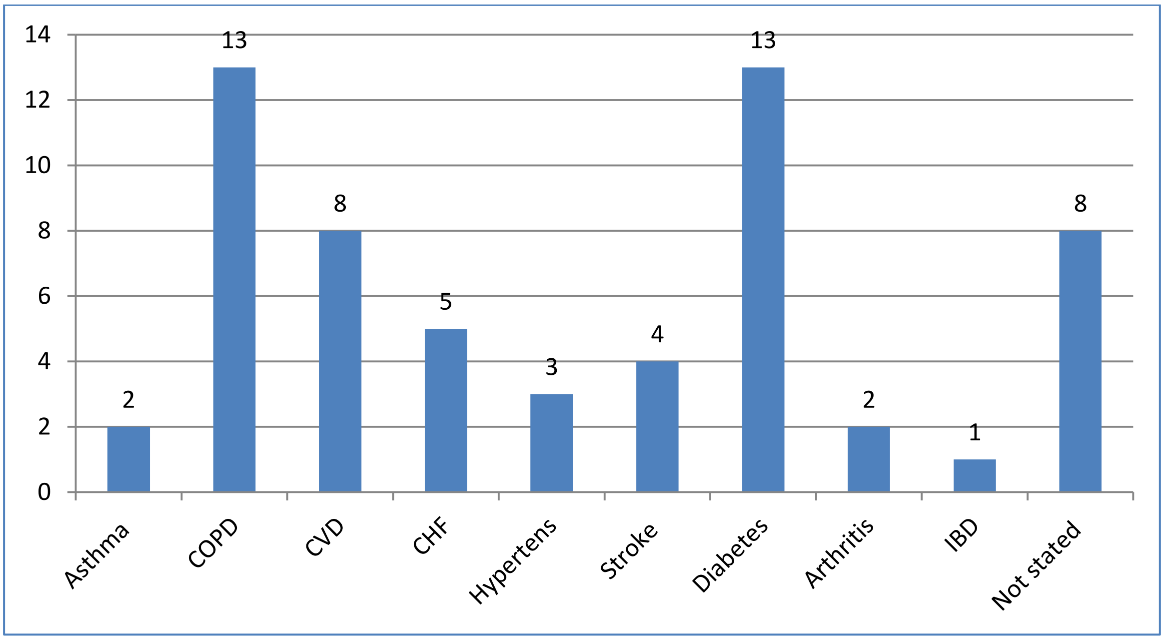

Figure 3: ***Diseases addressed in ICPs***

Further analysis established the number of diseases included in evidence synthesis papers reviewed (Figure 4). Diabetes was the most common disease examined.

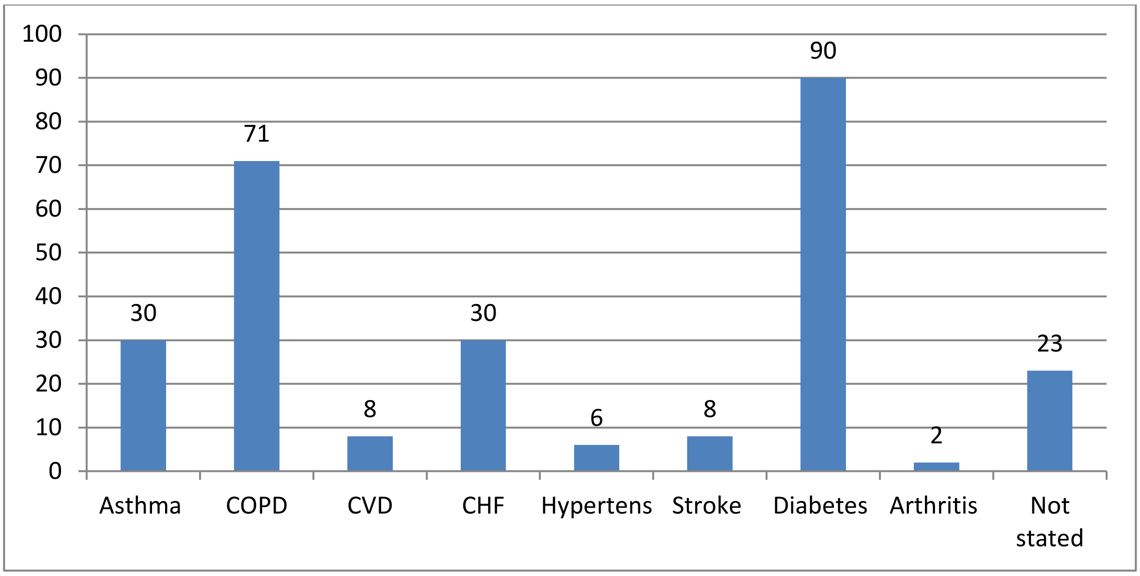

Figure 4 ***Diseases included in evidence synthesis papers on ICPs***

The following is a summary of the ICP interventions with reference to the main description presented for 'integrated care' in the studies reviewed.

- Planned and shared care coordination between primary and secondary care (Tivota et al. 2015; Hernandez et al. 2015; Joubert et al. 2009; Smith et al. 2007; Van Bruggen et al. 2007; Singh 2005a,b);
- Collaborations/multidisciplinary team working and approach to disease management (Rosenberg et al. 2014; Foy et al. 2010; Allen & Rixson 2008) including training on integrated disease management (Kruis et al. 2014b);
- Relationships or partnerships between services or systems integration (Naylor et al. 2015; Curry et al. 2013; RAND 2012; Apteligen 2011; Cumming 2011; Frølich et al.2010; Rosen et al. 2008);
- Integrated technology (Health Quality Ontario 2013; Pinnock et al. 2013);
- Integrated disease management programmes involving interventions that were patient, professional or organisational in orientation (Martinez-Gonzalez et al. 2014; Kruis et al. 2013a; Lemmens et al. 2009; Ouwens et al. 2005) including the implementation of performance improvement models (Minkman et al. 2007).

The above ICPs are not mutually exclusive and evidence of overlap is shown later in Table 9 on the spectrum of ICPs and their features. Later in the chapter, the above descriptors are categorised into 4 main types of integrated care: clinical, professional, organisational and systems approaches (see Spectrum of ICPs and Characteristic Features).

The country specific papers extracted in Appendix 6 included: the UK (Naylor et al. 2015; Curry et al. 2013; RAND 2012; Apteligen 2011; Rosen et al. 2008); Denmark (Frølich et al. 2010); and New Zealand (Cumming 2011).

Sample sizes of adults varied across papers, ranging in RCTs from 114 (Hernandez et al. 2015) to 256 (Pinnock et al. 2013). Some authors of evidence synthesis papers reported on a combined sample size for all studies reviewed with the highest being 47,326 (Van Bruggen et al. 2007). A larger sample was evident in one paper that reported on the number of participants in each study ranging from 36 to 101,368 (Lemmens et al. 2009). GP practices were the sampling unit in 2 studies involving 40 GP practices in a cluster RCT (Kruis et al. 2014b) and 100 general practices in a mixed study evaluation of pilot ICPs in the UK (Curry et al. 2013).

The studies varied on the extent to which individual questions were addressed. As shown in Table 3, the questions least addressed related to definitions (Q.2), and barriers and enablers to implementation of ICPs (Q.10 & Q.11).

Table 3 Number of ICP studies providing data on research questions

	MR[a] (n=2)	**MA[b] (n=1)**	**SR[c] & MA (n=3)**	**SR (n=5)**	**RCT (=6)**	**CS/R[d] (n=3)**	**MM[e] (n=4)**	**Total (n=24)**
Q.1.Defintions[1]	2	0	1	3	2	1	2	11
Q.2. Description of ICP	2	1	3	5	6	5	3	24
Q.3. Core elements	2	1	3	5	6	5	3	24
Q.4. Most/least common features	2	1	3	5	NA	5	2	17
Q.5. Chronic diseases addressed	2	1	3	5	6	5	3	24
Q.6 &7. Impact/Effects	2	1	3	5	6	4	3	23
Q.8. Components associated with improved results/ effects	1	1	3	5	3	4	1	17
Q.9. Methods of evaluation	2	1	3	5	6	5	3	24[2]
Q.10. Implementation barriers	0	0	1	0	3	5	3	11
Q.11. Implementation enablers	1	0	0	0	3	5	3	12

[1] Definitions explicit to integrated care only counted. [2] RTCs considered an evaluation of ICPs hence the total of 24.

[a] Meta review; [b] Meta-analysis; [c] Systematic review; [d] Case study/report; [e] Mixed method study

Methodological Quality of Studies

Quality of systematic reviews, meta-analyses and meta-reviews

The methodological quality of evidence synthesis studies on ICPs (n=11) varied considerably. From the eleven AMSTAR criteria, 2 studies met nine criteria (Kruis et al. 2013a, Smith et al. 2007) and 4 studies met eight criteria (Allen & Rixson 2009, Foy et al. 2010, Lemmens et al. 2009, Martínez-González et al. 2014). The remaining studies met less than 50% of the criteria, one of which met none (Van Bruggen et al. 2007). Most studies (n=10) conducted a comprehensive search consisting of at least two databases and a supplementary search of grey literature. The majority of studies provided an ‘a priori’ design, reported the characteristics of the included studies, assessed the scientific quality of included studies and used the findings to inform conclusions. Furthermore, the majority of studies used appropriate methods to combine study findings. None of the studies assessed the likelihood of publication bias using graphical aids and/or statistical tests. The appraisal of studies is presented in Table 4 and the number of studies meeting the quality criteria is presented in Figure 5.

Table 4 Quality assessment of systematic reviews, meta-analyses & meta-reviews on ICPs (n=11)

Author (year)	A priori design	Duplicate study selection and data extraction	Comprehensive literature search	Status of publication used as inclusion criteria	List of included and excluded studies	Characteristics of included studies	Scientific quality assessed	Scientific quality used to form conclusions	Methods to combine studies appropriate	Likelihood of publication bias	Conflict of interest	N Yes
Allen & Rixson (2009)	Yes	Can't answer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	No	8
Foy et al. (2010)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	8
Health Quality Ontario (2013)	Can't answer	No	Yes	No	No	Yes	Yes	Yes	No	NA	Yes	5
Kruis et al. (2013a)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	9
Lemmens et al. (2009)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	NA	Yes	8
Martínez-González et al. (2014)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NA	No	8
Minkman et al. (2007)	Can't answer	Can't answer	Yes	Yes	No	Yes	No	No	Yes	NA	No	4
Ouwens et al. (2005)	No	Yes	Yes	No	No	No	No	NA	No	NA	No	2
Singh (2005a)	Yes	No	Yes	Yes	No	No	No	No	NA	NA	No	3
Smith et al. (2007)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	NA	Yes	9
Van Bruggen et al. (2007)	No	No	No	No	No	No	No	NA	Can't answer	NA	No	0
Total (Yes)	7	6	10	5	2	8	7	7	7	0	5	

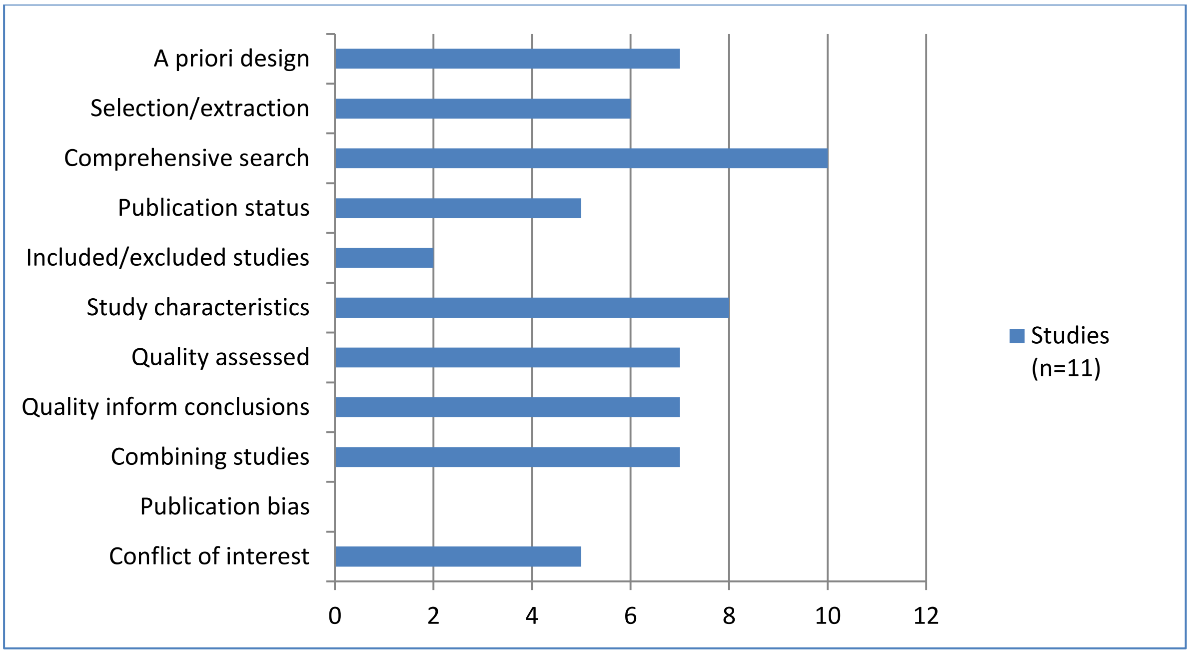

Figure 5 ***Quality of systematic reviews, meta-analyses & meta-reviews using AMSTAR***

Quality of RCTs

The methodological quality of RCTs on ICPs (n=6) was assessed for internal and external validity.

Internal validity: From the seven Cochrane EPOC risk of bias criteria, one study met six criteria (Hernández et al. 2015), and one met five criteria (Pinnock et al. 2013). The remaining studies met between three and four criteria (Joubert et al. 2009; Kruis et al. 2014b; Rosenberg et al. 2014; Titova et al. 2015). Six studies were identified as low risk in terms of selective reporting of outcomes and other bias. Five studies adequately generated the random allocation sequence. Less than half of the studies concealed the allocation adequately or conducted adequate blinding of participants, personnel and outcome assessors. One study did not address incomplete outcome data appropriately. The appraisal of studies for internal validity is presented in Table 5 and the number of studies meeting the quality criteria is presented in Figure 6.

Table 5 Internal validity of RCTs on ICPs (n=6)

Author (Year)	**Random sequence generation**	**Allocation concealment**	**Blinding of participants and personnel**	**Blinding of outcome assessment**	**Incomplete outcome data**	**Selective reporting**	**Other bias**	**Total (low risk)**
Hernández et al. (2015)	Low	Low	High	Low	Low	Low	Low	6
Joubert et al. (2009)	Low	High	High	High	Unclear	Low	Low	3
Kruis et al. (2014b)	Low	High	High	Unclear	Unclear	Low	Low	3
Pinnock et al. (2013)	Low	Low	High	Low	Unclear	Low	Low	5
Rosenberg et al. (2014)	Low	Unclear	High	Unclear	Unclear	Low	Low	3
Titova et al. (2015)	Unclear	High	Low	Low	High	Low	Low	4
Total (low risk)	5	2	1	3	1	6	6	

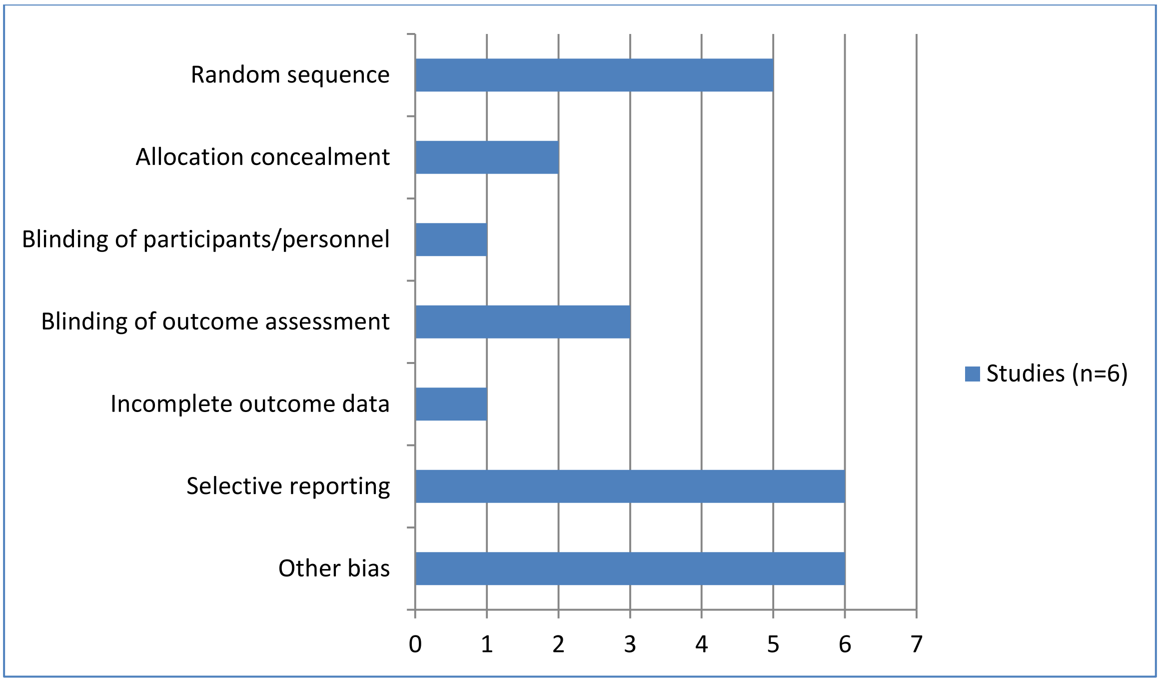

Figure 6 ***Internal validity of RCTs on ICPs***

External validity: The majority of studies (n=5) met all of the external validity criteria. One study met only five out of seven criteria (Titova et al. 2015). All of the studies used a representative study population; described the intervention in enough detail to enable replication; measured outcomes that directly benefit patients; and had at least 12 months of follow-up data. With regard to the researcher-developed question on applicability to the Irish healthcare context, all interventions (n=6) were deemed to be suitable for application. The appraisal of studies for internal validity is presented in Table 6 and the number of studies meeting the quality criteria is presented in Figure 7.

Table 6 External validity of RCTs on ICPs (n=6)

Author (year)	**Representative Study Population**	**Replication Enabled**	**Intervention Sustainability**	**Main Outcomes Important**	**Long-Term Outcome Known**	**Mechanism of Action**	**Could this intervention be applied to Irish Healthcare Context****	**Total (Yes)**
Hernández et al. (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes (with sufficient resources)	7
Joubert et al. (2009)	Yes	Yes	Yes	Yes	Yes	Yes	Yes (with sufficient resources)	7
Kruis et al. (2014b)	Yes	Yes	Yes	Yes	Yes	Yes	Yes (with sufficient resources)	7
Pinnock et al. (2011)	Yes	Yes	Yes	Yes	Yes	Yes	Yes (with sufficient resources)	7
Rosenberg et al. (2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes (with sufficient resources)	7
Titova et al. (2015)	Yes	Yes	No	Yes	Yes	No	Yes (with sufficient resources)	5
Total (Yes)	6	6	5	6	6	5	6	

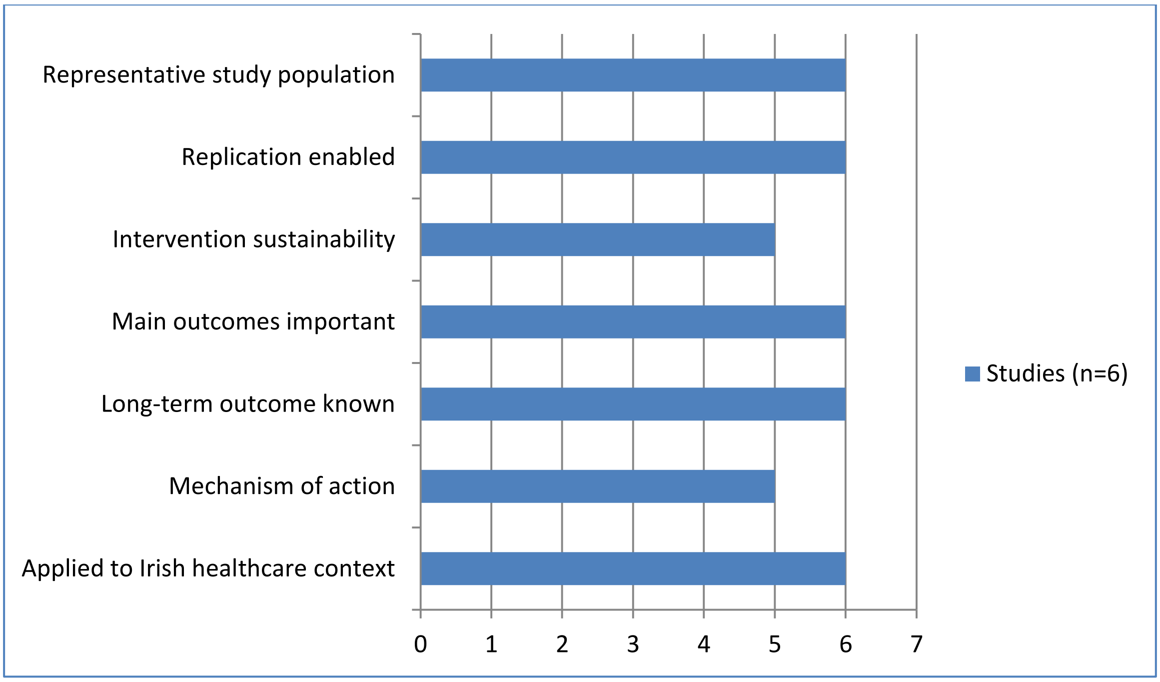

Figure 7 ***External validity of RCTs on ICPs***

Definitions of ICPs

What is the spectrum of definitions that exist for chronic disease ICPs?

The literature on integrated care has repeatedly pointed to a plethora of definitions on integrated care with one review identifying approximately 175 definitions (Armitage et al. 2009). In our review, 11 definitions were identified (Table 7).

Table 7 Definitions of integrated care

Paper	Definition[1]
Allen & Rixson (2008)	(IC pathway) "a multidisciplinary tool to improve the quality and efficiency of evidence based care and is used as a communication tool between professionals to manage and standardise the outcome orientated care" (p.81 sourced from (Vanhaecht et al. 2005)
Curry et al. (2013)	IC: " an approach that seeks to improve the quality of care for individual patients, service users and carers by ensuring that services are well coordinated around their needs (p.2, sourced from Goodwin et al. 2012)
Cumming (2011)	" service delivery that provides a 'smooth and continuous' transition between services i.e. 'co-ordinated' care with co-operation and collaboration across services and a 'seamless' journey for service users, as they receive health, support and social welfare services from a range of health and other professionals" (p.2)
Joubert et al. (2009)	The Integrated Care for the Reduction of Secondary Stroke (ICARUSS) model is "a novel and multimodal programme aimed at facilitating the implementation of recommended stroke prevention strategies. The model incorporates a "shared care" component"(p.278)
Kruis et al. (2013a)	"a mean of improving quality and efficiency of care aimed at reducing symptoms and avoiding fragmentation of care, while containing costs" (p.6)

Martinez-Gonzalez et al. (2014)	"an organizing principle for care delivery; integration describes the methods, processes and models to achieve such delivery of care"(p.561 cited from Ouwens et al 2005)
Minkman et al. (2007)	a "seamless…during whole care process. For health care organizations, this requires 'horizontal' coordination, collaboration with other organizations and community partners" (p.91)
Ouwens et al. (2005)	"an organisational process of coordination that seeks to achieve seamless and continuous care, tailored to the patient's needs, and based on a holistic view of the patient" (p. 142, sourced from Mur-Veeman et al. 2003)
RAND (2012)	IC conceptualised rather than defined with reference to 4 key elements: "(a) the types of integration (e.g., functional, organisational, etc.); (b) the breadth of integration (i.e., vertical or horizontal); (c) the degree of integration; and (d) the process of integration (i.e., structural, cultural, social)" (p. 8)
Singh (2005a)	"collaborative working, commonly across care in the community (primary care) and (secondary) care…can also be used to refer to multidisciplinary working, and involving health specialists, social care, and voluntary organizations in care processes" (p.10)
Sunde et al. (2014)	a means for improving services in relation to access, quality, user satisfaction, and efficiency… [by] bringing together inputs, delivery, management, and organisation of services related to diagnosis, treatment, care, rehabilitation and health promotion" (p.470, sourced from Grone & Garcia-Barvero 2001).

[1] Source references, if applicable, are cited as footnotes in (Appendices 5 & 6).

Although definitions differed, shared characteristics were evident. An analysis of the above definitions yielded 4 clusters of statements representing: (i) the core element of what integrated care is; (ii) the purpose of integrated care; (iii) the health care context of integrated care; and (iv) the method of achieving integrated care (Table 8).

Table 8 Statement clusters for integrated care definitions

Core element of IC	**Purpose**	**Method of achieving IC**	**Context of IC**
smooth & continuous transition between services[a] 'seamless' journey for service users[a] seamless…during whole care process[b] seamless and continuous care tailored to the patient's needs, and based on a holistic view of the patient[c] an organizing principle for care delivery[d] or process of organisation[c]	to improve quality[e f g] & efficiency[e f] of care to manage & standardize outcome oriented care[e] improving services in relation to access, quality, user satisfaction, & efficiency[h] avoid fragmentation[f] containing costs[f]	coorindated services/ care[a b c g] collaboration[a b j] shared care[i] multidisciplinary working[e j] bringing together inputs, delivery, management, and organization of services[h]	across service boundaries[a] across health & social welfare services[a] & community partners[b] across community (primary care) and (secondary) care[j]

[a] Cumming (2011); [b] Minkman et al. (2007); [c] Ouwens et al. (2005); [d] Martinez-Gonzalez et al. (2014); [e] Allen & Rixson (2009); [f] Kruis et al. (2013a); [G] Curry et al. (2013); [h] Sunde et al. (2014); [i] Joubert et al. (2009) [j] Singh (2005a)

Based on the above clusters, a definition of integrated care from this review is as follows:

> ***Integrated care in the management and prevention of chronic disease is an organizing principle characterised by a smooth, holistic, continuous and seamless journey between services tailored to the needs of service users. The ultimate goal of integrated care is to improve the quality and efficiency of care and services, and to avoid fragmentation. The methods for achieving integrated are through care co-ordination, collaboration, shared care, and multidisciplinary working.***

Spectrum of ICPs and Characteristic Features

What is the spectrum of ICPs that exist for chronic disease prevention / management?

What features characterize ICPs for chronic disease prevention/management?

What are the shared features and differences between ICPs?

We synthesised the spectrum of ICPs and associated features as follows:

1. **Clinical integration** is defined as "The coordination of person-focused care in a single process across time, place and discipline" (Valentjin et al. 2013, p.7). The focus is on the point of care delivery with the service user with consideration to the extent to which services are integrated in a co-ordinated way across various professional and organisational boundaries.
2. **Professional integration** is defined as "Inter professional partnerships based on shared competences, roles, responsibilities and accountability to deliver a comprehensive continuum of care to a defined population" (Valentjin et al. 2013, p.7).
3. **Organisational integration** is defined as "Inter-organisational relationships (e.g., contracting, strategic alliances, knowledge networks, mergers), including common governance mechanisms, to deliver comprehensive services to a defined population" (Valentjin et al. 2013, p. 6).
4. **System integration** focuses on system integration across the full spectrum of health and social care services targeting the whole population. It involves alignment of regulation, incentives and policies at both administrative and organisational level (Fulop et al. 2005).

The above categories represent levels of integrated care commonly cited in the literature, namely, macro level (system), meso level (professional and organisational) and micro level (clinical) (Valentjin et al. 2013; Fulop et al. 2005; Kodner & Spreeuwenberg 2002).
While the above categories provided a comprehensive framework for synthesising the data, few studies described interventions or programmes within a framework of integrated care.

As shown in Table 9 below, our mapping of ICPs spanned all four categories. ICPs with features of integrated care at clinical level were found to be most common; systems integration was least common.

Table 9 Spectrum of ICPs and features

Key Features identified within category of integration (see above definitions on clinical, professional, organisational & systems integration)	**No. of Studies / Reports (n=24)**
Clinical Integration (n=22, 91.6%)	
o **Nurse /specialist nurse led care** e.g.	16[B D E G H I J K L M N O Q R T V]
o case management /co-ordination/ clinics/telephonic support	
o specialist nurses working in primary care with scheduled visits to GP practices	
o primary care access to specialists (e.g.telephone/email) or	
o secondary care specialist outreach to patients' homes &/or GP practices,	
o **Shared/centralised information systems e.g.**	15[A C D E F G I L P Q R S T V W]
o electronic, e-mail, recalls, referrals, tracking, patient records, disease registers	
o **Clinical decision support tools** e.g.	17[A B C D F G I K L M N Q R S T V W]
o use of guidelines, protocols, standardised assessment /care plans	
o **Self-management/patient education & support**	15[B D F G H I J K M N O Q T V W]
Professional Integration (n=18,75%)	
o **Multidisciplinary team collaboration/working together**	16[A C D E G H I J K L N O Q S T U]
o planned collaboration between PC teams & specialists (secondary care)	
o collaboration between specialists from different services	
o joint assessment/care planning/disease management	
o **Multidisciplinary/Professional education**	
o educating multidisciplinary teams on integrated care/disease management	7[B D I J L O W]
Organisational Integration (n=9, 37.5%)	
o **Building inter-organisational relationships** e.g.	7 [E F O R T V W]
o Regional/national service or professional networks	
o Forming partnerships with community organisations	
o **Delivery system design e.g.**	5[A F S T W]
o role definition & task distribution	
o provision of case management services	
o practice plans	
o performance management/feedback	
Systems Integration (n=6, 25%)	
o **Shared governance & strategic arrangements across the system e.g.**	3[R V W]
o vision, accountability for service provision, system wide metrics for defining successes, shared management arrangements; reconfiguration of services; whole population focus	
o **Joint service delivery** (bringing organisations together) e.g.	5[R S U V W]
o putting in place IT infrastructures to facilitate sharing of information across provider organisations e.g. primary and hospital care	
o supporting multidisciplinary meetings across services	
o developing job roles that span primary and secondary settings	
o **Financing/ Financial incentives for participating organizations**	3[S V X]
o **Commissioning**	3[U V X]

[A] Martinez-Gonzalez et al. 2014; [B] Ouwens et al. (2005); [C] Foy et al. (2010); [D] Smith et al. (2007); [E] Singh (2005a); [F] Minkman et al. (2007); [G] Rosenberg et al. (2014); [H] Van Bruggen et al. (2007); [I] Kruis et al. (2014b); [J] Lemmens et al. (2009); [K] Allen & Rixson (2089); [L] Joubert et al. (2009); [M] Hernandez et al. (2015); [N] Titova et al. (2015); [O] Kruis et al. (2013a); [P] Health Quality Ontario (2013); [Q] Pinnock et al. (2013); [R] Naylor et al. (2015); [S] Curry et al. (2013); [T] RAND (2012); [U] Apteligen (2011); [V] Rosen et al. (2008); [W] Frølich et al.(2010); [X] Cumming (2011);

Overall, the most common features of ICPs were seen at clinical level with reference to:

- Nurse /specialist nurse led care e.g. case management, co-ordination, clinics (n=16)
- Shared clinical decision support tools (n=17)
- Shared/centralised information systems (n=13)

The role of nursing: this was found to be multifaceted involving: case management (Kruis et al. 2014b, Ouwens et al. 2005); hospital discharge care and follow up (Singh 2005a); community outreach services such as home care visits (Titova et al. 2015; Singh 2005a), telephonic support (Titova et al. 2015; Hernandez et al. 2015) or to primary care practices (Lemmens et al. 2009); care co-ordination between primary and secondary services (Titova et al. 2015; Hernandez et al. 2015; Smith et al. 2007); nurse led clinics in primary care practices (Van Bruggen et al. 2007; Singh 2005a); and collaborative care with primary care teams (Hernandez et al. 2015; Titova et al. 2015; Rosenberg et al. 2014; RAND 2012). A consistent finding across most studies reporting on self-management was that nurses had a key supporting role, directly involved with patients.

Summary points

The role of nursing in ICPs involves:

- specialist care in PC practice incl. education & support to PC teams
- outreach from hospital based specialists
- case management
- self-management support
- primary & secondary care coordination

There is an increasing shift away from specialist nursing outreach home visits & discharge follow-ups towards specialist scheduled visits in PC practices providing self-management support to patients, and education & support to PC teams.

Most evidence on the role of specialist nurses related to collaboration with primary care teams (GPs & practice nurses) including the provision of specialist education and support on disease management (Titova et al. 2015; Hernandez et al. 2015; Rosenberg et al. 2014; Pinnock et al. 2013; RAND 2012; Lemmens et al. 2009; Joubert et al. 2009; Van Bruggen et al. 2007; Singh 2005a,b).

In an evaluation of ICP pilot projects in the UK, RAND (2012) reported a shift towards specialist care into primary care with specialists going to GP practices to review patients and to provide specialist support and education to primary care teams. This model included nurses as named key workers involved in care planning, monitoring and self-management support, regular follow-up and contact as needed by the primary care services. Nurses were key to co-ordinating care between secondary and primary care services. This differs from the outreach model of specialist nursing which involves hospital based nurses providing services in the community.

Shared clinical decision support tools: the use of clinical decision support tools included clinical guidelines or protocols on the management of specific diseases. These tools supported standardised approaches to assessment, care planning, monitoring and referrals. Evidence based clinical guidelines drew on national or international recommendations and standards for the treatment and management of specific diseases such as COPD (e.g. Titova et al. 2015; Kruis et al. 2014b) and stroke (Joubert et al. 2009). There was evidence that clinical guidelines served as a basis for multi-disciplinary shared care (e.g. Titova et al. 2015; Foy et al. 2010; Frølich et al. 2010; Joubert et al. 2009; Smith et al. 2007). Although standardised, the need for clinical guidelines or other clinical decision support tools to be tailored and individualised to patients' needs is important (Foy et al. 2010).

Summary point

Shared disease specific clinical guidelines within and across services facilitate standardised approaches to assessment, care planning, monitoring & referrals.

Clinical Information systems: shared or centralised information systems between secondary and primary care were mostly computer based and bi-directional in flow. In other words, the exchange of patient and clinical information is a two way process flowing from:

(i) specialist and secondary care services out to primary care practices, and

(ii) primary care practices into specialist and secondary care services

Summary points

To support integrated care, information systems need to be:

- shared & centralised within and across services
- bi-directional in flow between primary and secondary care

Shared & centralised information systems are key to continuity of patient care within and across services

The types of information shared included:

- electronic health records of patients (Health Quality Ontario 2013; Curry et al. 2013; RAND 2012; Smith et al. 2007; Foy et al. 2010; Minkman et al. 2007), and
- tracking and recall information (Rosenberg et al. 2014; Smith et al. 2007; Foy et al. 2010; Minkman et al. 2007; Singh 2005a).

Continuity of patient care in the management of chronic disease was a fundamental goal of having shared or centralised information systems. With reference to the acute hospital sector, the need to develop and strengthen integrated IT platforms was highlighted by Naylor et al. (2015) to support information sharing between acute hospitals and primary care providers. In their report on case studies in the UK, they noted that some sites had invested significantly on shared information systems with the intention of eliminating duplication of effort and ensuring that assessment of patients' needs were universal.

Outcomes and Effectiveness of ICPs

What is the range of outcomes examined in the ICPs for chronic disease prevention/ management, and what is the level of change or resulting impact?

The range of outcomes examined in ICPs is presented in Box 3, most of which related to patient, process or service outcomes. Nine studies assessed costs none of which performed an economic analysis linking costs to outcomes. Later in this report (Chapter 5), findings of an economic evaluation of ICPs conducted for the economic arm of this review are reported.

Box 3 ICP outcomes assessed

Category	n	Category	n
Patient outcomes	**21**	**Service Outcomes**	**18**
Clinical health status	18	Hospital admissions or	14
Quality of life	14	Readmissions	7
Satisfaction with care	11	Length of stay (LOS)	12
Mortality	8	ED visits	11
Health behaviours	7	PC/specialist visits	4
Functional status	6	**HCP outcomes**	**3**
Mental health	5	Role clarification	2
Self-management	3	Satisfaction with	1
Process outcomes	**17**	services	
Health monitoring	8	Relationships with	1
Quality care/standards	6	clinicians	
Medication	5	**Resources**	**9**
management		Costs	9
Communication	3	Personnel	1
Coordination/access	3	**Systems**	**2**
		Levels of integration	2

Summary points

Outcomes most commonly assessed were:

- clinical health status, quality of life, satisfaction with care, health monitoring, hospital admission rates, LOS & ED visits

Positive effects of ICPs for:

- HbA1c, cholesterol, BP
- psychological health, QOL & behavioural changes
- diabetes health monitoring
- Hospital admissions & LOS

Inconclusive evidence on the effects of ICPs on ED visits

We faced some challenges in assessing the effects or impact of ICPs on outcomes measured. This was mainly because of the varying types of papers reviewed ranging from evidence synthesis studies to RCTs as well as mixed methods studies focusing on ICPs in individual countries. When extracting the data on ICP outcomes from secondary research, we were cautious to be as transparent as possible by reporting the number of studies that provided evidence on significant or non-significant effects where available from the total number of studies reviewed (e.g. see Lemmens et al. 2009; Allen & Rixson 2008 in Appendices 5 & 6).

Patient outcomes

As listed above in Box 3, the most common patient outcomes measured were:

- changes in clinical status
- quality of life
- satisfaction with care.

Changes in clinical status: measures on clinical status were largely related to the type of chronic disease, for example, HBA1c in diabetes, pulmonary function in COPD, and blood pressure in cardiovascular disease or stroke. The findings were mixed. The most notable positive effects as evident in 50% or more of studies related to improved HBA1c (n=8/9)[5]; cholesterol levels (n=6/7), and reduction in systolic and/or diastolic blood pressure (n=4/9). Effects of ICPs on pulmonary function in patients with COPD were less promising with few studies reported in systematic reviews as having significant effects (Kruis et al. 2013a; Smith et al. 2007; Lemmens et al. 2009).

Other patient outcomes: significant positive effects were found for satisfaction with care (n=9/11), changes in health behaviours (n=7/7), mental health and wellbeing (n=5/5), self-management (n=3/3), functional abilities (n=5/6), and quality of life (n=7/14). Only 3 of the 8 studies reporting on mortality had significant positive effects: CHF (Martinez-Gonzalez et al. 2014); stroke (Ouwens et al. 2005); and COPD (Hernandez et al. 2015).

Process outcomes

Process outcomes were assessed in 17 studies reviewed. However, individual outcomes within this category were each assessed in less than 50% of the 17 studies (see Box 3). The most frequently assessed outcome was health monitoring (8/17).

Health monitoring: There is evidence to suggest that ICPs increase the frequency of foot and eye examinations in diabetes care (n=3/5); cholesterol testing (n=2/2), and improves appropriate and timely referral and access to relevant services for patients (n=3/4).

Other process outcomes: there was little consistency on the assessment of some process outcomes. For example, medication management included adjustment (Rosenberg et al. 2014), usage (Tivota et al. 2015), appropriate prescribing (Health Quality Ontario 2013; Rosenberg et al. 2013) and decreased errors (RAND 2012). Overall, the findings were mixed with no clear trend of positive effects for medication management. Positive trends were seen on quality and standards of care for goal setting (Minkman et al. 2007), documentation (Allen & Rixson 2008), and practitioner adherence to guidelines (Martinez-Gonzalez et al. 2014). For example in Martinez-Gonzalez's meta-review, 19 systematic reviews most of which were meta-analyses reported significant improvements in guideline adherence across 15 papers relating to CHF, diabetes, COPD and asthma.

Positive outcomes with significant improvements were found in relation to the provision of self-management and lifestyle behaviour health advice to patients as observed in 6 studies reported in one systematic review and meta-analysis (Health Quality Ontario 2013). In two systematic reviews, positive effects on ICP on communication including documentation were found (Health Quality Ontario 2013; Allen & Rixson 2008). For example in 3 studies reported by Health Quality Ontario on the impact of eTools for health information exchange, a significant increase in the number of letters sent from specialist to GPs (although not the reverse) was found in 1 study. In another study, the length of time that

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[5] The data are reported as the number of studies yielding positive outcomes out of the number of studies that measured the outcome, i.e 9/10 means 9 out of the 10 studies that measured this outcome were found to have positive effects/trends toward improvement.

patients were seen by GPs and practice nurses increased. No significant differences were found between intervention and control groups in the third study regarding the timing that patient discharge summaries were received in primary care practices (Health Quality Ontario 2013). The use of shared records reviewed by Smith et al. (2007) found that a shared care intervention did not yield significant positive effects.

Service outcomes

Service utilisation outcomes were assessed in 18 studies, the most common being:

- hospital admission/readmission rates
- length of hospital stay
- ED visits

Hospital admission & readmission: significant positive effects were found for some studies in all evidence synthesis papers reviewed, 3 of which had most studies showing reductions on hospital utilisation with reference to:

- integrated disease management programmes for a range of chronic diseases (Martinez-Gonzalez et al. 2014, n=10/18) and COPD specifically; Kruis et al. 2013a, n =7/7);
- integrated primary and secondary care with MDTs working across boundaries (Singh 2005a, n=4/4); and
- clinical information exchange between primary care teams and secondary care specialists (Foy et al. 2010, n=1/1).

In contrast, other evidence synthesis papers found positive effects in less than 50% of studies reviewed involving shared care services (Smith et al. 2007, n =2/5) and integrated disease management programmes (Lemmens et al. 2009, n=7/25). Lemmens et al. highlighted that multiple interventions are needed to optimise the effectiveness of ICPs. They found that interventions incorporating three levels of integrated care in CDM (i.e. clinical, professional and organisational levels) resulted in patients having less chance of at least one hospital admission compared to those in usual care.

Hospital utilisation was assessed in 3 RCTs (Titova et al. 2015; Kruis et al. 2014b; Pinnock et al. 2013), one of which was found to have positive effects (Titova et al. 2015; Sunde et al. 2014). These Norwegian researchers implemented a COPD-home intervention as a post discharge integrated approach to care between home care nurses, GPs and specialist nurses for patients with stage III and IV COPD. The primary outcome was hospital admissions. Hospital admissions in the intervention group were reduced by 12.6% at 12 months follow up and by 46.5% at 24 months follow up. This compared favourably to the control group on usual care for whom a significant increase by 8.3% in hospital admissions was found.

The remaining 2 RCTs on telemonitoring (Pinnock et al. 2013), and educating primary care and specialist teams as well as establishing a primary care network (Kruis et al. 2014b) had no significant effect on hospital admissions or readmissions.

The differences in outcomes in the 3 RCTs suggest that ICPs with direct patient contact and MDT care optimise the potential for positive effects, as evident in one RCT by Tivota et al. (2015). Later, the types of ICPs showing positive effects are addressed.

Length of hospital stay (LOS): significant positive effects in reducing LOS was evident in 50% of studies in our review (n=6/12) inclusive of at least 50% of studies in evidence synthesis papers (e.g. Martinez-Gonzalez et al. 2014; Singh 2005a). In the RCT by Tivota et al. (2015) referred to above on the COPD-home model, the number of hospital days was significantly lower and reduced by 48.3% (468 days) at 12 months follow up for the intervention group compared to 479 days for the control group. This reduction was sustained 2 years later.

ED visits: the evidence on the effects of ICPs on ED is inconclusive based on our review. Most evidence on ED utilisation was drawn from evidence synthesis papers, 3 of which found significant reductions in ED visits in all (Singh 2005a, n=5//5) or 50% or more (Martinez-Gonzalez et al. 2014, n=6/11; Minkman et al. 2007, n=1/2) studies that assessed this outcome. The remaining 4 systematic reviews that reported on this outcome found significant positive effects in less than 50% of studies reviewed (Kruis et al. 2013a, n=1/3; Health Quality Ontario 2013, n=1/3; Lemmens et al. 2009, n=3/18; Smith et al. 2007, n=1/5).

The papers on the implementation and evaluation of ICPs in pilot sites in the UK reported no significant reductions in ED visits (Curry et al. 2013; RAND 2012). On the other hand, Naylor et al.'s (2015) reported reductions in ED visits in some NHS trusts implementing integrated care using telehealth technology or community emergency response teams.

In our review, just one RCT assessed ED visits (Hernandez et al. 2015) and found a significant reduction in COPD related visits at 12 months follow up and this was sustained 6 years later. The intervention involved integrated community care for patients with severe COPD and co-morbidities. It was primary care led with support from specialist teams, primarily hospital based respiratory nurses who educated the primary care teams on COPD management and did some joint home visits including scheduled visits as required. Primary care teams had continuous access to respiratory nurse specialist.

ICPs with Positive Outcomes

What ICPs are effective in improving outcomes and what are the results on outcomes?

As shown earlier in Table 9 on the spectrum of ICPs, most programmes were found to involve one or more features of integrated clinical care (n= 22, 01.6%) followed by professional integration involving multidisciplinary team working and collaborations (n=18, 75%). Most studies involving integrated care at organisational and systems level were found to include features of clinical and professional integrated care. Because of this overlap, we took the main description presented for 'integrated care' in the studies reviewed as the basis for assessing the effectiveness of different types of ICPs. A mapping of the type of ICP with associated positive patient, process and service outcomes is presented in Table 10.

Table 10: ICPs studies with positive outcomes for all or most outcomes.[1]

	Outcomes		
Description	**Patient**	**Process**	**Service**
Planned and shared care coordination between primary and secondary care [EFGHIP]	5/6[EFGHP]	3/3[GHI]	4/4[EFGI]
Multidisciplinary team working & approaches[BJKO]	3/4[JKO]	3/3[BJO]	0[BO]/2
Use of technology[LM]	0/2	0/1	0/2
Relationships or partnerships between service organisations or systems integration [QRSTU]	4/4[QRST]	3/3[RST]	1/3[U]
Integrated Disease Management incl. patient/clinical, professional & organizational IC[6] [ACDNV]	4/5[ACNV]	2/4[AN]	2/5[AV]

[A] Martinez-Gonzalez et al. (2014); [B] Kruis et al. (2014b); [C] Lemmens et al. (2009); [D] Ouwens et al. (2005); [E] Hernandez et al. 2015; [F] Titova et al. (2015); [G] Van Bruggen et al. (2007), [H] Singh (2005a); [I] Smith et al. (2007); [J] Rosenberg et al. (2014); [K] Foy et al. (2010); [L] Health Quality Ontario (2013); [M] Pinnock et al. (2013); [N] Minkman et al. (2007); [O] Allen & Rixson (2008); [P] Joubert et al. (2009); [Q] Curry et al. (2013); [R] RAND (2012); [S] Rosen et al. (2008); [T] Frølich et al.(2010); [U] Naylor et al. (2015); [V] Kruis et al. (2013a) Note: Outcomes not reported by Apteligen (2011) or Cumming (2011).

[1] Reported as number of studies out of total number of ICPs that measured the outcomes = n/n)

As can be seen from the above table, the majority ICPs had a positive impact on most or all outcomes assessed. Interventions with the main description of integrated care as involving planned and shared care co-ordination between primary and secondary care were found to rank highest in terms of having the greater number of positive effects across each of the 3 categories of outcomes, i.e. patient, process and service outcomes. The role of nursing was found to be a key feature of these studies in operationalising integrated care between primary and secondary care.

Summary points

- Planned and shared care coordination between primary and secondary care ranked highest in terms of positive effects, on patient, process and service outcomes.
- The role of nursing was found to be a key to operationalising integrated care between primary and secondary care.

For example, in Hernandez et al.'s (2015) RCT on a community based ICP for frail elderly patients with COPD, care was planned and coordinated between specialist respiratory nurse (hospital based) and PC team. Joint patient assessment and care planning was conducted including a home visit. Self-management education of patients was initiated by the specialist nurse and continued by PC teams with educational support from the specialist nurse. Access to the specialist nurse for the PC team continued through and ICT platform including a web-based call centre. This intervention has positive outcomes for most patient outcomes assessed. The intervention was also found to significantly reduce ED visits.

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[6] All papers included were systematic reviews. Each review included studies that had different interventions tat reported on integrated care in different ways e.g. primary-secondary care co-ordination as well as interventions focusing on MDT working (e.g. Kruis et al. 2013a). Therefore, interpretation of which type of ICP intervention contributed to positive outcomes is difficult.

The type of ICP ranked lowest in achieving positive effects related to the use of integrated tele-monitoring (Pinnock et al. 2013) and computerised care co-ordination (Health Quality Ontario 2013) yielded little or no positive impact on outcomes assessed. One explanation for this may be that technology represents just one component of integrated care and as will be shown in the following section, integrated care requires a multifaceted approach to yield positive outcomes.

Features of ICPs with Positive Outcomes

What features of ICPs are associated with improved results?

Some researchers reported a lack of clarity on which components or 'active ingredients' of ICPs should be prioritised to maximize their benefits (Martinez-Gonzalez 2014; Kruis et al 2013a; Allen & Rixson 2008; Smith et al. 2007). Others reported the need for ICPs to have multiple components in order to yield positive outcomes (Hernandez et al. 2015; Rosen et al. 2008; Minkman et al. 2007; Singh 2005a). Some researchers were explicit in noting which ICP components showed trends toward achieving positive outcomes (e.g. Hernandez et al. 2015; Titova et al. 2015; RAND 2012; Joubert et al. 2009; Minkman et al. 2007). It was also possible to establish from some evidence synthesis papers (Van Bruggen et al. 2007; Singh 2005a) which intervention components were likely to have contributed to positive effects.

Summary points

- ○ Interventions with multiple components optimise the impact of ICPs
- ○ ICP features that operationalise shared and co-ordinated clinical care between primary and secondary care are:
  - (i) Nurse led/specialist case management & coordination
  - (ii) Shared clinical information systems
  - (iii) Shared decision making support tools e.g. guidelines

Three components of ICPs specifically relevant to operationalising integrated clinical care between primary and secondary care services were identified as being associated with improved results. These are:

- ○ **Nurse led/specialist care co-ordination & support between primary & secondary services (Titova et al. 2015; Hernandez et al. 2015; RAND 2012; Joubert et al. 2009; Van Bruggen et al. 2007; Singh 2005a)**
- ○ **Clinical information systems across and within services e.g. information exchange, recall system, tracking (Rand 2012; Joubert et al. 2009; Minkman et al. 2007; Ouwens et al. 2005; Singh 2005a)**
- ○ **Shared clinical decision support tools e.g. clinical guidelines, care pathways (RAND 2012; Joubert et al. 2009; Minkman et al. 2007)**

The evidence points to there being 'no one way' to approach integrated care and that multiple components in ICPs are needed in order to optimise their potential for positive outcomes (Hernandez et al. 2015; Lemmens et al. 2009; Minkman et al. 2007; Singh 2005a) An additional feature of ICPs associated with improved results is when multiple levels of integrated care are involved for example , clinical, professional and organisational levels. This point was illustrated earlier with reference to Lemmen et al.'s (2009) evidence on ED visits showing that triple interventions have more positive effects than those involving fewer levels of integrated care.

Evaluation of ICPs

What level of evaluation has been used for ICPs for chronic disease prevention and management?

Various approaches have been taken to evaluate ICPs including evidence synthesis through secondary research, mostly RCTs (n=11 e.g. meta-reviews, meta-analysis, systematic reviews), RCTs (n=6), case reports of pilot projects (n=3), and mixed methods studies of pilot projects (n=4).

The majority of the 17 studies reported in Appendix 5 (i.e. not country specific initiatives in Appendix 6) were limited to evaluating ICPs against control groups in usual or standard care. Although most offered some description of the control group (n=11, others provided no detail (e.g. Martínez-González et al. 2014; Lemmens et al. 2009; van Bruggen et al. 2007; Ouwens et al. 2005). The researchers of one systematic review commented that insufficient detail on control groups was provided in studies reviewed (Allen & Rixson 2008). In one meta-analysis study, Foy et al. (2010), pooled effects were used to evaluate different features of interactive communication and concluded that improving the quality of information exchange increases effectiveness.

Evaluation of ICPs is also limited by short follow up timeframes, most of which were around 12 months. Therefore, based on the evidence analysed in this review, little is known about the long term effectiveness of ICPs.

Summary points

- ○ RCTs are the most common approach to evaluating ICPs
- ○ RCTs limited by short timeframes & little comparison with different IPCs
- ○ mixed methods approach most common for pilot ICPs implemented in various countries

RCTs may not be the best approach to evaluating ICPs because of implementation complexity & timescale which can take many years

A pilot study approach is recommended with ongoing & long term evaluation from the outset

There is a need to keep pilot sites dynamic and active so that additional practices & interventions can be incorporated throughout implementation phase & evaluated accordingly

Mixed methods approaches are recommended focusing on a single primary outcome& select secondary outcomes

In selecting primary outcome(s), the Core Outcome Measures in Effectiveness Trials (COMET) Initiative as relevant to the specific disease under investigation need to be included.

Evaluation of ICPs implemented in various countries either regionally or nationally (Appendix 6) has mostly involved case analysis or mixed methods approaches. Case analyses have included interview data (Naylor et al. 2015), systematic analysis of implementation (Cumming 2011) and conference seminar discussions (Rosen et al. 2008). Mixed methods research has been used to evaluate pilot projects implemented in the UK (Curry et al. 2013; RAND 2012; Apteligen 2011) and Denmark (Frølich et al. 2010). The range of data collection methods across these studies included surveys, secondary data sources on outcomes measures and clinical data, individual and focus group interviews with stakeholders, non-participant observations, and review of relevant documentation.

Some researchers commented on the need for a systematic approach to evaluating the implementation and effectiveness of ICPs and that to date robust evaluations are lacking (Naylor et al. 2015; Cumming 2011). The need for ongoing and long term evaluations emerged. According to Curry et al. (2013), the implementation of integrated care can be expected to take many years given its complexity and time consuming nature. In Rosen et al.'s (2008) report on an integrated care seminar and case study analyses, the need for early involvement of evaluation teams was noted as important to establish data collection from the outset. A pilot study approach to implementation of ICPs was recommended with a goal of replicating and scaling up successful programmes. Rosen et al. commented that RCTs may not be the best approach to evaluating ICPs because of the complexity and timescale involved. Moreover, when implementing ICPs, there is a need to keep pilot sites dynamic and evolving so that additional practices and interventions can be incorporated which may disrupt a RTC which requires that intervention and control groups are tightly defined (Rosen et al. 2008). Instead, these researchers proposed mixed method observation methods focusing on just one primary outcome. They proposed changes in health care utilisation as one measure for which uniform data would be available across all organisations. In addition to this single comparable end point measure, a cluster of additional measures were proposed including clinical and functional outcomes as well as patient experiences. Evaluation using qualitative data on the processes of integration was recommended (Rosen et al. 2008).

The authors of the current review for the HSE advocate careful consideration with regard to the selection of primary outcomes. Furthermore, we recommend that researchers planning to conduct RCTs, audits of practice or other forms of research should ensure that outcomes identified by the Core Outcome Measures in Effectiveness Trials (COMET) Initiative as relevant to the specific disease under investigation, are included.[7]

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[7] The COMET Initiative aims to develop agreed standardised sets of outcomes, known as a 'core outcome set.' These sets should represent the minimum that should be measured and reported in all clinical trials, audits of practice or other forms of research for a specific condition. They do not imply that outcomes in a particular study should be restricted to those in the core outcome set. Rather, there is an expectation that the core outcomes will be collected and reported to allow the results of trials and other studies to be compared, contrasted and combined as appropriate; and that researchers will continue to collect and explore other outcomes as well. More information from: http://www.comet-initiative.org/.

Implementing ICPs: Barriers and Enablers

What are the barriers or enablers for implementation of ICPs for chronic disease prevention and/or management identified?

A total of 11 studies reported on barriers and/or enablers to implementing ICPs. We organized the barriers and enablers around four general categories: patient specific; HCP specific, service/practice specific; and organisational specific. A summary of the most common barriers and enablers are presented in Figure 8 and Figure 9. Enablers and barriers at organisational level were exclusively reported by case studies/reports and evaluations of ICP implementation in various countries.

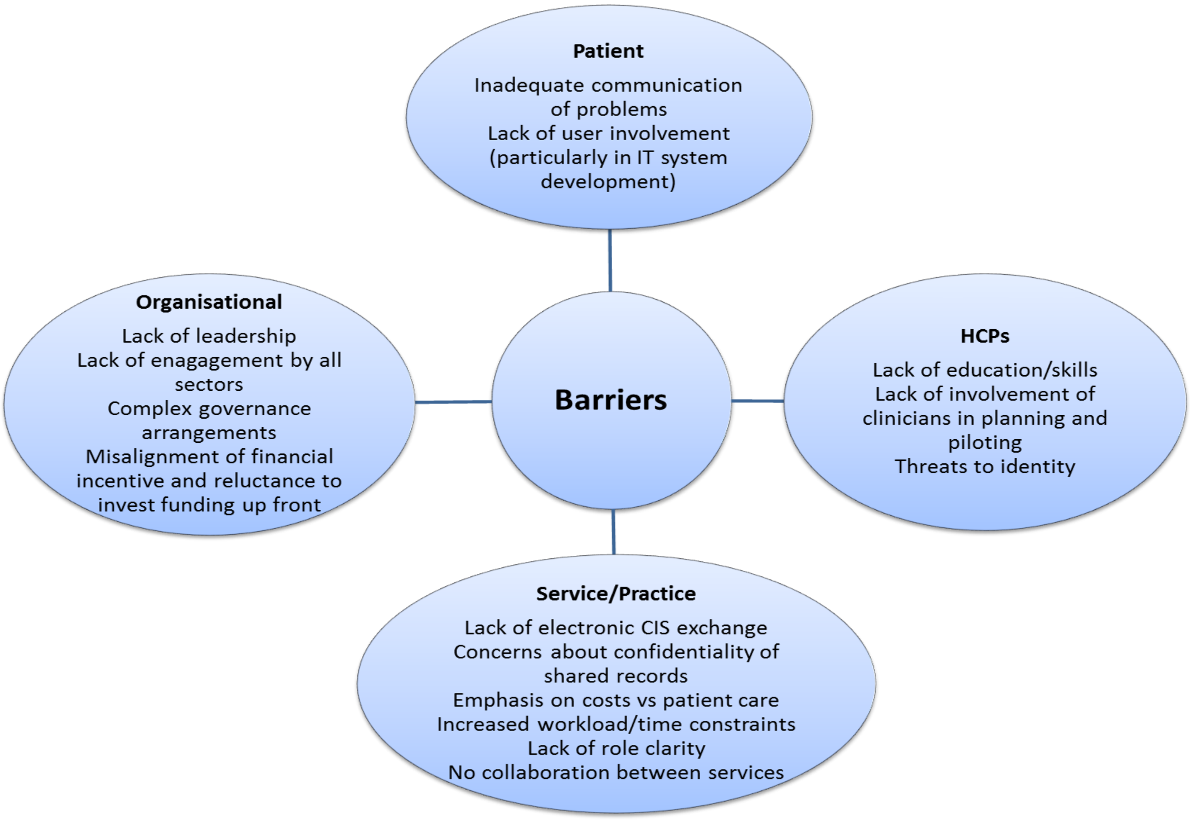

Figure 8 Barriers to implementation of ICPs

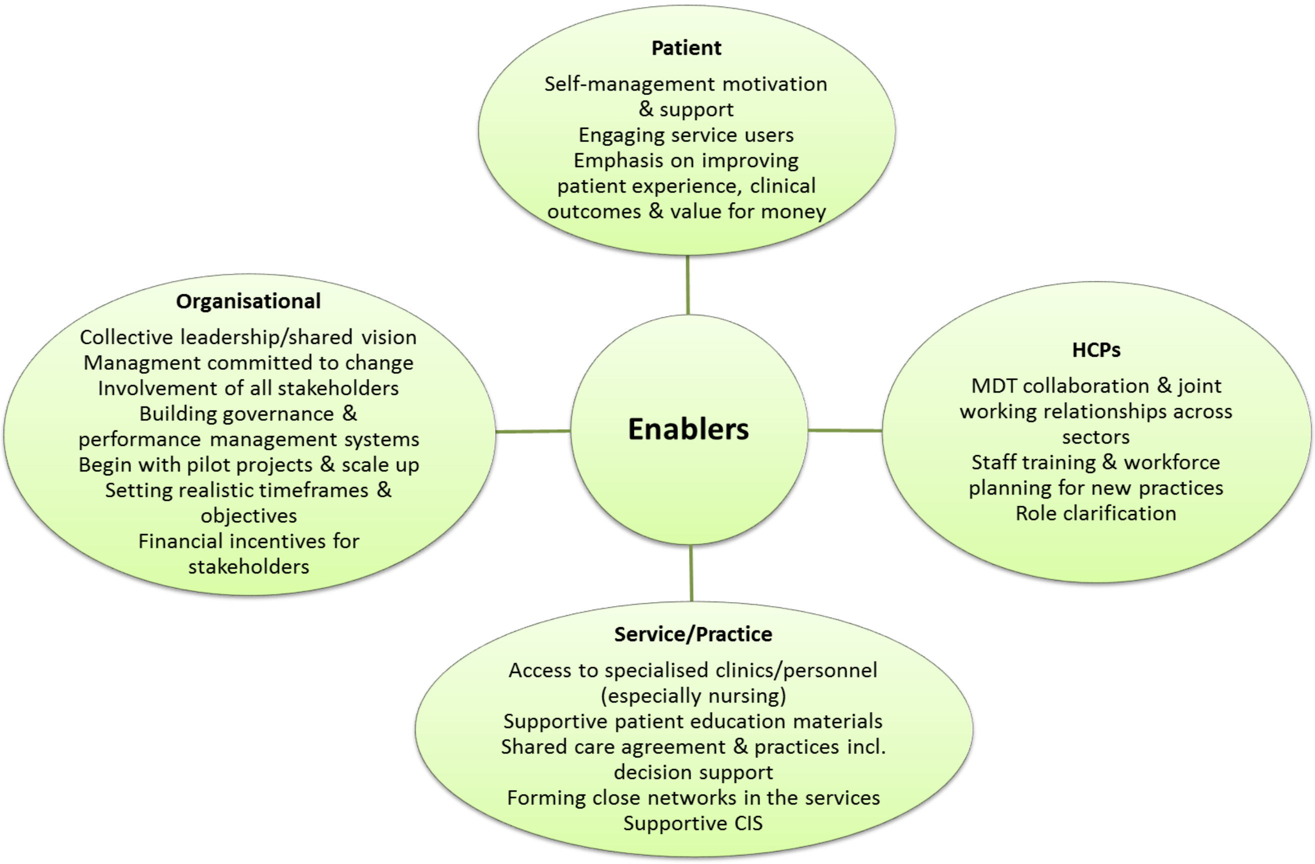

Figure 9 ***Enablers to implementation of ICPs***

Generic Models of Care

In this section, the research questions specific to generic models of care in the prevention and management of chronic diseases are addressed. Individual models are presented using subheadings for the various research questions. An overall narrative summary without subheadings is presented for models or programmes with a small number of studies.

Although generic models of care for disease management exist, the term 'generic model of care' is seldom cited in the literature apart from some reports on national strategies and approaches to disease management across Europe and elsewhere. There is a preference for generic models over disease specific models in national clinical programmes to support CDM applicable to patients with multiple conditions (Lewis & Dixon 2004). The problem of multimorbidity in individual patients raises the need to move away from disease specific protocols for single conditions to more generic approaches to managing multimorbidity (Smith & O' Dowd 2007). These authors commented that generic approaches involve a shift away from the predominant role of specialists in CDM to a greater role for generalists and primary care practice with access to specialist support.

Summary points

- the term 'generic model of care' is seldom cited in the literature
- Generic approaches involve:
  a shift away from 'single diseases' to addressing multimorbidity, i.e. multiple diseases in the same individual, and
  a greater role in CDM for primary care teams as generalists with access & support of specialists

The purpose of generic models of CDM is to provide an overall framework for the content of national programmes with elements that can be shared and that are transferable across different types of diseases.

According to the National Board of Health (2007) in Denmark, the purpose of generic models of CDM is to provide an overall framework for the content of national programmes with elements that can be shared and that are transferable across different types of diseases.

As will be seen in this section, various models of care for CDM have emerged over time, mostly originating from the USA and some of which are gaining widespread implementation within individual countries. Based on our search strategy for this review, we identified 5 models/programmes of care for inclusion. Additional models of care were identified from reading full text papers for inclusion eligibility. As reported in Chapter 2 on the *Clinical Review Methods,* an additional and select search for these models was undertaken in *CINAHL and MEDLINE* through which we located one paper for inclusion on 'the patient care medical home model'. Brief summaries of additional models identified but that did not meet inclusion criteria, mostly on publication type, are presented in Appendix 11.

These additional models of care are varied in stage of development and focus but are not mutually exclusive. For example, the *Evercare*[8] *model* emerged from the USA in the 1980s and was designed as a home care model for high risk older adults using case management by advanced primary care nurses (Singh & Ham 2006). A more recent model, also developed in the USA for older adults with chronic illnesses, is the *Guided Care Model.* Although this model involves a primary care approach to multimorbidity, its target population is older adults with an emphasis on multidimensional geriatric assessment (Boult et al. 2008).

A primary care model that has recently emerged in the UK to address multimorbidity is the *House of Care.* This model is addressed in more detail toward the end of this chapter in a section on models for managing multimorbidity.

Characteristics of Studies

Types of evidence

A total of 60 papers representing 50 studies on generic models of care were reviewed. The types of evidence on these models are presented in Table 11. For ease of presentation, all papers are reported as studies unless making specific reference to case studies/reports.

Table 11 Category of evidence reported for models of care

MA [a]	SR [b] & MA	SR	RCTs	CmR [c] & CS [d]	MM [f]	Total
2	4	16[g]	21 [h]	6	1[i]	50

a Meta-analysis; b Systematic review; c Commissioned report; d Case study; e Quasi experimental, f Mixed method evaluation; g Reported in 17 papers; h Reported in 27 papers; i Reported in 4 papers;

As shown in Table 11, most evidence on models of care was drawn from RCTs. We undertook additional analysis to establish the types of evidence included in the synthesis papers (n=22) reported in this review. This analysis revealed that over 759 studies with more than 50% being RCTs.

Chronic Diseases

What chronic diseases are examined singly or in combination in generic models of care?

Eight chronic diseases were explicitly addressed across the models of care reviewed with diabetes featuring most commonly (Figure 10). In some papers, reference was made to multimorbidities and to other ‘general chronic conditions’ but detailed information was not presented.

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[8] Evercare is a commercial organisation in the USA and is part of the United Healthcare Organisation. It is an approved medicare Advantage provider. It offers insurance and benefits for senior citizens with chronic illnesses. Access at http://www.seniors-health-insurance.com/evercare.php.

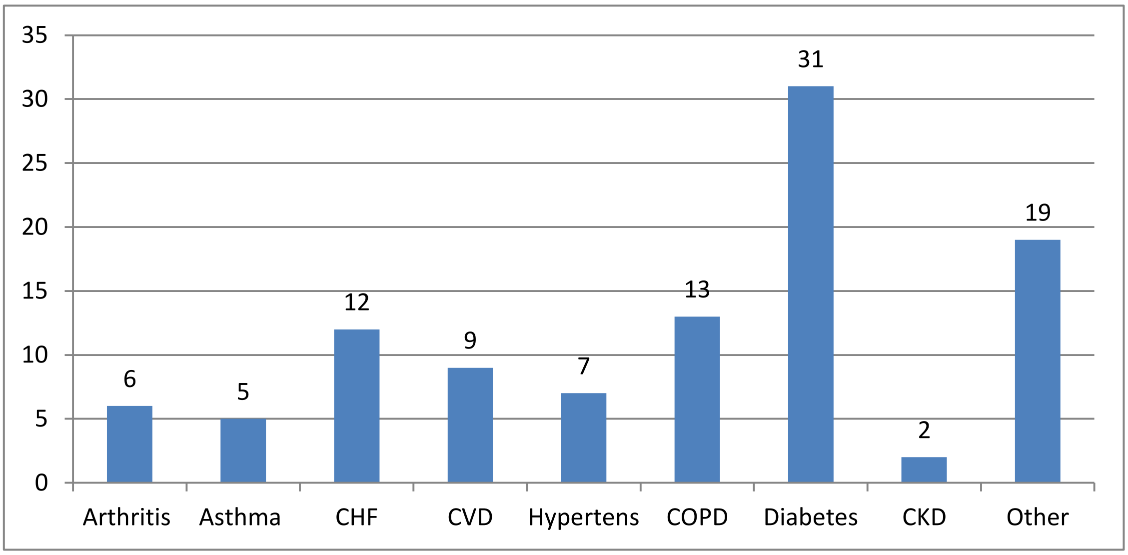

Figure 10 ***Diseases addressed in models of care papers***

Spectrum of Models of Care

What is the spectrum of generic models of care that exist for chronic disease prevention and management?

Five generic models of care were identified for inclusion:

- Chronic care model (CCM)
- Disease management programmes (DMPs)
- Patient medical centered home model (PMCH)
- Generic models for multimorbidity
    - *Care Management Model*
    - *House of Care*

Two papers reviewed multiple models. One paper included the CCM, the innovative care for chronic conditions (ICCC), the Stanford Chronic disease self-management programme, a transitional care model, and improving chronic illness care (Grover & Joshi 2015). The second paper included the Phoenix-Care model (integrated nurse case management with intensive home based care); a respiratory nurse led case management programme; and ‘community care for COPD model (Nurmatov et al. 2012). In one grey literature report, a number of international models of care for chronic disease prevention and management were reviewed, for example, the public health model and the continuity of care model (Singh and Ham 2006).

In addition, we reviewed evidence on the Stanford Chronic disease self-management programme (CDSMP). While this programme offers an approach to CDM, we do not consider it a generic model of care for chronic disease prevention and management. Our rationale for including this programme for review relates to its use in some national initiatives to support CDM (see later section for further detail).

Methodological Quality of Studies

Quality of systematic reviews and meta-analyses

The methodological quality of evidence synthesis papers on models of care varied. Of the eleven AMSTAR criteria, 5 studies met nine criteria (Nurmatov et al. 2012, Comino et al. 2012; Pimouguet et al. 2011, Adams et al. 2007, Foster et al. 2007) and 3 studies met seven criteria (Jackson et al. 2013; Mitchell et al. 2008; Smith et al. (2012a). The remaining studies met less than 50% of the AMSTAR criteria and two of these (Grover and Joshi 2015, Mallow et al. 2014) only achieved one criterion each. The majority of studies (n=19) conducted a comprehensive search consisting of at least two databases and a supplementary search of grey literature. Sixteen studies provided an 'a priori' design and 16 studies described the characteristics of the included studies. More than 50% of the studies (n=13) had at least two independent data extractors and a consensus procedure for disagreements. Thirteen studies used appropriate methods to combine study findings. Eleven studies assessed the scientific quality of studies and 8 of these used the quality findings to inform conclusions. Less than 50% of studies used publication status as an inclusion criterion, provided a list of included and excluded studies, assessed the likelihood of publication bias or fully acknowledged potential sources of support. The appraisal of evidence synthesis studies is presented in Table 12 and the number of studies meeting the AMSTAR quality criteria is presented in Figure 11.

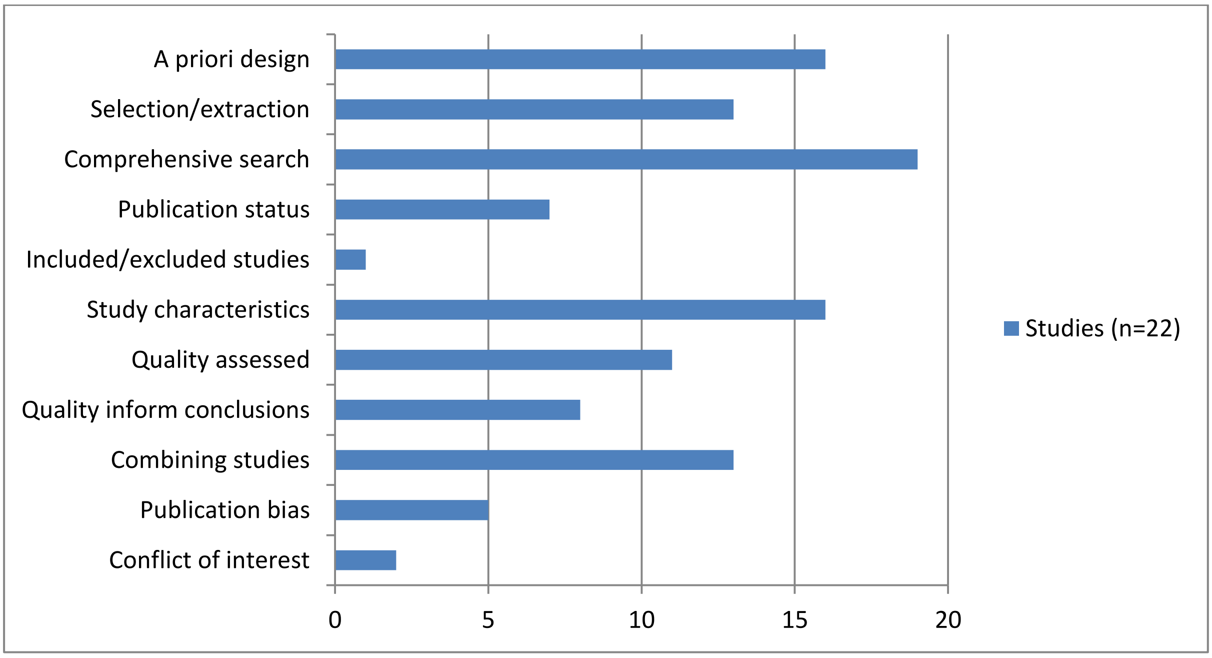

Figure 11 ***Quality of systematic reviews, & meta-analyses on models of care using AMSTAR***

Table 12: Quality assessment of systematic reviews, meta-analyses on models of care (n=22)

Author (year)	A priori design	Duplicate study selection and data extraction	Comprehensive literature search	Status of publication used as inclusion criteria	List of included and excluded studies	Characteristics of included studies	Scientific quality assessed	Scientific quality used to form conclusions	Methods to combine studies appropriate	Likelihood of publication bias	Conflict of interest	N Yes
Adams et al. (2007)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	9
Brady et al. (2013)	No	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No	5
De Bruin et al. (2012)	No	Yes	Yes	Can't answer	No	Yes	Yes	Yes	No	No	No	5
Egginton et al. (2012)	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	6
Foster et al. (2007)	Can't answer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	9
Fuchs et al. (2014)	No	Can't answer	Yes	No	No	Yes	No	No	No	No	No	2
Gaikwad & Warren (2009)	No	No	No	No	No	Yes	No	No	Yes	No	No	2
Grover and Joshi (2015)	No	Can't answer	No	No	No	Yes	No	No	No	No	No	1
Hisashige (2012)	Yes	Yes	Yes	No	No	No	Yes	Yes	Not applicable	Not applicable	No	5
Jackson et al. (2013)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	7
Knight et al. (2005)	Yes	Yes	Yes	No	No	Can't answer	No	No	Yes	Yes	No	5
Kadu and	Yes	No	Yes	No	No	Yes	No	No	No	No	No	3

Stolee (2015)												
Mallow et al. (2014)	Yes	Can't answer	No	Can't answer	No	No	No	No	Not applicable	Not applicable	No	1
Mattke et al. (2007)	Yes	Can't answer	Yes	No	No	No	No	No	No	Not applicable	No	2
Mitchell et al. (2008)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Not applicable	No	7
Nolte & Osborne (2013)	Yes	Can't answer	Yes	Can't answer	No	No	Yes	Yes	Yes	Not applicable	No	5
Nurmatov et al. (2012)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Not applicable	Yes	9
Pimouguet et al. (2011)	Yes	Yes	Yes	Can't answer	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Solomon (2008)	Yes	Can't answer	Yes	No	No	No	No	No	Not applicable	Not applicable	No	2
Smith et al. (2012a)	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Not applicable	No	7
Stellefsen et al. (2013)	Yes	Yes	Yes	Can't answer	No	Yes	No	No	No	Not applicable	No	4
Yu et al. (2006)	Yes	Can't answer	Yes	Yes	No	Yes	No	No	Yes	Not applicable	No	5
Total (Yes)	16	13	19	7	1	16	11	8	13	5	2	

Quality of RCTs

Both the internal and external validity of RCTs was assessed using the Cochrane EPOC risk of bias criteria.

Internal validity: Three studies met five out of seven criteria (Coburn et al. 2012, Hogg et al. 2009; Kennedy et al. 2007) and 4 studies met four criteria (Cameron-Tucker et al. 2014; Due et al. 2014; Frei et al. 2014; Galbreath et al. 2008). Four of the remaining studies met just two or three of the seven criteria and a further 4 studies only met one criterion. Four studies did not meet any of the criteria and were deemed at a high risk of bias (Adepoju et al. 2014; Forjuoh et al. 2014; Harno et al. 2006, Piatt et al. 2006)

Over half of the RCTs (n=14) generated the random sequence adequately and addressed incomplete outcome data adequately. Just half of the RCTs (n=13) were identified as low risk in terms of selective reporting of outcomes. With regard to allocation concealment and adequate blinding of participants, personnel and outcome assessors, only six out of 24 RCTs were found to meet these criteria. Finally, the level of risk was considered unclear with regard to other biases for the majority of RCTs except for two which were assessed as having low risk. The appraisal of RCTs for internal validity is presented in Table 13 and the number of RCTs meeting the quality criteria is presented in Figure 12.

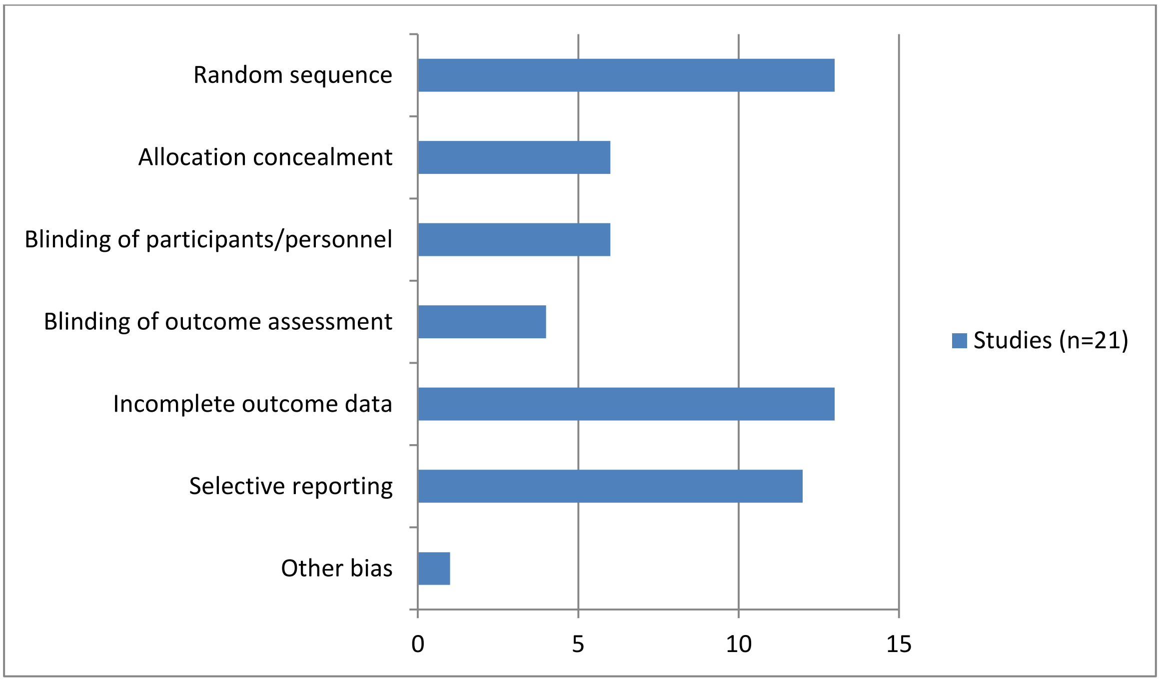

Figure 12 ***Internal validity of RCTs on models of care***

Table 13 Internal validity of RCTs for models of care(n=21)

Author (Year)	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias	Total (low risk)
Adepoju et al. (2014)	High	Unclear	Unclear	Unclear	High	High	High	0
Cameron-Tucker et al. (2014)	Low	Unclear	Unclear	Low	Low	Low	High	4
Coburn et al. (2012)	Low	Low	Low	Uncertain	Low	Low	Uncertain	5
Dickinson et al. (2014)	Unclear	Unclear	Unclear	Unclear	Low	Unclear	High	1
Due et al. (2014)	Low	Uncertain	Low	Uncertain	Low	Low	High	4
Elzen et al. (2008)	Unclear	Unclear	Unclear	Unclear	Low	Unclear	High	1
Forjuoh et al. (2014)	Unclear	Unclear	Unclear	Unclear	High	Unclear	High	0
Frei et al. (2014)	Low	Low	High	Unclear	Low	Low	Unclear	4
Galbreath et al. (2008)	Low	Low	Low	Low	Unclear	Unclear	High	4
Harno et al. (2006)	Unclear	Unclear	High	High	Unclear	Unclear	Unclear	0
Hogg et al. (2009)	Low	Low	Low	Low	Unclear	Low	Unclear	5
Kennedy et al. (2007)	Low	Low	Unclear	Unclear	Low	Low	Unclear	4
Khunti et al. (2007)	Low	Unclear	Low	Unclear	Low	Unclear	Unclear	3
Konstam et al. (2011)	Unclear	High	High	High	Unclear	Low	Unclear	1
McMahon et al. (2012)	Low	Unclear	Unclear	Unclear	Low	Low	Unclear	3
Piatt et al. (2006)	High	High	Unclear	Unclear	Unclear	Unclear	Unclear	0
Schillinger et al. (2009)	Unclear	Unclear	High	High	Unclear	Low	Low	2
Smeulders et al. (2010)	Low	Low	High	High	Low	Low	Unclear	4
Smidth et al. (2013b)	Unclear	Unclear	High	Unclear	Low	Unclear	Unclear	1

Sönnichsen et al. (2010)	Low	Unclear	High	Low	Low	Low	Unclear	4
Turner et al. (2012)	Low	Unclear	Low	Unclear	Low	Unclear	Unclear	3
Total (low risk)	13	6	6	4	13	12	1	

External validity: Only one study met all of the external validity criteria (Galbreath et al. 2008). Twelve studies met five or six out of seven criteria. Two studies met four criteria and the remaining studies met fewer criteria (i.e. 3 or less. All of the studies included outcomes that were directly measuring benefit to patients or adherences to practices of proven benefit. Most of the studies (n=16) described the intervention in enough detail to enable replication and recruited a representative study population (n=13). Half of studies provided evidence of the sustainability of the intervention (n=11) or had at least 12 months of follow-up data (n=11). Only 9 studies provided evidence on the mechanism of action or change. With regard to the researcher-developed question on applicability to the Irish healthcare context, 13 interventions were deemed to be suitable for application in this context. The appraisal of RCTs for external validity is presented in Table 14 and the number of RCTs meeting the quality criteria is presented in Figure 13.

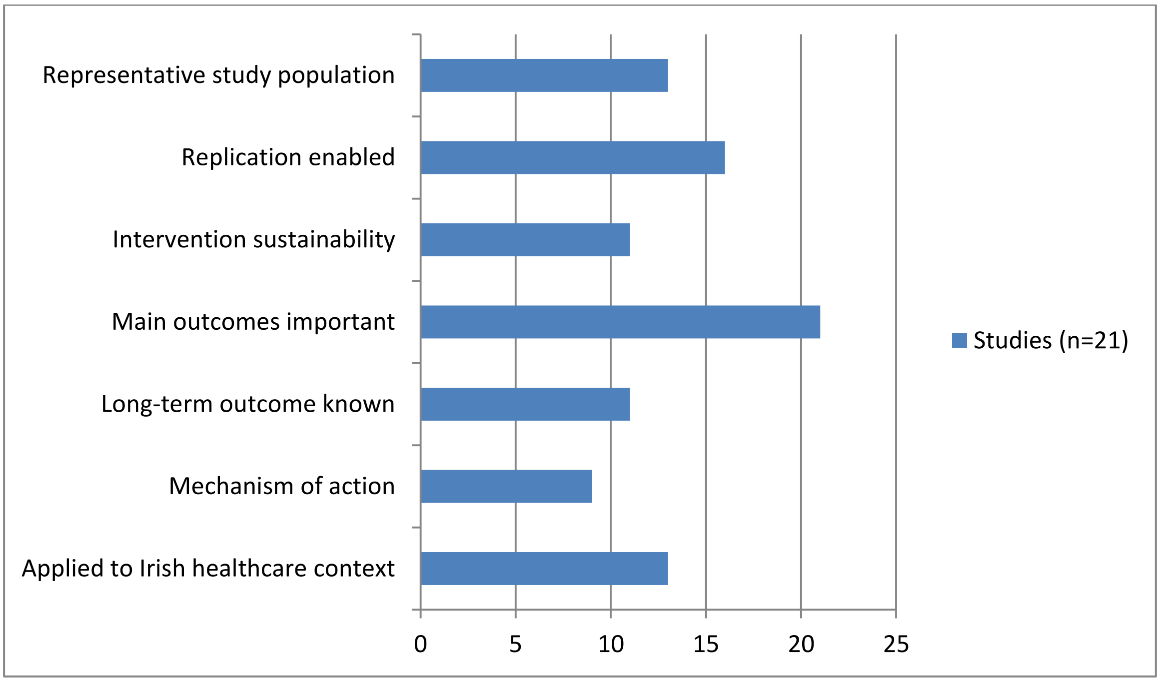

Figure 13 ***External validity of RCTs***

Table 14 External validity of RCTs for models of care (n=21)

Author (year)	Representative Study Population	Replication Enabled	Intervention Sustainability	Main Outcomes Important	Long-Term Outcome Known	Mechanism of Action	Could this intervention be applied to Irish Healthcare Context**	Total (Yes)
Adepoju et al. (2014)	No	No	No	Yes	No	No	No	1
Cameron-Tucker et al. (2014)	Yes	No	No	Yes	No	Yes	Yes (but intervention demonstrated little real clinical effect)	4
Coburn et al. (2012)	Yes	Yes	Yes	Yes	Yes	Yes	No (based on the US system – Medicaid seems to be important)	6
Dickinson et al. (2014)	Yes	Yes	Yes	Yes	No	Yes	Yes	6
Due et al. (2014)	No	Yes	No	Yes	No	Yes	No (outcomes from the study were inconclusive. Would need to compare Danish and Irish healthcare systems)	3
Elzen et al. (2008)	No	No	No	Yes	No	No	No (mainly due to insufficient information in the paper and Dutch model is different from the Irish context)	1
Forjuoh et al. (2014)	No	Yes	Yes	Yes	No	Yes	No (intervention had little or no effect)	4
Frei et al. (2014)	Yes	Yes	Yes	Yes	No	Yes	Yes	6
Galbreath et al. (2008)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Hogg et al. (2009)	Yes	Yes	No	Yes	Yes	No	Yes	5

Kennedy et al. (2007)	Yes	Yes	Yes	Yes	No	Yes	Yes (as part of direct an overall model or framework of care including professional leaders)	6
Khunti et al. (2007)	Yes	Yes	Yes	Yes	Yes	No	Yes	6
Konstam et al. (2011)	Yes	Yes	Yes	Yes	No	No	Yes	5
McMahon et al. (2012)	No	Yes	Yes	Yes	Yes	No	Yes	5
O'Malley et al. (2006)	No	No	No	Yes	Yes	No	No (shouldn't be applied to Irish Healthcare)	2
Piatt et al. (2006)	No	Yes	Yes	Yes	Yes	No	Yes	5
Schillinger et al. (2009)	Yes	Yes	No	Yes	Yes	Yes	No	5
Smeulders et al. (2010)	Yes	Yes	No	Yes	Yes	No	Yes	5
Smidth et al. (2013b)	Yes	No	No	Yes	Yes	No	No (need registry data)	3
Sönnichsen et al. (2010)	Yes	Yes	Yes	Yes	Yes	No	Yes	6
Turner et al. (2012)	No	Yes	No	Yes	No	No	Yes	3
Total (Yes)	13	16	11	21	11	9	13	

Chronic Care Model

The chronic care model (CCM) developed in the US by Ed Wagner in the 1970s is one of the most widely known frameworks applied to caring for people with chronic conditions.[9] Since its initial implementation in the USA, the model has been implemented in other parts of the world including Canada, Europe and Australia (Singh and Ham 2006). As a context for presenting findings on the CCM in this section, the following are brief statements on the model:

"The Chronic Care Model (CCM) is designed to help practices improve patient health outcomes by changing the routine delivery of ambulatory care through six interrelated system changes meant to make patient-centered, evidence-based care easier to accomplish. The aim of the CCM is to transform the daily care for patients with chronic illnesses from acute and reactive to proactive, planned, and population-based. It is designed to accomplish these goals through a combination of effective team care and planned interactions; self-management support bolstered by more effective use of community resources; integrated decision support; and patient registries and other supportive information technology (IT). These elements are designed to work together to strengthen the provider-patient relationship and improve health outcomes." (Coleman et al. 2009, p.75)

The following statements are drawn from Wagner (2000) with reference to evidence reviewed.

Patient care team

The patient care team is reported to be the cornerstone of the CCM. According to Wagner "primary care teams make it possible to manage complex illnesses intensively without losing the benefits of comprehensive, continuous primary care" (p.571)

There is an emphasis on complementary roles (e.g., supporting behavioural change by a team members other than doctors). Increasing the number and quality of services available optimises the real potential of care teams to improve health outcomes.

"Effective team care for chronic illness often involves professionals outside the group of individuals working in a single practice; it may involve multiple practices—for example, primary and specialist care—or it may involve multiple organisations" (p. 569).

Complementary health care professional team members

Nurse case managers: chronic disease interventions are more successful if nurses with additional and specialised training in the clinical and behavioural management of chronic diseases are involved. The role involves managing patients according to protocols, clinical and self-management support, and managing greater intensity of care. Most innovations in primary care involve a centralised nurse case manager working across several practices. Effective nurse case management involves regular communication with both primary care and secondary care specialist teams.

Medical specialist: various models noted to have emerged e.g. alternating visits with primary care doctors, specialist input mediated through nurse case manager, primary care visits. The primary care involvement of medical specialists as a critical success factor was found to be unclear compared to specialist nurse case managers.

Summary points

- the CCM is a proactive planned population based model for primary care
- patient care team is the cornerstone of CCM involving primary and specialist teams
- The involvement of specialist nurses as case managers working across several practices optimises the success of CDM – offering self-management support, managing higher risk patients & liaising between primary & secondary care.

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[9] The CCM can be applied to a variety of chronic illnesses, health care settings and target populations. *Available at:* http://www.improvingchroniccare.org/index.php?p=The_Chronic_CareModel&s=2

Pharmacists: These team members may enhance CDM by optimising drug regimes to reduce adverse effects, and increase efficacy.
Social workers: Little evidence available to support the role of social workers in primary care CDM, although viewed by Wagner to be important in relation to the elderly.

In this review, a total of 15 studies in 18 papers addressed the CCM including a systematic review on multiple models (Grover & Joshi 2015) and 2 grey literature evidence reports from the UK (Singh and Ham 2006) and Canada (Health Council of Canada 2009). The USA was the most common country of author origin. Studies included:

- the application of CCM to the care of patients with COPD (Smidth et al. 2013a,b; Adams et al. 2007), diabetes (Dickinson et al. 2014; Frei et al. 2014; Stellefson et al. 2013; Piatt et al. 2011, 2010, 2006); CHD (Turner et al. 2012);
- the use of self-management technology to support CCM (Solomon 2008), mobile health in community dwelling individuals with diabetes (Mallow et al. 2014), and automated telephone calls (Schillinger et al. 2009)
- facilitators and barriers to implementing the CMM (Kadu & Stolee 2015)
- review of multiple models including CCM (Grover & Joshi 2015) and comprehensive care programmes using CCM components (de Bruin et al. 2012)
- case studies on CCM components (Health Council of Canada 2009) and review of CCM as part of a commissioned report on international frameworks (Singh & Ham 2006)

Definitions of CCM

Definitions specific to the CCM were available for extraction from 5 papers (Table 15). Defining features gleaned on the CCM are that that CDM needs to be: primary care led, preventative based, evidence based, team centred care approach, self-management support and patient empowerment. The definitions, for the most part, clearly point to the CCM involving integrated care at systems level.

Table 15 Definition of CCM

Paper	Definition
Frei et al. (2014)	"an evidence-based approach for the care of chronically ill patients with a team-centred care approach as a central element to facilitate and produce effective interactions between proactive primary care practice teams, and empower patients with the aim to improve processes and outcomes in patients with chronic illnesses" (p.1040, cited from previous literature)
Piatt et al. (2006)	"a multifaceted framework for enhancing health care delivery… based on a paradigm shift from the current model of dealing with acute care issues to a system that is prevention based" (p.811).
Schillinger et al. (2009)	"an ecological model describing factors including self-management support that can improve functional and clinical outcomes" (p. 560)
Stellefson et al.(2013)	"a systematic approach to restructure medical care to create partnerships between health systems and communities"(p.1).

Solomon (2008)	"a system… [where] health care organizations, embedded in the larger community system, provide the core care delivery and information systems infrastructure to support multi-disciplinary care teams collaborating with chronically ill patients… in which information is flowing across organisational boundaries to promote the accumulation of knowledge by care teams and patients as they work together to improve health outcomes" (p.394).

[11] Source references, if applicable, are cited as foot notes in (Appendices 7 & 8).

Components of CCM

The CCM has 6 key components: health system organisation; delivery design system; decision support; clinical information systems; self-management support, and community resources. The most common component included in studies was self-management support (n=13) and the least common was community resources (n=7). The studies reporting on specific components of the CCM were mapped and are presented in Table 16 below (grey literature not applicable).

Table 16 Components of CCM

Key Elements **Elements identified as essential to a health care system that encourages high-quality chronic disease care:**	**Studies Implementing Specific Components**	
	SR & MA	***RCTs***
The health system e.g. ○ Extending roles to nurses e.g. screening	5 [a d e f m]	2 [j l]
Delivery design system e.g. ○ introduction of team based practices ○ implementation of practice guidelines ○ introduction of diabetes days for patients ○ better scheduling of patient visits/reviews ○ practice facilitation of quality improvement initiatives ○ redesigning patient visit processes	5 [a d e f m]	4[g i j l k]
Decision support e.g. ○ Patient information summaries ○ education and support for HCPs ○ specialist expertise for PC teams	6 [a c d e f m]	4 [g h j l]
Clinical information system e.g. ○ Patient registry with reminders to patients/HCPs ○ Disease registries ○ Electronic medical records ○ mHealth	6 [a d c e f m]	2 [j l]
Self-management support: mostly patient education e.g. ○ motivational and behavioural change ○ use of supportive IT applications ○ support groups facilitated by diabetes educator ○ telephone support[l] & peer support Little emphasis on collaborative decision making/care planning with patients with the exception of one systematic review[c] & one RCT	7 [a b c d e f m]	6 [g h i j k l]
The community ○ Availing of community nursing	5 [a d e f m]	1 [j]

[a] Grover & Joshi (2015); [b] Adams et al. (2007); [c] Solomon (2008); [d] de Bruin et al. (2012); [e] Stellefson et al. (2013); [f] Kadu & Stolee (2015); [g] Piatt et al. (2006; 2010; 2011); [h] Schillinger et al. (2009); [i] Turner et al. (2012); [j] Smidth et al. (2013a,b); [k] Dickinson et al. (2014); [l] Frei et al. (2014); [m] Mallow et al. (2014).

Few studies included all 6 CCM components. One RCT involving all 6 components (Schmidt et al. 2013a,b) was a structured implementation of a disease management programme based on CCM for patients with COPD targeting both GP practices and hospitals. The programme included multiple interventions targeting patients' HCPs and organisations.

Summary points

- Few studies included all 6 CCM components
- Self-management was the most common component & community resources was the least common component

Five components were included in Frei et al.'s (2014) RCT which implemented a team care approach to diabetes management with practice nurses taking over monitoring activities from GPs. This role for practice nurses reflects the complementary role of practice team members referred to above in the contextual description of CCM.

The complementary role of specialists in primary care was evident in Piatt et al.'s (2011) RCT. A specialist diabetes educator provided self-management support to patients and decision support to HCPs. In addition, the diabetes educator provided support in redesigning practices such as patient visit processes. This finding illustrates that scheduled visits in primary care by a specialist can be multi-faceted including self-management support for patients, clinical decision support, and practice redesign support. In other words, there is evidence to suggest that the introduction of a specialist to primary care practices on a regular basis optimises the implementation of an intervention that targets the patient, primary care teams, and practice organisation.

Summary point

Scheduled visits by a specialist in diabetes education in primary care practice can offer multi-faceted support for patient self-management, clinical decision making by HCPs, & practice redesign, thereby optimising the implementation of an intervention that targets the patient, HCPs and practice organisation.

Outcomes and Effectiveness of CCM

The range of outcomes examined in CCM studies is presented in Box 4, most of which were patient outcomes.

Box 4 Outcomes assessed in CCMs

Category	n	Category	n
Patient outcomes	**13**	**Service Outcomes**	**5**
Clinical health status	12	Hospital admissions	3
Quality of life	6	Length of stay	4
Satisfaction with care	4	ED visits	3
Mortality	2	PC/home visits	1
Health behaviours	4	Long term care stay	1
Functional status	3	**HCP outcomes**	**1**
Mental health	4	Satisfaction with services	1
Self-management	5		
Knowledge	5	Knowledge	1
Process outcomes	**7**	**Resources**	**3**
Health monitoring	6	Costs	3
Quality care/standards	1	**Systems**	**1**
Communication	3	Change in culture	1
Health promotion	1		

Patient outcomes: There is evidence of positive effects on the CCM on clinical health status in interventions that have used mobile health (Mallow et al. 2014), the introduction of a diabetes educator on primary care practice (Piatt et al.'s 2011,2010).

Summary point

CCM interventions using mobile health technology or specialist diabetes educator in primary care can improve HBA1c.

In a systematic review of 23 RCTs, Mallow et al. (2014) found that mobile health interventions for community dwelling individuals with diabetes significantly improved HbA1c (n=8/10) and blood pressure (n=2/3). Examples of the types of technology included text messaging, Bluetooth glucose monitoring, and SMS reminders.

Summary point

There is a need for long term and continuous specialist education and support for patients and HCPs in primary care practices in order to achieve sustained benefits

In Piatt et al.'s (2011, 2010) RCT, the role of a diabetes educator in primary care supporting patient self-management, HCP education, and practice redesign was found to significantly improve HbA1c, non-HDL cholesterol, quality of life, blood glucose self-monitoring at 12 months follow up. These effects were not sustained at 36 months follow up. The diabetes educator was in the primary practice setting for just 6 months which may explain why the effects were not sustained. This finding highlights the need for long term and continuous specialist education and support for patients and HCPs in primary care practices in order to achieve sustained benefits.

Evidence on the effects of the CCM on patient outcomes from other studies reviewed is inconclusive. For example, in Adams et al.'s (2007) systematic review and meta-analysis of the CCM implemented for patients with COPD, significant improvements for dyspnoea were found in fewer studies (n=3/7) and improvement in pulmonary function were found in just 1 of 5 studies assessing this outcome. An RCT involving automated self-management telephone support for patients with poorly controlled diabetes was found to have no significant effect on HbA1c or systolic BP but did have a positive effect on self-management behaviours (Schillinger et al. 2009). Positive effects on knowledge were found in some studies reviewed in evidence synthesis papers (e.g. Solomon 2008, n=4/4; Adams et al. 2007, n=5/9) but seemed less favourable in others (Mallow et al. 2014) including and RCTs (Piatt et al. 2011). Likewise, the findings are inconclusive for other outcomes assessed such as quality of life and functioning status.

Process outcomes: Health monitoring was the most common outcome assessed (n=3) and positive effects of the CCM were found in 3 RCTs which involved redesigning patient scheduling in primary care (Piatt et al. 2011, 2010), continuous quality improvement practice facilitation (Dickinson et al. 2014), and the active structured implementation of a disease management programme for COPD involving GP practices and hospital services (Smidth et al. 2013a,b).

Summary points

- Health monitoring improved with patient scheduling, practice quality improvement, & structured primary & specialist team integrated care (IC)
- Hospital admissions reduced with structured primary-specialist IC,
- LOS reduced with automated technology self-management support

Service outcomes: Smidth et al.'s RCT on the active structured implementation of a disease management programme for COPD involving GP practices and hospital services was found to significantly reduce hospital admissions. Hospital bed days were significantly reduced in Schillinger et al.'s (2009) RCT of an automated technology self-management support intervention. Significant reductions in length of stay, ED visits, and hospitalisations were found in a meta-analysis by Adams et al. (2007) who examined which CCM components contributed to improved results.

In 2 systematic reviews, CCM interventions were identified as having significant positive effects on most outcomes assessed. However, caution needs to be exercised in drawing conclusions from this evidence.[10]

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[10] Although 4 papers in total reported positive effects for most outcomes assessed, we exercised caution in highlighting the positive effects reported in 2 papers. The researchers of 2 systematic reviews (Grover & Joshi. 2015; Stellefson et al. 2013) did not report on statistical significance of any outcomes reviewed. For Stellefson et al.'s paper, we sourced the original papers & noted that some studies were baseline results, yet reported as positive outcomes in the review. For this reason, we were prompted to include the original papers eligible as full papers in our review.

Components of CCM with Positive Outcomes

A number of researchers commented on difficulties in establishing which CCM components contribute to improved outcomes and under what circumstances (de Bruin et al. 2012; Turner et al. 2012; Adams et al. 2007). Stellefson et al. (2013) noted that multiple components are recommended in order to optimize benefits from the CCM. This seemed evident in Adam et al.'s (2007) review in that reduced service utilisation was observed in patients with COPD who received interventions with more than 2 CCM components. However, the researchers also reported that there were "no significant differences for those receiving only 1 CCM component" (p.551).

Summary point

- multiple components are needed to optimise the benefits of CCM.

There remains uncertainty about which component of CCM should be prioritised in chronic disease prevention & management apart from consensus that multiple

Evaluation of CCM

Our review is limited to publication type and so evidence on approaches to evaluating the CCM is drawn mostly from systematic reviews, meta-analysis, and RCTS. There was insufficient data available in approximately 50% of studies on comparison or control groups in evaluating the effects of CCM. The control or comparison groups seemed to be usual or standard care. Only one study compared different interventions which involved different approaches to practice facilitation in implementing organisational changes (Dickinson et al. 2014). The follow up evaluation timeframes were generally short ranging from 6 weeks to 3 years, most of which were between 6 and 12 months.

Summary point

- evaluation is compromised by short timeframes & little comparison between different CCMs

CCM interventions have developed in isolation over time leaving an inconclusive body of evidence on impact

Taken as a whole, a number of CCMs have been developed over time in isolation leaving an inconclusive body of evidence on the impact of the CCM on CDM.

Disease Management Programmes

There are similarities between disease management and integrated care and the boundaries between them overlap and are increasingly blurred. They differ on detail as evident in the description of their main features presented below for disease management (Table 18) and earlier for ICPs (Table 9). ICPs work across the system with an emphasis on a seamless delivery of care within and across the services. Generic disease management programmes are concerned with actually managing the chronic conditions.

Disease management as a concept is concerned with reducing health care costs and improving quality of life for individuals with chronic conditions by preventing or minimising the effects of the disease through integrated care. There is evidence of disease management programmes (DMPs) being implemented throughout a number of European countries (Nolte & Knai 2015). The following are brief statements on disease management as a context for this section.

Disease management is "a system of coordinated heath care interventions and communications for defined patient populations with conditions where self-care efforts are significant" (Care Continuum Alliance, Accessed 23rd June 2015).

"The concept of Disease Management was first introduced in the United States in the 1980s and has traditionally targeted a single (chronic) disease or condition. Disease management was initially used by pharmaceutical companies to promote medication adherence and behaviour change among people with diabetes, asthma and coronary heart disease through educational programmes offered to employers and managed care organisations. In the mid 1990s, the US health care industry began to adopt disease management strategies, with nearly 200 companies offering disease management programmes by 1999. As growing evidence showed that treating people with chronic conditions could save costs, disease management was adopted more widely. This included adoption by the US Federal Government under the fee for service Medicare system, targeting common chronic conditions in diverse populations and delivered by private CDM organisations.

There are two important trends in the evolution of this profitable disease management "industry". Under the broad umbrella of disease management, two basic types of initiatives: (i) "on-site" programmes and (ii) "off-site" or "carved-out" programmes. The "off-site" or "carved out" programmes focus on specific processes of care or clinical outcomes, mostly patient education and self-management based on information systems. These are offered by commercial for-profit organizations, marketed mainly to employers and health insurers as cost containment strategies. They are not integrated with primary care and there is minimal communication with primary care providers.

Summary points

- the boundaries between disease management and integrated care overlap and are increasingly blurred.
- disease management (DM) is a population based and co-ordination approach to CDM including self-care support
- US origins in commercial 'industry' since 1980s (off site i.e. delivered by external providers)
- parallel growth of 'on-site' and population based DMPs delivered by PC providers
- generic DMPs evolving to address multiple diseases and to more integrated care

“On-site” programmes are directed by the primary provider and delivered within a primary care setting. A further trend has been towards a broader, population-based approach to managing chronic conditions including multiple conditions in patients. This development and ‘on site’ programmes have seen a growth in databases and disease registers to identify individuals at risk. Alternative approaches or models to disease management have evolved to provide a more integrated approach to care.

The growth of disease management programmes has resulted in a range of initiatives that vary in scope, focus, purpose and range of components, and the concept itself had a range of definitions and meanings. The boundaries between disease management and integrated have become blurred and there is overlap between these concepts.
(sourced from Nolte & McKee 2008).

In this review, a total of 18 studies addressed DMPs including 1 meta-analyses, 5 systematic reviews, 2 systematic reviews with meta-analyses, 7 RCTs, 1 mixed methods evaluation, and 2 retrospective comparison evaluations.

The studies on DMPs included:

- an assessment of effectiveness of a range of DMPs and their components across various chronic conditions (Hisasighe 2012; Mattke et al. 2007) or specific conditions, namely diabetes (Pimouguet et al. 2011; Knight et al. 2005), heart failure (Yu et al. 2006), coronary artery disease (Khunti et al. 2007), asthma (Galbreath et al. 2008), COPD (Due et al. 2014), multimorbidity (Hogg et al. 2009)
- the use of technology: review of the role of home based technology and communication in DMPs (Gaikwad & Warren 2009); an assessment of the effects of automated home monitoring in patients with heart failure (Konstam et al. 2011); the use of an integrated e technology system in managing diabetes (Harno et al. 2006)
- a review of the impact of MDT care co-ordination and planning (Mitchell et al. 2008)
- evaluations of the effectiveness of DMPs implemented in individual (Hamar et al. 2015; Fuchs et al. 2014; Hamar et al. 2010; Sönnichsen et al. 2010) or multiple countries (Nolte & Knai 2015)

Definitions of DMP

Definitions specific to DMP were available for extraction from 10 papers (Table 17). Based on similarities across definitions, a broad overarching definition of DMPs is as follows:

Systematic, proactive and coordinated approaches to population based chronic disease prevention and management along a continuum of care across health care services with specific consideration to the nature of the condition(s) and risk stratification of patients.

Table 17 Definitions of DMP

Paper	Definition
Due et al. (2014)	“a systematic, proactive approach to chronic care including a division of tasks between general practitioners, hospitals and municipalities where programmes stress the need for population-based patient registration; annual chronic disease check-ups; and stratification of patients into three levels according to risk of complications, complexity, and state of the disease”(p.3 sourced from Fuller et al. 1984).
Elissen et al. (2014)	‘‘a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant’’ (p.26, Elissen et al. 2014)
Fuchs et al. (2014)	**“**a program that intends to improve the care of persons with chronic diseases.”(p.453)
Galbreath et al. (2008)	“a system of coordinated health care interventions and communications for populations with conditions in which patient self -care efforts are significant”(p.599).
Hisasighe (2012)	“a systematic population-based approach emphasizing coordinated and comprehensive care along the continuum of disease and across the health care delivery system” (p.27, sourced from previous literature).
Mattke et al. (2007)	“a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant” (p.671, sourced from the Disease Management Association of America). The researchers added DM has having defining characteristic: (i) illness severity in target population involving health risk appraisal (ii) intervention intensity varying from low to high; (iii) the nature of the condition which can be more or less complex to manage.
Nolte et al. (2012a)	‘the coordinated treatment and care of patients during the entire duration of a (chronic) disease across boundaries between providers and on the basis of scientific and up-to-date evidence” (p. 131, sourced from Bundesversicherungsamt, 2011).
Nolte & Knai (2015)	“as comprising the following components: (a) an integrated approach to care or coordination of care among providers, including physicians, hospitals, laboratories and pharmacies; (b) patient education; and (c) monitoring or collection of patient outcomes data for the early detection of potential complications” (p.3, Krumholz et al. 2006).
Pimouguet et al. (2011)	“an ongoing and proactive follow-up of patients with at least two of the following five components: patient education, care coordination, monitoring, treatment adjustment & coaching”.
Yu et al. (2006)	“a programme that used multiple interventions in a systematic manner to manage heart failure across different health-care delivery systems”(p.597).

[1] Source references, if applicable, are cited as foot notes in (Appendices 7 & 8).

Components of DMPs

The DMPs in studies reviewed were generally consistent in having six key components. Each of the studies were mapped for these components (see Table 18). Patient self-management education and collaborative practice were the most commonly reported components. The least common component was population identification processes, that is, a broad population based approach to chronic disease prevention and management.

Although all studies referred to target groups of individuals with chronic diseases, targeting whole populations was evident in only 6 studies. Populations targeted in 3 cluster RCTs included patients with COPD across 183 general practices (Due et al. 2014), Austrian adults with diabetes across almost 250 general practices in a province with a total population of 500,000 where the estimated prevalence of diabetes is 2.5 to 3% (Sönnichsen et al. 2010), and secondary prevention in a population of 1316 patients across 20 primary care practices in the UK (Khunti et al. 2007). Other studies addressing population based DMPs included a systematic review evaluating the effectiveness of DMPs implemented nationwide in Germany (Fuchs et al. 2014), Australia (Hamar et al. 2015), and a review of national DMPs implemented in 12 European countries (Nolte and Knai 2015).

Table 18 Studies with components of DMPs

Key Elements	**Studies Implementing Specific Components**	
	Syst. Rev/Meta-Analyses	*RCTs/MM*
Population identification processes i.e. population based approach (Programs designed to target individuals with specific diseases & chronic and costly conditions)	1[j]	5 [c f h i p]
Evidence-based practice guidelines	4[a b m n]	3 [d g i]
Collaborative practice involvement (Multidisciplinary teams that may include physicians, pharmacists, nurses, dieticians and psychologists; disease managers and nurse-led DMP in primary care, outreach visits to GP practices)	5[a b k l m]	6 [c e f g h i]
Risk identification and matching of interventions to need	3 [a b l]	6 [c d g h i o]
Patient self-management education (Self- management may include behaviour modification, support groups and primary prevention, coaching)	5[a b k l n]	8 [d e f g h i o p]
Tracking and monitoring system (Routine reporting and feedback loops that include patients and providers; appropriate use of information technology)	3[a b l]	5 [d e g h l p]

Available at: http://www.amcp.org/WorkArea/DownloadAsset.aspx?id=9295
http://www.rand.org/content/dam/rand/pubs/technical_reports/2011/RAND_TR894.pdf

[a] Pimouguet et al. (2011); [b] Yu et al. (2006); [c] Khunti et al. (2007); [d] Galbreath et al. (2008); [e] Hogg et al. (2009); [f] Sönnichsen et al. (2010); [g] Konstam et al. (2011); [h] Due et al. (2014), [i] Elissen et al. 2014), [j]Fuchs et al. (2014), [k] Hisasighe (2012); [l] Gaikwad & Warren (2009); [m] Mitchell et al. (2008); [n] Knight et al. (2005); [o]Hamar et al. (2010); [p] Hamar et al. (2015)

Outcomes and Effectiveness of DMPs

The outcomes assessed in DMPs are presented in Box 5.

Box 5 Outcomes assessed in DMPs

Category	n	Category	n
Patient outcomes	**16**	**Service Outcomes**	**12**
Clinical health status	11	Hospital admissions / readmission	7
Quality of life	12	Length of stay	4
Satisfaction with care	4	ED visits	3
Mortality	6	PC/home	3
Health behaviours	4	OPD visits	1
Knowledge	2		
Process outcomes	**12**	**Resources**	**4**
Health monitoring	10	Costs	4
Quality care/standards	4		
Medication management	3		
Patient-HCP relations	3		
Patient education	3		

Summary points

Most evidence has shown positive effects of DMPs for:

- clinical health status (cholesterol, BP, symptoms & HbA1C)
- quality of life
- health monitoring e.g. blood pressure check, diabetes eye and foot care
- service utilisation especially from national DMPs

Multifaceted interventions contribute to positive outcomes

Patient outcomes:

As listed above in Box 5 above, the most common patient outcomes measured were:

- changes in clinical status
- quality of life
- mortality

Changes in clinical status: A total of 9 of the 11 studies that assessed changes in clinical status were found to have positive effects. These effects included reducing cholesterol (Fuchs et al. 2014; Sönnichsen et al. 2010; Harno et al. 2006), blood pressure and BMI (Sönnichsen et al. 2010; Khunti et al. 2007; Harno et al. 2006), HbA1c levels (Pimouguet et al. 2011; Elissen et al. 2014; Mattke et al. 2007; Harno et al. 2006), and improving symptoms (Galbreath et al. 2008).

The strongest source of evidence was drawn from a meta-analysis of DMPs for diabetes care which calculated the pooled standardized mean difference in HbA1c levels between the intervention and control groups (Pimouguet et al. 2011). This difference corresponded to an absolute mean difference of 0.51% in HbA1c levels between the intervention and control groups. The features contributing to positive effects are presented in the next section on *Components of DMPs with Positive Effects.*

Quality of Life: 9 of the 11 studies found significant positive effects (Elissen et al. 2014; Fuchs et al. 2014; Hamar et al. 2010; Gaikwad & Warren 2009; Mitchell et al. 2008; Galbreath et al. 2008; Khunti et al. 2007; Mattke et al. 2007; Yu et al. 2006).

Other patient outcomes: significant positive effects were found for satisfaction with care (Hisashighe 2012), changes in health behaviours in (Fuchs et al. 2014; Khunti et al. 2007), functional abilities (Gaikward & Warren 2009), and for mortality in some studies included in systematic reviews (Fuchs et al. 2014; Yu et al. 2006).

Process outcomes

Health monitoring: a consistent pattern of positive effects was found for health monitoring across 7 of the 9 studies that assessed this outcome. These effects related to increased guideline adherence (Elissen et al. 2014; Sönnichsen et al. 2010; Mattke et al. 2007), increased blood pressure monitoring (Fuchs et al. 2014; Sönnichsen et al. 2010; Khunti et al. 2007) and increased annual checks by GPS for patients with diabetes and COPD (Due et al. 2014) and increased retinal screening and foot examination in diabetes care (Knight et al. 2005).

Other process outcomes: apart from health monitoring, there were few process outcomes assessed in the studies reviewed. There is some evidence to suggest that DMPs can improve medication management (Fuchs et al. 2014; Khunti et al. 2007) and risk management (Khunti et al. 2007).

Service outcomes

The most frequent outcome assessed was hospital admission rates. There was consistent evidence of positive effects on service utilisation in studies implementing population based national programmes (Nolte & Knai 2015; Hamar et al. 2015; Elissen et al. 2014; Hamar et al. 2010), and in most studies reviewed in some evidence synthesis papers including a meta-analysis (Hisasighe 2012), and a systematic review (Gaikwad & Warren 2009). A handful of studies (n=6/22) had significantly positive effects in another systematic review (Sönnichsen et al. 2010).

Hospital admissions/readmission: reductions on hospital in-patient utilisation were seen in national DMPs cited above. For example, hospital admission rates was the primary outcome assessed in primary care nurse delivered calls to a population of over 17,000 involving a range of chronic conditions (Hamar et al. 2010). Hospital admissions reduced by 6.2% in the intervention group compared to an increase by 14.9% in the comparison group. The researchers noted that the overall decrease in hospital admissions was driven by risk stratification levels and those in the middle and highest levels of severity (Level 1 to 3 = least severe to most severe) showing a decrease by 8.2% (Level 2)and 14.2% (Level 3) compared to increases by 12.1% and 7.9% respectively in comparison groups. The greater the number of nurse calls was associated with a

Summary points

○ Sustained long term reductions in hospital admissions were driven by risk stratification with a higher reduction for patients in greater disease severity.

Proactive chronic care management involving risk stratification is effective in reducing hospital admissions

greater decrease in admissions. The researchers concluded that proactive chronic care management is effective in reducing hospital admissions.

Positive effects of a telephone outreach service complemented by online self-management support resources was found in a national population based health and wellbeing programme in Australia covering a range of chronic conditions (Hamar et al. 2015). A significant decrease in hospital admissions (by 11.7%) and readmissions (37.67%) was seen over 4 years following implementation.

The above findings differ from the RCT of Hogg et al. (2009) involving multidisciplinary team care provision in a family practice with the addition of one pharmacist and three practice nurses. Care was delivered almost exclusively by telephone and in the home to patients across a range of patients with single chronic illnesses. There were no significant changes in hospital admissions between groups.

One explanation for the differences in findings between studies on telephonic interventions for CDM may be that positive effects are more likely if delivered by a specialist nurse in primary care compared to generalist healthcare professionals such as practice nurses. Nurses in both studies by Hamar et al. (2015, 2010) seemed to be specialists, described as chronic care management nurses involved in autonomous clinical judgment of risk stratification of patients. They were also trained counsellors in disease management.

In a systematic review by Gaikwad and Warren (2009) on the benefits of home based information and communications technology for chronic disease management, telephonic support, nursing call services were evaluated positively. Significant reductions in hospital admissions and length of stay were found. This review found telephone support in nurse led interventions to be one of the most effective tele-health interventions for reducing service utilisation and improving clinical indicators. There was evidence of telephone-based systems of telemonitoring being less expensive than more complex forms of tele-monitoring, yet as effective. Evidence from this review points to the need for a specialised model of nursing care to support tele-health interventions.

Summary points

Telephone support by specialist nurses is:
- effective in reducing hospital admissions
- less expensive than more complex approaches to tele-monitoring

Telephonic support increases the effectiveness of DMPs when used in combination with home/clinic visits in primary care.

Significant reductions in hospital readmissions were evident in Yu et al.’s (2006) systematic review with 91.7% of effective DMPs having combined telephone call support with clinic/home visits. Based on their evidence, these researchers supported extending the role of specialist nurses including a shift away from the hospital setting to direct patient care in the community involving in-person clinic/home visits and telephone support. Yu et al. concluded that telephone support as a cost saving approach is a necessary complement to the more expensive home/clinic visits.

Other service outcomes: The national programme for Australia referred to above from Hamar et al. (2015) was found to significantly reduce bed days by 17.2% over 4 years. Evidence from some studies reviewed by Gaikwad & Warren (2009) indicate that Home Telehealth reduces the number of bed days and also unplanned emergency visits. In contrast Hogg et al.'s study on telephonic and home care, referred to above, had no impact on ED visits.

Taken as a whole, national DMPs are being evaluated positively in terms of effects on patient, process and service outcomes. For example, the results from the DISMEVAL project concerning national implementation of DMPs across a number of European countries (Nolte & Knai 2015; Elissen et al. 2014) are showing predominately favourable outcomes. These DMPs are structured to improve coordination and are being implemented nationally or regionally in decentralised systems. Overall, the programmes have a strong emphasis of primary care for chronic disease prevention and management, strengthening of ambulatory care, and strengthening the role of nursing in primary care such as nurse led clinics, nurse led case management and self-management support for patients.

Summary points

Clinical programmes for disease management across Europe are predominately showing positive outcomes for service utilisation.

National DMPs have a strong emphasis of primary care, strengthening of ambulatory care, and strengthening the role of nursing in primary care such as nurse led clinics & nurse led case management.

The introduction of 'community matrons' in the UK is a strategy to strengthen the role of nursing in primary care. Introduced in 2004, community matrons act as case managers and co-ordinate care for complex and high risk individuals in the community. Case management is a targeted, proactive, community-based approach to care that is part of a wider programme of CDM (Ross et al. 2011). According to Ross et al. identification of individuals at high risk (case finding) of hospital admission is a first step in case management. Typically, community matrons are generalists supported by specialist nurses. To date, there has been no national evaluation of community matrons and evidence reviewed by Nolte and Knai (2015) indicate that the community matron service has increased access to and quality of care among older adults but has not significantly impacted on rates of emergency admission for those at high risk of hospitalisation.

Components of DMPs with Positive Outcomes

The evidence thus far indicates that specialist nurses involved in case management and risk stratification contribute to positive outcomes (Hamar et al 2015; Hamar et al. 2010; Gaikwad & Warren 2009; Yu et al. 2006).

The positive impact of the role of specialist nurses in DMPs was evident in Khunti et al.'s (2007) cluster RCT involving 20 primary care practices and over 1,000 patients. The intervention involved specialist nurses delivering a DMP for secondary prevention of CHD and CHF, holding scheduled weekly clinics in the practices. The specialist nurses were involved in patient assessment, confirmation of diagnosis based on investigations, medication management including titration, and liaison with secondary care. Nurses had extended roles of referring patients for echocardiography and to secondary specialist services for assessment. Patients in the control group did not have access to specialist nurse primary practice clinics.

Summary points

- ○ specialist nurses involved in case management and risk stratification contribute to positive patient outcomes.

Improvements associated with specialist nurse led primary care clinics could lead to an increase in meeting the national targets for CDM.

The intervention lasted 12 months. At 12 months follow up from baseline, nurse led disease management in primary care practices was found to have significant positive effects on: most clinical outcomes (BP and BMI but not cholesterol); uptake of smoking cessation programme; quality of life; satisfaction with care; health monitoring (BP, ECGs, confirmed or excluded diagnosis of CHF); medication management, and adequate management of BP and cholesterol.

Khunti et al. commented that the improvements associated with specialist nurse led primary care clinics could lead to an increase in meeting the targets of *the UK Quality and Outcomes Framework.*[11] The researchers concluded that their trial, which was pragmatic, could easily and widely be implemented in the primary care setting.

Khunti et al. (2007) noted that while "it is difficult to determine from this trial which facet or facets of a complex, multifactorial intervention led to improvements in care" (p.1403), the components contributing to success seemed to be education, optimisation of treatment and regular contact with patients.

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[11] The QOF is a system for performance management and payment of GPs in the NHS, UK,, introduced in 2004 as part of the General Medical Services. QOF awards surgeries achievement points for:
managing some of the most common chronic diseases, e.g. asthma, diabetes

- ○ implementing preventative measures, e.g. regular blood pressure checks
- ○ the extra services offered such as child health care and maternity services
- ○ the quality and productivity of the service, including the avoidance of emergency admissions to hospital
- ○ compliance with the minimum time a GP should spend with each patient at each appointment

Accessed at:http://www.hscic.gov.uk/qof on the 22nd June 2015.

Evidence to support optimisation of treatment and regular contact with patients as two components that contribute to successful outcomes for DMPs was explicit in the meta-analysis conducted by Pimouguet et al. (2011). These researchers assessed the effectiveness of DMPs for improving glycaemic control in patients with diabetes and they performed a meta-regression analysis to determine which components of programmes are associated with their effectiveness. Two effective components were identified:

- high frequency of patient contact
- the ability for disease managers to adjust treatment with or without prior physician approval.

These two components of DMPs respectively accounted for 6.1% and 39.2% of the variance between studies.

Having delineated the core features of effective DMPs for diabetes, Pimouguet et al. (2011) recommended that priority should be given to DMPs with intensive and proactive follow-up targeting those at high risk of diabetes complications rather than targeting the overall population of patients with diabetes in programmes with low frequency of contact. In addition, they recommended that disease managers (mostly nurses in their review) should be allowed to proactively start or modify medical treatments in the management of diabetes.

The evidence and recommendations from Pimouguet et al. 's (2011) meta-analysis has practice implications for supporting the role of specialist nurses in primary care actively involved in case management of high risk patients identified through risk stratification.

In the studies reviewed by Pimouguet et al. (2011), high frequency of patient contact was facilitated by face to face meetings, telephone support, or a combination of both. As noted earlier from Yu et al.'s (2006) systematic review, DMPs were more effective if patient contact involved a combination of telephone call support and clinic/home visits. Their evidence indicated that while telephone support alone has limited beneficial effect, "combining this method with an in-person method appears to be crucial to enhance the success of the DMPs" (p.605).

Summary points

Core features of effective DMPs are:

- high frequency of patient contact
- proactive treatment & modification

The above core features of DMPs has policy implications such that priority should be given to intensive and proactive follow-up targeting groups at high risk of complications rather than targeting the overall population of patients in DMPs with low frequency of contact.

The evidence has practice implications for supporting the role of specialist nurses in primary care in the case management of high risk patients. Direct patient contact should involve Contact of patient contact who should have direct patient contact through a combination of face to face meetings and telephone call support.

Evaluation of DMPs

Summary point

○ evaluations are compromised by short timeframes & little comparison between different DMPs

There is a need for multiyear timeframe evaluation in order to establish the 'success' of DMPs in terms of medium & long-term effects such as health & economic impacts

Our evidence on approaches to evaluating the DMPs is drawn from a meta-analysis, systematic reviews, RCTS, a mixed methods large scale evaluation study, and retrospective cohort studies. Similar our review of CCM studies, little detail on comparison or control groups was provided and there has been little attempt to compare different DMP models or to compare DMP as a model of care with another model of care (e.g. CCM) for chronic disease prevention and management. Evaluations of DMPs through RCTs, have been limited by short follow up timeframes.

According to Nolte et al. (2012b), if the goal of evaluation is to assess the DMP implementation process against a plan for learning, short timeframes are likely to be sufficient. On the other hand, if the goal is to establish the 'success' of the DMP in terms of medium and long-term effects such as health or economic impacts, then a multiyear timeframe evaluation is recommended if such effects can be expected to occur and be reliably measured. It may take between 3 to 5 years for a given DMP to be fully implemented and for effects to become evident (Nolte et al. 2012b)

An assessment of chronic diseases approaches across 12 countries in Europe, known as the DISMEVAL project (Developing and validating DISease Management EVALuation methods for European health care systems), provides evidence on evaluation strategies used in individual countries. The DISMEVAL project aimed to develop and validate metrics for the evaluation of disease management (Nolte and Knai 2015; Elissen et al. 2014; Nolte et al. 2012a). The project was conducted over 3 years between 2009 and 2011. Ireland was not included in this project.

Evidence from the DISMEVAL project indicates that DMPs have been implemented within the context of health service reforms in individual countries, mostly as small scale pilot projects with longer terms goals of scaling up. Nolte and Knai (2015) noted some similarities between countries on how DMPs are evaluated. A common feature is an emphasis on process and outcome evaluations using a range of methods including but not limited to RCTs, observational methods, quasi-experimental, and/or mixed methods and audit data. In some countries, economic indicators are used as part of an evaluation of DMPs.

In the UK, approaches to evaluating DMPs have been described as largely academic. In Denmark, evaluations are disease specific and assessment and monitoring tools for this have been developed. Evaluations are typically built into practices and conducted by health care professionals implementing DMPs. In some countries, evaluation of DMPs is mandatory such as required by a national clinical programme on diabetes care in Italy. Overall, the evidence from the DISMEVAL project shows that most DMP evaluations have been for single diseases with little consideration for multiple conditions in individuals (Nolte and Knai 2015). This finding is not surprising given that few DMPs to date have not been developed with multimorbidity in mind.

Some key recommendations for evaluating DMPs arising out of the DISMEVAL project relate to addressing practical and methodological challenges (Nolte et al. 2012b).

Some practical challenges include:

- the quality, completeness and sources of the actual data to be used
- accessibility, management and confidentiality of data
- the availability of and familiarity with analytical tools and capacity
- associated costs
- support for practitioners to engage in local evaluation

Methodological challenges include:

- feasibility of experimental designs as 'gold standard' in complex real world health care settings
- tensions between scientific rigour and practicality
- threats to validity of DMP evaluations associated with a wide range of potential biases and confounding factors
- identification of a suitable comparison group because DMP interventions populations, disease progression, morbidity and multimorbidity can change over time

Key recommendations for DMP evaluations and that can address the above challenges are presented in Box 6.

Box 6 Recommendations for evaluation of DMPs

- RCTs remain should always be considered the preferred choice if feasible
- observation studies are more suited to the ‘real world’ but acknowledging their limitations
- mixed methods including combination of designs (qualitative & qualitative) to fully understand observed effects, to take account of disease management as a process of social change, and to understand how specific local conditions, influence the outcomes of DMPs
- routine databases can be a useful resource e.g. as retrospective control group or as baseline data
- meta-analysis and meta-regression needed to establish which DMP components contribute most to effectiveness
- supportive infrastructure for data needed to be useful for evaluation

Source: Nolte et al. (2012b)

Patient Centered Medical Home Model

The Patient-Centered Medical Home (PCMH) care was introduced by the American Academy of Pediatrics (AAP) in 1967. The concept mainly refers to primary care that emphasises timely access to medical services, enhanced communication between patients and their health care team, coordination and continuity of care, and an intensive focus on quality and safety. In this review, 1 study was identified that examined the effects of PCMH (Jackson et al. 2013). This study was a systematic review of RCTs (n=10), observational studies (n=19) and non-comparative studies (n=12). The main aim of the study was to describe approaches for patient-centered medical home (PCMH) implement-action and to summarise evidence for effects on patient staff experiences, process of care, and clinical and economic.

According to Jackson et al. (2013), PCMH is “a model of primary care transformation that seeks to meet the health care needs of patients and to improve patient and staff experiences, outcomes, safety and system efficiency” (p.169). To be considered a PCMH, an intervention have the following components: (1) a team-based care, (2) at least 2 of 4 elements focused on how to improve the entire organisation of care enhanced access, coordinated care, comprehensiveness, systems-based approach to improving quality and safety, (3) a sustained partnership, and (4) an intervention that involves structural changes to the traditional practice.

The review of PCMH interventions indicated mixed results with no evidence of positive effects for most clinical or service outcomes. The researcher commented that as yet, evidence is insufficient to support or refute the effectiveness of PCMH on chronic illness care processes, clinical outcomes, on hospital admission costs or of care.

Summary point

There is insufficient evidence to support or refute the effectiveness of the PCMH

Generic Models for Multimorbidity

Although all of the above model or programmes are applicable to individuals with multiple conditions, the prevailing evidence points to their use in single conditions. In recent years, attention to addressing multimorbidity is emerging. A Cochrane review by Smith et al. (2012a) sought to examine the effectiveness of interventions designed to improve outcomes in individuals with two or more chronic conditions. Ten RCTs were reviewed that were:

- Organisation oriented (n=8) – case management and coordination of care or skill enhancement in multidisciplinary teams.
- Patient oriented (n=6) –focusing on health related behaviour
- Professional oriented (n=3) – education & training

Most interventions were found to have multiple components but varied which made it difficult to compare interventions. Overall, the researchers concluded that the more effective interventions for positive outcomes are those categorised as organisational. More specifically, organisational interventions that are "targeted at specific risk factor management or focused areas where patients have difficulties such as functional ability or medicines management, are more likely to be effective" (p. 12). The researchers recommended these interventions over broader organisational interventions such as case management or changes in delivery, which were found to be less effective. However, it was noted that linking patient oriented interventions to healthcare delivery increased likelihood of positive effects.

The review highlighted the paucity of RCT interventions to improve outcomes for patients with multimorbidity. Likewise, as evident in our review on generic models of care including DMPs, efforts to address multimorbidity are scarce. However, we identified 2 models of care specifically designed for managing multiple conditions: a 'care management model' developed in the USA (Bodenheimer & Berry-Millet 2009), and the 'House of Care' developed in the UK (Coulter et al. 2013).

Care Management Model

Care management is described as a model of care for individuals with multiple chronic conditions representing a shift from models that primarily address single diseases such as the CCM and DMPs (Bodenheimer & Berry-Millet 2009). The following is a brief overview of care management as a context for this section.

A framework of care management was developed in the USA by the Centre for Health Care Strategies (CHCS) to meet the challenge of expanding managed care programmes for individuals being supported by social security. Within this framework, a care management model must have the following components:

Identification, Stratification and Prioritization

Interventions **that are multifaceted, tailored to meet consumer need, involve consumer in**

decision making, improve quality and effectiveness and ensure co-ordination of care.
Evaluation **which should include systematic, measurement, testing and analysis**
Payment/financing **to support improvements in care management by rewarding participating consumers and providers (Centre for Health Care Strategies 2007).**[12]

Care management differs from disease management and population management which focus on specific diseases and large populations of patients, stratified by risk to determine the best approach for each risk subgroup. Care management focuses on specific patients who have multiple diseases (Bodenheimer & Berry-Millet 2009).

For this review, four papers were identified within the category of care management models: a systematic review with meta-analysis (Egginton et al. 2012), two RCTs (McMahon et al. 2012; Coburn et al. 2012); and a grey literature synthesis report on care management of patients with complex health care needs (Bodenheimer & Berry-Millet 2009). Multiple chronic conditions in individuals were limited to two studies reviewed:

- synthesis report on care management of patients with complex health care needs (Bodenheimer & Berry-Millet 2009)
- assessing the effectiveness of a community based nursing intervention on mortality in older adults with one of more chronic conditions (Coburn et al. 2012).

The remaining two studies were on diabetes, which aimed to:

- assess the effectiveness of online care management (McMahon et al. 2012) and the composition and performance of care management models and their impact on outcomes (Egginton et al. 2012).

Definition of Care Management

A definition of care management was offered in one study:

> **"Care management is a set of activities designed to assist patients and their support systems in managing medical conditions and related psychosocial problems more effectively, with the aim of improving patients' health status and reducing the need for medical services" (**Bodenheimer & Berry-Millet 2009, p. 4**).**

Components of Care Management

The six components of the chronic care model are considered to be relevant to care management but with modification to the decision support component because multiple chronic diseases cannot be managed by standard clinical guidelines (Bodenheimer & Berry-Millet 2009). However, there

Summary points

- Care management is described as a model for managing multimorbidity

Community based nursing across primary care practices with older adults with multimorbidity over 6 years is promising in terms of impact on survival.

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[12] Centre for Health Care Strategies 2007) Accessed at *(*www.chcs.org/usf_doc/Care_Management_Framework.pdf *14th June 2015*

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was little evidence in the studies reviewed that the CCM components formed part of care management, although some similarities were apparent. Each of the 4 studies was mapped to the key components of the care management framework developed by CHCS (see Table 19). Most studies included identification, stratification, prioritisation as well as multifaceted tailored interventions, although tailoring was not explicit in the systematic review (Egginton et al. 2012).

Table 19 Studies with components of care management

Components	**Studies reporting components**	
	Syst. Rev with Meta-Analyses & Evidence Report	*RCT*
Identification, Stratification and Prioritization (e.g. Health risk assessments; predictive models (algorithm–driven model that uses multiple inputs to predict high-risk opportunities for care management); Surveys (e.g., Patient Health Questionnaire 9, Short Form 12); Case finding (e.g., chart reviews, surveys) referrals (from member, provider, community)	1[A]	2[BD]
Multifaceted tailored Interventions that are collaborative with service users e.g. evidence-based practices, interactive care plan, developed based on consumer-set priorities, multidisciplinary care teams, "Go to" person, Medical home, Physical/behavioural health integration, specialised patient engagement (e.g., self-management training).	2[AC]	2[BD]
Evaluation - systematic, measurement, testing and analysis to ensure that interventions improve quality, efficiency, and Effectiveness e.g. Program evaluations, rapid-cycle micro experiments (e.g., continuous quality, improvement, testing, and program adjustments), representative measures of quality (e.g., HEDIS, CAHPS), and representative measures of cost (e.g., ROI calculations).		1[D]
Payment/Financing e.g. pay for performance at multiple levels (e.g., health plan, provider, and consumer level), Share in program savings (gainsharing), Case management/medical home payments		

[A] Bodenheimer & Berry-Millet (2009);[B] McMahon et al. (2012); [C]Egginton et al. (2012); [D]Coburn et al. (2012).

Outcomes and Effectiveness of Care Management

Only one study reported on the effects of care management in relation to multimorbidity. Coburn et al.'s (2012) RCT on a community based nursing intervention in the care management of older adults with multiple chronic conditions found significantly positive effects for all outcomes assessed. Nurse care managers provided disease management and preventative care, and collaborated with primary care physicians. They worked across multiple primary care practices which included seeing patients in the practices and in addition home visits if needed. The main objective was to determine the survival impact of community based nursing. The study duration was over 6 years. A relative lower risk of death was observed in the intervention group compared to usual care control group. The researchers concluded that a programme of community nursing care management would be a valuable addition to primary care for older adults with multiple chronic illnesses.

Egginton et al.’s (2012) systematic review of 52 studies including meta-analysis on diabetes care found a significant but small reduction in glycaemic control and other outcomes assessed. Most care management programmes in this review were ‘carved out’ (n=36) in primary care, therefore not delivered by patients’ existing primary care teams as part of their overall care. The researchers concluded that ‘carved out’ care programmes have limited effects on patient outcomes.

McMahon et al.’s (2012) RCT compared online, telephone care management and web training, and usual care supplemented with online self-management resource materials. They found that HbA1c declined significantly in both groups including those in usual care group with no differences between them. The researchers concluded that active care management delivered using online or telephone methods offers no additional benefits for achieving positive outcomes and that self-management online resources may be as effective. Care managers who were experienced diabetes educators were involved in the active management of diabetes with direct patient contact by telephone or online messaging.

Components of Care Management with Positive Outcomes

There was insufficient evidence available from this review to establish which components of care management contribute to positive effects.

Evaluation of Care Management Models

Evaluations of care management models is limited to the type of studies included in this review and are characterised by short timeframes. Coburn et al.’s (2012) study differed in that the programme was implemented over many years and outcomes were measured over time.

House of Care

The *House of Care* as a generic model of care has recently emerged from the UK. The *House of Care* as a metaphor for a co-ordinated health service delivery model has emerged in the UK and is being implemented in a number of sites. A fundamental feature of this generic model is that it is designed to address multiple conditions in the same individuals, not just single diseases or high risk groups. In addition, the model embraces a partnership approach with an emphasis on collaborative personalised care planning with patients (Coulter et al. 2013).

The *House of Care* has four key components which together are depicted as a house:

- informed and empowered patients and carers (house pillar)
- healthcare professionals committed to partnership working (house pillar)
- the commissioning of appropriate services, (house foundation) and
- the operation of the organisational and clinical processes necessary for successful treatment (the house roof)

In the centre of the House is 'person centred coordinated informed care'. Therefore, the *House of Care* approach is about building care around the person rather than making the person fit the care (Accessed at: http://www.england.nhs.uk/house-of-care/). An overview of the *House of Care* is presented in Appendix 11.

In contrast to the predominant focus of managing single diseases identified in the evidence that we reviewed, it is evident from implementation of the *House of Care* that efforts are being made to working towards a holistic care plan by bringing together all the clinical issues for each individual with multiple conditions, albeit challenging (Coulter et al. 2013). Coulter et al. (2013) noted that 26 communities involving 6,000 practitioners in the UK were involved in the *House of Care.*

We did not source any papers that assessed the effectiveness of the *House of Care* on preventing and managing multimorbidity. We identified one source of grey literature reporting on pilot implementation specific to diabetes care (Diabetes UK 2011).

The review of pilot findings following implementation in three sites indicated that care planning was adopted in the majority of practices with scheduled visits in place. Specialist health care professionals were needed to support care planning in primary care. Benefits included improved organisation, teamwork and job satisfaction. Costs associated with health literacy in supporting patients' involvement in care planning were identified (Diabetes UK 2011).

Stanford Chronic Disease Self-Management Programme

In this review, a total of 9 studies in 10 papers addressed the Stanford CDSM programme including 1 meta-analysis, 2 systematic reviews, and 6 RCTs.

The literature on self-management is vast and while it is an approach to CDM, it is limited as a generic model or programme of care for national implementation. To recall from earlier in this chapter, according to the Danish National Board of Health (2007), the purpose of generic models of CDM is to provide an overall framework for the content of national programmes with elements that can be shared and that are transferable across different types of diseases. As evident in our review, self-management invariably featured in the chronic care model, disease management programmes, care management model and implicitly in the *House of Care.* Therefore, self-management is best considered as part of the content of a national framework.

Our search strategy yielded several papers on self-management and from these we included papers that explicitly referred to the Stanford Chronic Disease Self-Management Programme (CDSMP). This programme is concerned with the empowerment of patients to self-manage their chronic illnesses. A hallmark of the programme is that it is a community based lay led programme. The programme is delivered in community setting (e.g. church, community halls) and in workshop format over 6 weeks consisting of weekly sessions of 2.5 hour duration. Lay leaders are individuals with chronic illness. The CDSM programme consists of five key components: self-management education, self-efficacy, decision-making, goal setting and action planning, and effective communication with HCPs. Together, these components work towards a problem solving approach to managing chronic disease by patients in their everyday lives (accessed at: http://patienteducation.stanford.edu/organ/cdsites.html)..

Our decision to include the Stanford CDSMP, in particular, related to evidence of its use in national programmes to support chronic disease management. For example, the Stanford CDSMP formed the basis of the NHS Expert Patient Programme in the UK and it was recommended that user led self-management would be integrated into the NHS national provision of health care (Department of Health 2001). In addition to the UK, the Stanford programme has been implemented throughout the world including European countries such as Ireland, Italy, France, Finland, Denmark, the Netherlands and Norway (accessed at: http://patienteducation.stanford.edu/organ/cdsites.html).

In the evidence already reviewed on generic models of care and on integrated care programmes, the focus on self-management was predominately on support led by healthcare professionals rather than user led self-management support. Therefore, the purpose of this section is to examine the evidence on the effectiveness of studies that implemented the Stanford CDSMP.

The implementation of the CDSMP in terms of adopting the 6 week group course using lay led leaders was evident in the studies reviewed. In one RCT, the lead was a trained cardiac nurse specialist supported by a lay leader (Smeulders et al. 2010).

Outcomes and Effectiveness

Outcomes of the CDSM were reported in all 9 studies reviewed most of which related to patient outcomes (see Box 7).

Box 7 Outcomes assessed in the Stanford CDSMP

Category	n	Category	n
Patient outcomes	**7**	**Process outcomes**	**3**
Clinical health status	5	Communication with HCP	3
Quality of life	5		
Health behaviours	4	**Service Outcomes**	**6**
Functional status	2	Hospital admissions	3
Mental health	5	Length of stay	3
Self-efficacy	5	Primary care visits	3
Knowledge	2	ED visits	2

Summary points

- There is inconclusive evidence on the effectiveness of the Stanford lay led CDSM programme.
- The programme seems beneficial for promoting self-efficacy and mental health
- The evidence overall indicates that the programme has no effect on service utilisation.

Patient outcomes: There is evidence of positive effects for some patient outcomes, namely, self efficacy and mental health and wellbeing, a finding common to evidence synthesis papers reviewed (Brady et al. 2013; Nolte & Osborne 2013; Fosters et al. 2007). The findings on quality of life were mixed with just 2 of the 5 studies reporting positive effects which were small to moderate in effect size (Kennedy et al. 2007) and not sustained in the longer term (6 & 12 months) on completion of programme (Smeulders et al. 2010). Significant improvements were evident for some symptoms such as pain but not for shortness of breath or fatigue (Fosters et al. 2007). Other researchers found symptom improvement to be in the short term only e.g. fatigue (Brady et al. 2013) or that that the effects were negligible e.g. pain (Nolte & Osborne, 2013). No significant effects were evident for HBA1c in studies on diabetes reviewed by Foster et al. (2007).

Process outcomes: Process outcomes was reported in 3 studies, all of which related to communication with HCPs. Evidence from one meta-analysis (Brady et al. 2013) and 2 systematic reviews (Nolte & Osborne 2013; Foster et al. 2007). The effects were negligible to small (Nolte & Osborne 2013) or small to moderate at most (Brady et al. 2013)

Service Outcomes: The findings on service outcomes overall suggest no effect on service utilisation. Although a significant positive effect on delay time to hospitalisation was identified in one RCT (Adepoju et al. 2014), the remaining 5 studies found no significant effects of the CDSM programme on the service utilisation including hospital admissions, LOS, or primary care visits.

Barriers and Enablers for Implementing Models of Care

What are the barriers or enablers for implementation of models of care for chronic disease prevention and/or management identified?

We organized the barriers and enablers around four general categories: patient specific; HCP specific, service/practice specific; and organisational specific. A summary of the most common barriers and enablers is presented in Figure 14 and Figure 16.

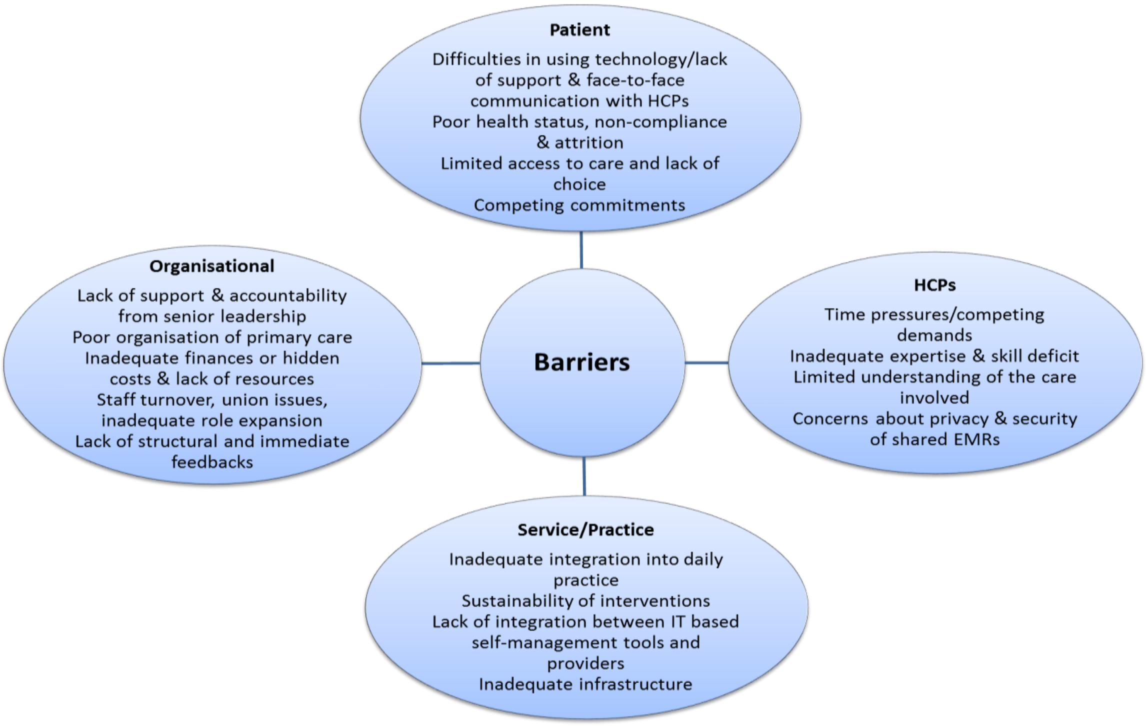

Figure 14 ***Barriers to implementation of models of care***

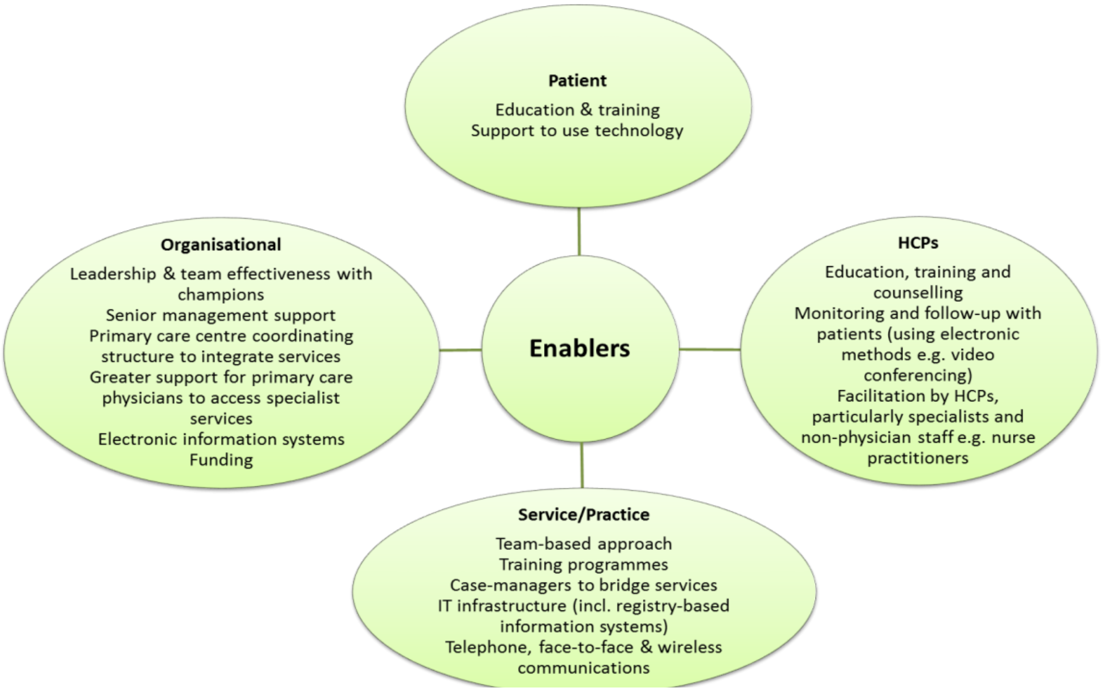

Figure 155 ***Enablers to implementation of models of care***

Bringing it All Together: What Works Best for Clinical Care

The evidence presented in this chapter on integrated care and on generic models of care offer consistent trends on what works best for the clinical management of chronic disease.

The distinction between integrated care and generic models of care for disease management is not always clear cut. The literature points to overlap and blurred boundaries especially in relation to defining features and care processes. Our analysis is that while there is overlap, they work differently and are mutually complementary. ICPs work across the system with an emphasis on a seamless delivery of care within and across the services. Generic disease management programmes are concerned with actually managing the chronic conditions.

Based on the evidence from this review, the following table summarises what works best for integrated care and generic models of care. For integrated care, the focus is on the organisation of service delivery across boundaries or sectors. For a generic model of care, the focus is on the clinical aspects of working with individuals or populations in the prevention or management of chronic diseases.

Table 20 What works best

	Integrated Care	Generic Model of Care
What is it?	An organizing principle characterised by a smooth, holistic, continuous and seamless journey between services tailored to the needs of service users. This organisation works at four levels: clinical, professional, organisational, & systems.	National level: An overall framework for the content of national programmes with elements that can be shared and that are transferable across different types of diseases.[13] Clinical care level: A proactive structured, scheduled, co-ordinated and continuous approach to care with specific consideration to the nature of the condition(s) and risk stratification of individuals and populations; designed to prevent or manage one or more chronic conditions in individuals and populations.
Why?	To improve the quality and efficiency of care and services, and to avoid fragmentation.	To reduce the risk and burden of chronic diseases and to manage chronic diseases in individuals and populations in order to improve patient health outcomes and the delivery of care.

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[13] This definition is sourced from The National Board of Health (2007) Denmark. Full citation included in reference list.

How it is done?	Evidence of success factors are: o ***Co-ordinating health professional*** (specialist nurses) located in primary care and linking into specialist services o **Shared centralised information system –** to facilitate smooth and timely exchange of information between service organisations and health care professionals. This includes disease registers. o ***Shared clinical decision tools/guidelines -*** to facilitate a continuous and holistic approach to care delivery by health care professionals	Evidence of success factors are: o Structured & coordinated care led by **primary care team led** as generalists **supported by specialist services** o Long term & sustained **specialist nurses in primary care** working across a cluster of practices o **Standardised care** using evidence based guidelines but cognizant of **tailoring to individual needs** o Prioritising **high risk** & complex cases for frequency of contact involving **case management** & **risk stratification** o **Proactive identification of high risk patients** for scheduled care monitored/tailored by **clinical information systems** o **Self-management education & support** o Specialist resource, education and **support for PC teams**. o **Person centred, tailored and individualised care planning**, cognisant of holistic approach for multimorbidity

Where?	***Primary Care*** ***as the principal point of service delivery and care***

Chapter 4

◆

Economic Review Methods

Introduction

Economic evaluations provide a means of assessing the costs and effects of competing health interventions under consideration. This allows for a comparison between them, following which the best (i.e. most cost effective) can be recommended for reimbursement (Drummond et al., 2005). For an economic evaluation to be considered a full economic evaluation (cost utility analysis/cost effectiveness analysis/cost benefit analysis/cost minimisation analysis) there are two necessary criteria. Firstly, both the costs and the consequences need to be considered. Secondly, there must be a comparator to which the costs and consequences for the intervention can be compared (this is often usual/typical care). When these criteria are not fulfilled the evaluation is termed a partial economic evaluation. The different types of economic evaluation are described in Table 21.

Table 21 Distinguishing characteristics of health care evaluation

Are both costs (inputs) and consequences (outputs) of the alternatives examined?				
Is there a comparison of two or more alternatives?	**NO**	**NO**		**YES**
		Examines only consequences	Examines only costs	
		1A Partial evaluation 1 B		**2 Partial evaluation**
		Outcome description	Cost description	Cost-outcome description
	YES			
		3A Partial evaluation 3 B		**4 Full economic evaluation**
		Efficacy or effectiveness evaluation	Cost analysis	Cost effectiveness analysis Cost-utility analysis Cost-benefit analysis

Source: Drummond et al., 2005, p.11

In cells 1A and 1B, there are no comparison of alternatives. In cell 1A, only the consequences of the service or programme are examined, so it is categorised as an *outcome description*. In cell 1B, only costs are examined, so the study is considered a *cost description* (Drummond et al. 2005). In cell 2, both costs and outcomes of a single programme are described that is not compared to an alternative so therefore the evaluation is termed as a *cost-outcome description*. In cell 3A, only the consequences of the alternatives are compared, so it is consequently referred to as an *effectiveness* *evaluation*. In cell 3B, only the costs of the alternatives are examined and are labelled *cost analyses* (Drummond et al. 2005).

In cell 4, full economic evaluations are presented. Here there is an evaluation of two or more alternatives and both costs and consequences of the alternatives are compared (Drummond et al. 2005). There are four types of full economic evaluations: cost-utility analysis (CUA), cost effectiveness analysis (CEA), cost-benefit analysis (CBA) and cost-minimisation analysis (CMA).

Review Methods

The systematic review presented here follows the HIQA (2014a) draft guidelines for the retrieval and interpretation of economic evaluations of health technologies in Ireland, with adaptions to satisfy the requirements for the systematic review's broader health system and policy related questions. The aim of the economic arm of the review was to answer the following research question:

What are the findings in the economic literature of cost effectiveness, cost impact and resources involved with integrated models of care for chronic diseases including implementation costs?

Selection Criteria for Studies

The following types of studies were considered for inclusion in this systematic review of health economic studies:

- Full economic evaluation studies (i.e. CUA, CEA, CBA and CMA) of intervention(s) versus comparator(s); partial economic evaluations (i.e. cost analyses, cost-description studies, cost-outcome descriptions) of intervention(s) and comparator(s); and randomized trials reporting more limited information, such as estimates of resource use or costs associated with intervention(s) and comparator(s);
- Primary studies (i.e. RCT's, cluster RCT's, non-randomised trials, interrupted time-series design analyses, retrospective/prospective observational studies)
- Secondary studies (i.e. systematic reviews, meta-analyses, meta-synthesis and meta-reviews);
- Peer reviewed publications;
- Documents or reports published or unpublished as grey literature;
- Studies written in the English language, published since 2005;
- Studies focused on adults from aged 18 years upwards.

The following types of studies are not considered for inclusion in this systematic review of health economics studies:

- Any study that does not meet the clinical criteria;

- Theses, case studies, discussion or opinion papers that do not present research findings;
- Studies published in a foreign language.

The PICOS framework is used to support inclusion criteria but with a minor adaption to include context (Davies 2011) as per the clinical arm of the study. The framework is PICOCS as follows:

Box 8: PICOCS framework guiding selection criteria - economic arm

Population:	Adults (≥18 years) diagnosed with at least one or more chronic illness(es) including but not limited to cardiovascular/ respiratory/ diabetes/musculoskeletal; Adults at risk of developing chronic illness (i.e. the focus being on prevention programmes)
Interventions:	Integrated models of care – primary and secondary care.
Comparator:	Usual or standard service delivery – principally the comparator should be the most cost effective alternative intervention currently available.
Outcomes:	Any measure of economic outcomes; Resource use – length of hospital stay/number of outpatient attendances; Costs – direct medical costs/indirect medical costs/implementation costs/health cost expenditures/service utilisation costs/cost savings; Cost effectiveness analysis – cost per unit of effect (cost per life – years gained (LYG)) or effects per unit of cost (LYG per Euro spent); Cost utility analysis – generic outcome measures – quality-adjusted life years (QALYs)/ health years equivalent (HYE)/ disability-adjusted life years (DALYs) etc.; Cost-benefit ratios; Incremental cost-effectiveness ratio (ICERs); Incremental cost-per QALY.
Contexts:	Societal/Health Service or Health Payer
Studies:	Full economic evaluations –CEA/CUA/CBA and CMA; Partial economic evaluations – cost analyses, cost description studies and cost-outcome descriptions; Primary studies; Secondary studies

Search Strategy

The economic section of the study aims to consider all relevant health economics studies, whether or not conducted alongside, or based upon, effectiveness studies that meet the clinical eligibility criteria of integrated models of care for the review. To conduct the search for these studies, economic search terms were combined with the terms used for the clinical arm in the study for integrated care. The economic search terms used were informed by the PICOCS framework and the economic filter used by Scottish Intercollegiate Guidelines Network (SIGN). The search terms used for each database can be found in Appendices 12-18.

A systematic literature search was performed in the databases EconLit, Business Source Complete and the major health search engines MEDLINE, CINAHL, (via EBSCO) and EMBASE (via Elsevier). Searches were also performed in the Database of Abstracts of Reviews of Effects (DARE) and the NHS Economic Evaluation Database (NHS EED) (via the CRD website) along with the Cochrane Library methodology register (via

Wiley). The search was conducted on the 11th May 2015, searches were limited by dates 1st Jan 2005 – 31st March 2015 and only studies in the English language were included. Relevant literature from the clinical searches were also identified and included for review if they had not been captured in the economic searches. EndNote X7 was used to store all references and all duplicates were removed both automatically and manually.

A search for grey literature was conducted in grey literature repositories/ systems including Open Grey, New York Academy of Medicine, Open Doar, NIH, HSE, Health Information and Quality Authority (HIQA), Health Research Board (HRB), Lenus, World Health Organisation (WHO), National Institute for Health and Care Excellence (NICE), Centre for Health Economics and Policy Analysis (CHEPA), Institute of Health Economics (Alberta Canada), Department of Health UK, NHS and Health Canada/ Public Health Agency. The search terms used for each database can be found in Appendix 19.

Search Results

Figure 17 outlines the study identification process. A total of 2,210 references were imported into EndNote X7 and 218 duplicates were removed automatically and manually. A total of 1,992 abstracts were screened, with 35 studies being identified for full text review. The systematic search yielded 8 studies that met the inclusion criteria for this review and 1 paper was included from the grey literature.

Review Process

Data selection was conducted in two phases:

Phase 1: All potentially eligible papers identified in the search strategy were screened by abstracts and where not available, by titles. These were assessed against the inclusion and exclusion criteria as outlined above by two reviewers specialised in the field of health economics.

Phase 2: For studies that appeared to meet the inclusion criteria, or in cases when a definite decision could not be made based on the title and/or abstract alone, the full paper was obtained for detailed assessment against the inclusion criteria independently by the two reviewers. A third reviewer, with expertise in the medical field, screened selected papers to ensure the studies fulfilled the clinical criteria.

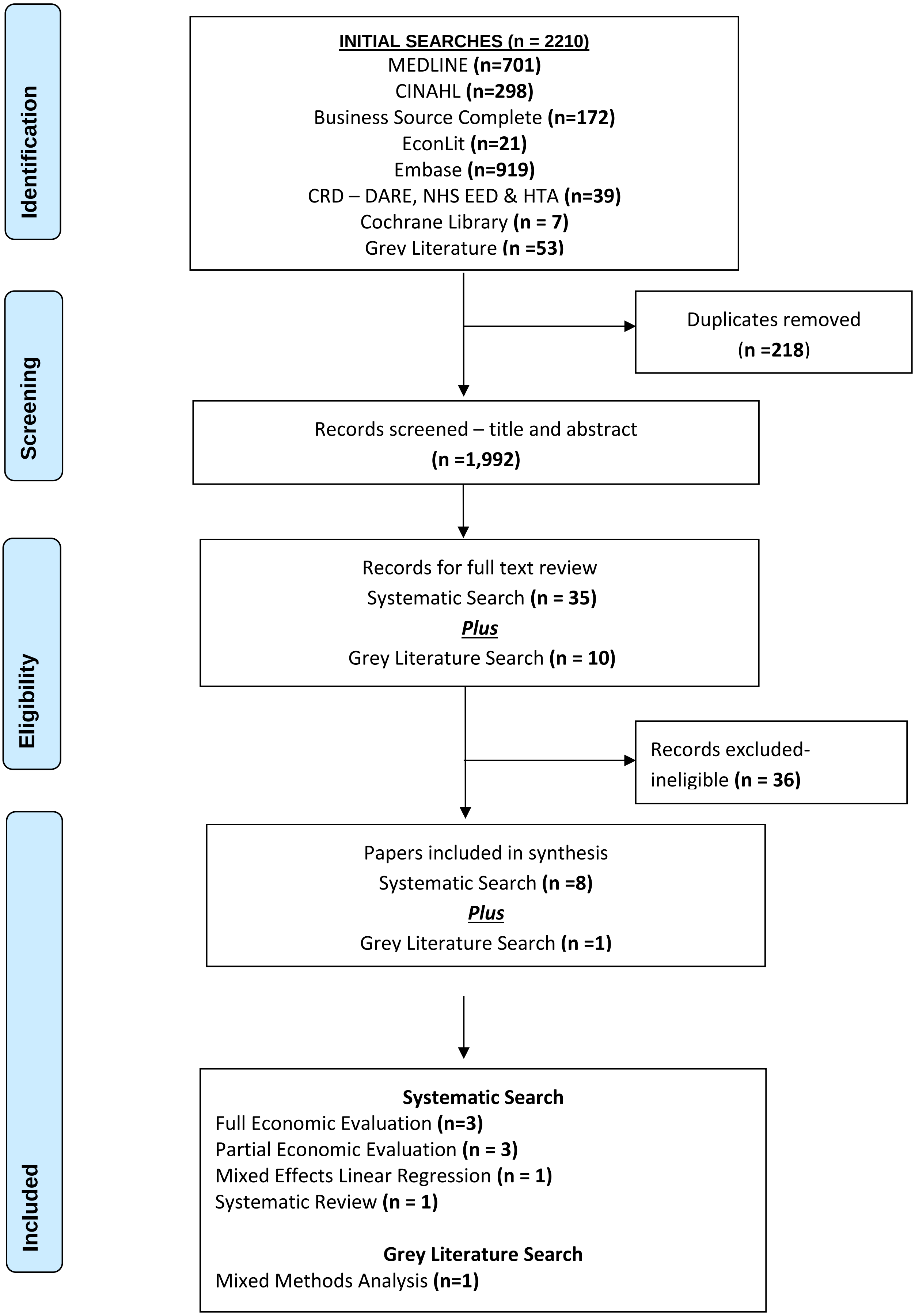

Figure 17 *Flow chart of search process and results – economic arm*

Data Extraction

Data extraction was conducted by the two health economists on the team and is presented in tabular format to aid consistency of reporting, reproducibility and also to reduce bias (CRD 2008). Data extraction includes the key methodological elements that may impact on the results of an economic evaluation (HIQA 2014a). These include: year of study; details of the intervention and comparator; study design; type of economic evaluation; outcome measurement; integrated models of care definition; setting; perspective; time horizon; included costs, resource items and sources; data sources of outcomes and benefits; methods of measuring or valuing outcomes and benefits; discounting; information on price year and currency; details of sensitivity analyses undertaken; measures of incremental resource use and costs; outcomes and benefits and incremental cost effectiveness ratios (HIQA 2014a).

Quality Appraisal

A critical appraisal of the methodological quality was undertaken in order to assess the risk of bias. As recommended by the *Cochrane Handbook* (Schemilt et al. 2011, cited in HIQA 2014a) *"the BMJ checklist"* (Drummond et al. 1996) was applied to inform critical appraisal of the methodological quality of the full economic evaluations carried out alongside effectiveness studies, and partial economic evaluations. For studies within the review that applied a modelling technique, their quality was assessed using the "*Philips checklist"* (Philips et al. 2004) as recommended by the *Cochrane Handbook* (Shemilt et al. 2011, cited HIQA 2014). Copies of these checklists are provided in Appendices 20 and 21.

Transferability

HIQA (2014a) recommends that the following key features are considered when assessing the transferability of study results for economic evaluations: perspective; time horizon; clinical effectiveness; health-related quality of life; costing approaches; modelling approach; discount rate; results of any sensitivity analyses and the implications of the cost-effectiveness result relative to the notional threshold used in Ireland. To assess these factors HIQA (2014a) recommends the use of the EUnetHTA transferability tool provided in economic evaluation questions 27 – 29 (EUnetHTA 2011) to determine transferability to the Irish setting. A copy of the EUnetHTA transferability tool is included in Appendix 22.

Data Synthesis

The evidence was summarised using a narrative synthesis supported with summary tables as appropriate.

Chapter 5

◆

Economic Review Findings

Characteristics of Economic Papers

Nine papers were sourced through the review of literature pertaining to economic evaluations of integrated models of care. The chronic conditions represented are stroke (n=3); diabetes (n=2); cardiovascular disease (n=2); COPD (n=1) (the remaining study examines integrated models of care across chronic diseases). Countries evaluated on this review are: the Netherlands (n=3); USA (n=1); Australia (n=1); Italy (n=1); Switzerland (n = 1) and the UK (n=1). The remaining study is a systematic review with studies from a range of countries. With regards to study design there are three full economic evaluations in the form of cost utility analysis; three partial economic evaluations – cost analysis; two mixed methods and one systematic review. An overview of the characteristics of these papers is presented in Figure 18, Figure 19, & Figure 20.

Summary points

Evidence sourced from 9 papers

Four chronic diseases addressed

- Stroke, COPD, Cardiovascular disease and Diabetes

Study Design

  - 3 full economic evaluations
  - 3 partial economic evaluations
  - 1 systematic review
  - 2 mixed methods

Netherlands most frequent country evaluated

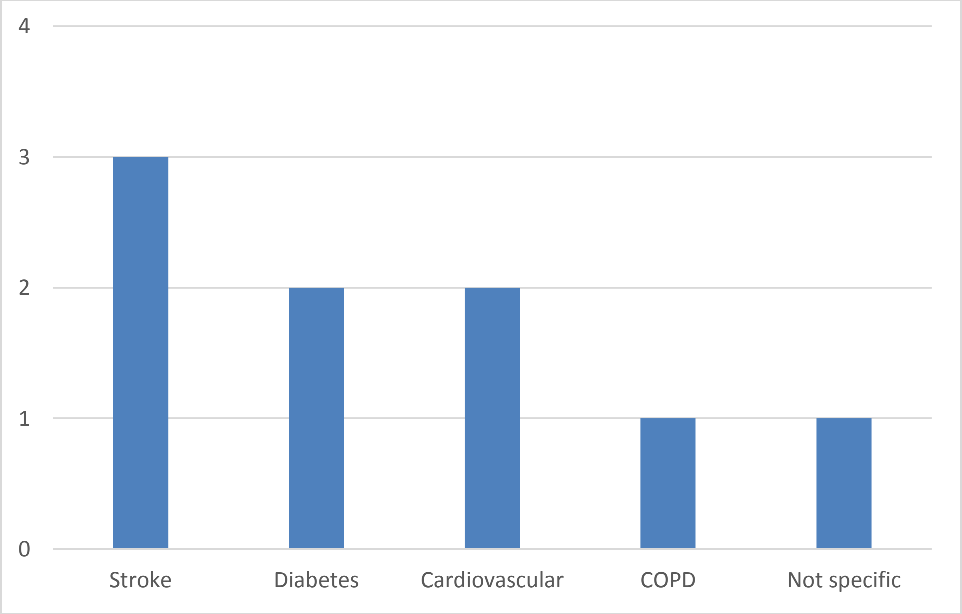

__Figure 18 Chronic diseases represented in economic review (n = 9)__

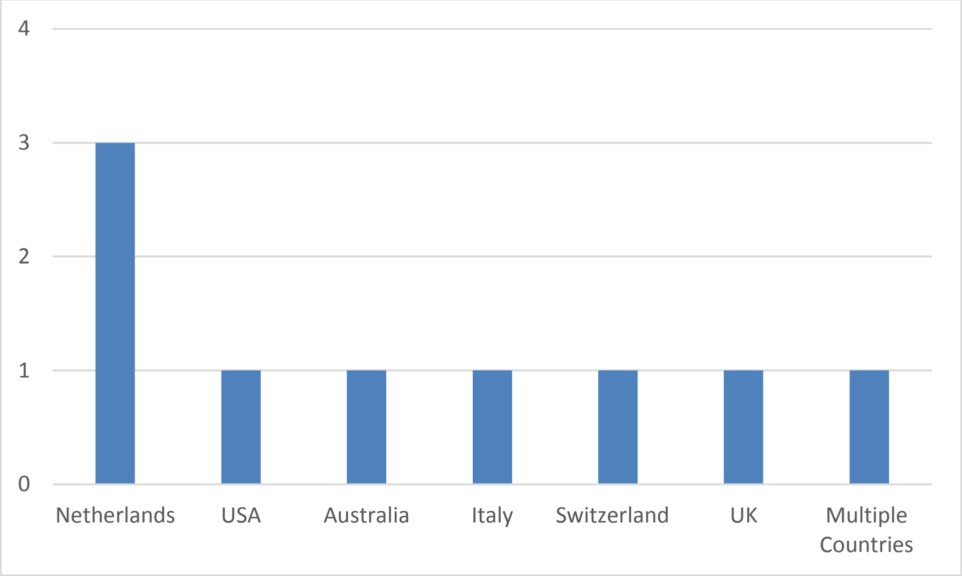

Figure 19 Countries represented in economic review (n = 9)

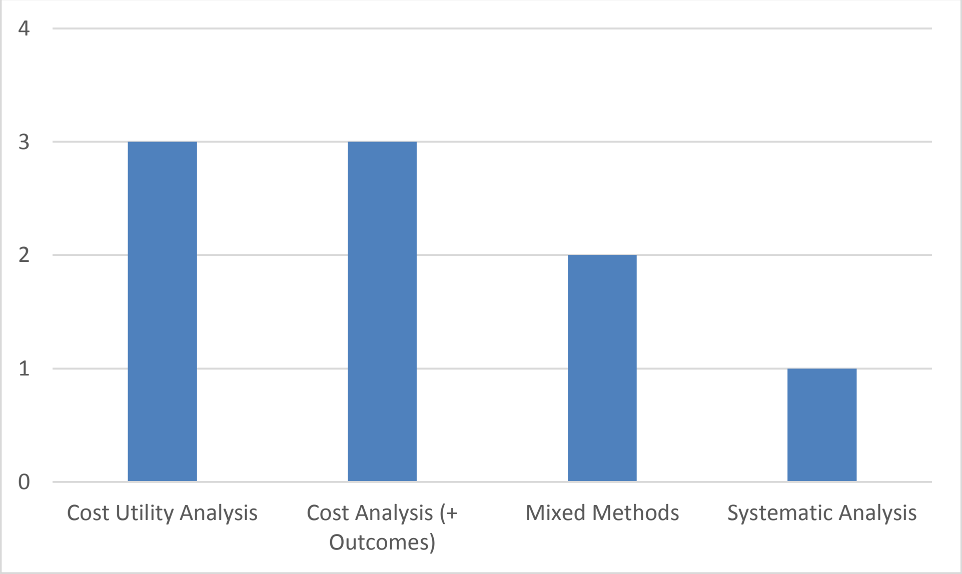

Figure 20 Studies included in analyses & syntheses of economic papers (n=9)

Systematic Search

Quality of Included Studies

As proposed by HIQA (2014a) the BMJ checklist (Drummond et al. 1996) for quality was applied to each of the studies yielded from the systematic search and the Philips checklist (Philips et al. 2004) was employed to assess the modelling aspects more thoroughly in the McRae et al. (2008) study (the only study to include a decision analytical model). The three full economic evaluations, (Baeten et al. 2010; McRae et al. 2008; Van Exel et al. 2005) are considered good quality as per the BMJ checklist

(Drummond et al. 1996). Similarly, the partial economic evaluations are also of good quality. Even though the three studies by Giorda et al. (2014), Delate et al. (2010) and Roberts et al. (2010) are cost analyses they also report on health outcomes. However, they do not estimate cost effectiveness ratios so therefore cannot be considered full economic evaluations (see Table 22 for results). As for the quality of the decision analytical model in McRae et al. (2008), according to the Philips et al. (2004) checklist, this study also performs well (see Table 23 for results).

Summary points

Quality

- 6 x economic evaluations (3x full and 3 x partial evaluations) are of good quality

Transferability

- The perspectives and cost categories in the 6studies are relevant to the Irish context
- 2 out of 6 studies report QALY's
- 2 out of 6 studies consider a lifetime horizon
- Systems at varying levels of integration which does impact on transferability

Transferability

As for HIQA (2014a) guidelines, the EUnetHTA toolkit for transferability was employed (EUnetHTA, 2011) to the studies yielded from the systematic search. While this was predominately developed for full economic evaluations it is applied here to all the studies from the systematic review, except for Tummers et al. (2012) as this is a systematic review.

Over all, the perspectives taken in these studies and cost categories included are relevant to the Irish context. The three full economic evaluations estimate cost effectiveness ratios. However, of the three full economic evaluations only two use QALYs as a measure of outcome which is in keeping with Irish guidelines. Only two studies, Baeten et al. (2010) and McRae et al. (2008) look at a life time horizon as recommended by HIQA, the remaining studies apply a time horizon ranging from six months (Van Exel et al. 2005) to four years (Giorda et al. 2014; Reich et al. 2012). None of the studies included in this review are from an Irish clinical setting. The countries studied for this review have different health infrastructure and systems. In addition, they are at varying stages of developing integrated models of care, which has an impact on transferability. Readers need to be cognisant of theses country and system differences when interpreting these economic evaluations. Table 24 presents the transferability results using the EUnetHTA toolkit.

Table 22 Quality: British Medical Journal (BMJ) Checklist

Item	Baeten et al. (2010)	Van Exel et al. (2005)	McRae et al. (2008)	Giorda et al. (2014)	Delate et al. (2010)	Roberts et al. (2010)	Tummers et al. (2012)	Reich et al. (2012)
Extract Study design.								
1. The research question is stated.	y	y	y	y	y	y	n/a	y
2. The economic importance of the research question is stated.	y	y	y	y	y	y	y	y
3. The viewpoint(s) of the analysis are clearly stated and justified.	y	y	y	y	y	x	n/a	x
4. The rationale for choosing alternative programmes or interventions compared is stated.	y	y	y	y	y	y	y	y
5. The alternatives being compared are clearly described.	y	y	y	y	y	y	y	y
6. The form of economic evaluation used is stated.	y	y	y	y	y	x	y	n/a
7. The choice of form of economic evaluation is justified in relation to the questions addressed.	y	y	y	y	y	x	n/a	x
8. The source(s) of effectiveness estimates used are stated.	y	y	y	y	y	n/a	y	y
9. Details of the design and results of effectiveness study are given (if based on a single study).	y	y	y	y	y	y	n/a	y
10. Details of the methods of synthesis or meta-analysis of estimates are given (if based on a synthesis of a number of effectiveness studies).	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11. The primary outcome measure(s) for the economic evaluation are clearly stated.	y	y	y	n/a	y	y	y	n/a
12. Methods to value benefits are stated.	y	y	y	y	y	y	x	n/a
13. Details of the subjects from whom valuations were obtained were given.	y	y	y	y	y	y	y	y
14. Productivity changes (if included) are reported separately.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
15. The relevance of productivity changes to the study question is discussed.	x	x	x	x	x	x	x	x
16. Quantities of resource use are reported separately from their	x	x	x	y	y	x	x	x

unit costs.								
17. Methods for the estimation of quantities and unit costs are described.	y	y	y	y	y	y	x	x
18. Currency and price data are recorded.	y	y	y	y	y	x	y	y
19. Details of currency of price adjustments for inflation or currency conversion are given.	y	y	x	x	n/c	x	x	x
20. Details of any model used are given.	y	n/a	y	y	n/c	n/a	x	y
21. The choice of model used and the key parameters on which it is based are justified.	y	n/a	y	y	n/c	n/a	x	y
22. Time horizon of costs and benefits is stated.	y	y	y	y	y	x	y	y
23. The discount rate(s) is stated.	y	n/a	y	x	x	x	x	x
24. The choice of discount rate(s) is justified.	y	n/a	x	x	x	x	x	x
25. An explanation is given if costs and benefits are not discounted.	x	y	n/c	x	x	x	x	x
26. Details of statistical tests and confidence intervals are given for stochastic data.	y	y	y	y	y	x	x	y
27. The approach to sensitivity analysis is given.	y	y	y	y	y	x	x	x
28. The choice of variables for sensitivity analysis is justified.	y	n/a	y	y	y	x	x	n/a
29. The ranges over which the variables are varied are justified.	y	n/a	y	y	y	x	x	n/a
30. Relevant alternatives are compared.	y	y	y	y	y	y	y	y
31. Incremental analysis is reported.	y	y	y	x	x	x	n/a	x
32. Major outcomes are presented in a disaggregated as well as aggregated form.	y	y	y	y	x	x	x	n/a
33. The answer to the study question is given.	y	y	y	y	y	x	y	y
34. Conclusions follow from the data reported.	y	y	y	y	y	x	y	y
35. Conclusions are accompanied by the appropriate caveats	y	y	y	y	y	x	y	y

Y Yes; x no; n/a not applicable; n/c not included

Table 23 Quality: Philips Checklist Decision Analytical Modelling

	Questions for critical appraisal	McRae et al. 2008
S1	Is there a clear statement of the decision problem?	y
	Is the objective of the evaluation and model specified and consistent with the stated decision problem?	y
	Is the primary decision-maker specified	x
S2	Is the perspective of the model stated clearly?	y
	Are the model inputs consistent with the stated perspective?	y
	Has the scope of the model been stated and justified?	y
	Are the outcomes of the model consistent with the perspective, scope and overall objective of the model?	y
S3	Is the structure of the model consistent with a coherent theory of the health condition under evaluation?	y
	Are the sources of data used to develop the structure of the model specified?	y
S4	Are the causal relationships described by the model structure justified appropriately?	x
	Are the structural assumptions reasonable given the overall objective, perspective and scope of the model?	y
S5	Is there a clear definition of the options under evaluation?	y
	Have all feasible and practical options been evaluated?	y
	Is there justification for the exclusion of feasible options?	y
S6	Is the chosen model type appropriate given the decision problem and specified causal relationships within the model?	y
S7	Is the time horizon of the model sufficient to reflect all important differences between options?	y
	Are the time horizon of the model, the duration of treatment and the duration of treatment effect described and justified?	y
S8	Do the disease states (state transition model) or the pathways (decision tree model) reflect the underlying biological process of the disease in question and the impact of interventions?	y
S9	Is the cycle length defined and justified in terms of the natural history of disease?	x
D1	Are the data identification methods transparent and appropriate given the objectives of the model?	y
	Where choices have been made between data sources, are these justified appropriately?	y
	Has particular attention been paid to identifying data for the important parameters in the model?	y
	Has the quality of the data been assessed appropriately?	y
	Where expert opinion has been used, are the methods described and justified?	n/a
D2	Is the data modelling methodology based on justifiable statistical and epidemiological techniques?	y
D2a	Is the choice of baseline data described and justified? Are transition probabilities calculated appropriately? Has a half-cycle correction been applied to both cost and outcome? If not, has this omission been justified?	y
D2b	If relative treatment effects have been derived from trial data, have	n/a

	they been synthesised using appropriate techniques?	
	Have the methods and assumptions used to extrapolate short-term results to final outcomes been documented and justified?	y
	Have alternative assumptions been explored through sensitivity analysis?	y
	Have assumptions regarding the continuing effect of treatment once treatment is complete been documented and justified?	y
	Have alternative assumptions been explored through sensitivity analysis?	y
D2c	Are the costs incorporated into the model justified?	y
	Has the source for all costs been described?	y
	Have discount rates been described and justified given the target decision-maker?	y
D2d	Are the utilities incorporated into the model appropriate?	y
	Is the source for the utility weights referenced?	y
	Are the methods of derivation for the utility weights justified?	y
D3	Have all data incorporated into the model been described and referenced in sufficient detail?	y
	Has the use of mutually inconsistent data been justified (i.e. are assumptions and choices appropriate)?	y
	Is the process of data incorporation transparent?	n/a
	If data have been incorporated as distributions, has the choice of distribution for each parameter been described and justified?	n/a
	If data have been incorporated as distributions, is it clear that second order uncertainty is reflected?	y
D4	Have the four principal types of uncertainty been addressed?	y
	If not, has the omission of particular forms of uncertainty been Justified?	x
D4a	Have methodological uncertainties been addressed by running alternative versions of the model with different methodological assumptions?	y
D4n	Is there evidence that structural uncertainties have been addressed via sensitivity analysis?	y
D4c	Has heterogeneity been dealt with by running the model separately for different subgroups?	x
D4d	Are the methods of assessment of parameter uncertainty appropriate?	y
	If data are incorporated as point estimates, are the ranges used for sensitivity analysis stated clearly and justified?	n/a
C1	Is there evidence that the mathematical logic of the model has been tested thoroughly before use?	y
C2	Are any counterintuitive results from the model explained and justified?	n/a
	If the model has been calibrated against independent data, have any differences been explained and justified?	n/a
	Have the results of the model been compared with those of previous models and any differences in results explained?	y

Y Yes; x no; n/a not applicable; n/c not included

See Appendix 21

Table 24 Transferability: EUnetHTA ToolKit Transferability Q27-29

			Baeten et al. (2010)	Van Exel et al. (2005)	McRae et al. (2008)	Giorda et al. (2014)	Delate et al. (2010)	Roberts et al. (2010)	Reich et al. (2012)
27		How generalisable and relevant are the results, and validity of the data and model to the relevant jurisdictions and populations?	x	x	y	x	x	x	x
28	a)	Are there any differences in the following parameters?							
	I	Perspective	x	x	x	x	x	x	y
	II	Preferences	n/a	n/a	n/a	n/a	n/a	n/a	y
	III	Relative costs	x	x	x	x	x	x	Y
	IV	Indirect costs	x	x	x	x	y	x	Y
	V	Discount rate	y	n/a	y	n/a	n/s	n/a	n/a
	VI	Technological context	y	n/a	n/a	N.A.	y	y	y
	VII	Personnel characteristics	x	x	x	x	y	x	x
	VIII	Epidemiological content (including genetic variants)	x	x	x	x	x	x	x
	IX	Factors which influence incidence and prevalence	x	x	x	x	x	x	n/a
	X	Demographic context	x	x	x	x	y	x	x
	XI	Life expectancy	x	x	x	x	x	x	x
	XII	Reproduction	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	x
	XIII	Pre- and post-intervention care	y	y	y	y	y	y	y
	XIV	Integration of technology in health care system	y	y	y	y	y	y	y
	XV	Incentives	N.A	N.A	N.A	N.A	y	y	y
	b)	If differences exist, how likely is it that each factor would impact the results?	Likely	Likely	Likely	Likely	Likely	Likely	n/a
		In which direction?	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	n/a
		Of what magnitude?	N.A	N.A.	N.A.	N.A.	N.A.	N.A.	n/a
	c)	Taken together, how would they impact the results and of what magnitude?							n/a
	d)	Given these potential differences, how would the conclusions likely change in the target setting?							n/a
		Are you able to quantify this in any manner?	No	No	No		No	No	

29		Does the economic evaluation violate your national/regional guidelines for health economic evaluation?	Only DR	No	Reports QALE rather than QALYs; 5% DR used IRL 4%	Not full EE	Not full EE	Not full EE	N/A

Y Yes; x no; n/a not applicable; N.A. not available; EE economic evaluation; DR discount rate

Characteristics of Included Studies

Systematic Search

A summary of studies from the systematic search is provided in Appendix 23. Of the nine studies included three are full economic evaluations in the form of cost utility analyses (studies 1 – 3); three are partial economic evaluations – cost analyses, although they do report some health outcomes they do not estimate cost effectiveness ratios (studies 4 – 6). The remaining two studies include a systematic review of integrated stroke services (study 7) and a mixed effects regression with cost as the dependent variable (study 8). An overview of these studies in terms of the research question is discussed below:

Summary points

Cost utility analysis	2 x Stroke and 1 x Diabetes
Cost analysis	1 x Diabetes, 1 x CAD and 1 x COPD
Systematic review	1 x Stroke
Mixed effects regression	1 x Integrated Models of care

Overview of Full Economic Evaluations: Cost Utility Analyses

1. **Beaten et al. (2010),** in their cost utility analysis examine the lifetime cost-effectiveness of stroke in an integrated service setting (n = 151) compared to conventional stroke care (n=187) in the Netherlands. The study takes the hospital perspective and assesses lifetime impact and cost consequences of stroke in an integrated service setting. Using results from the EDISSE study (Evaluation of Dutch Integrated Stroke Service Experiments), they compare stroke services to usual care. Here integrated stroke services are characterised as formal arrangements and strict coordination between various providers of stroke care, with the aim to *"provide the right care to the right patient at the right time"* (Baeten et al. 2010, p.2).

Summary point

Baeten et al. (2010) concluded that that effective coordination between health care providers involved in the rehabilitation of stroke patients, through integrated stroke integrated services may result in positive health outcomes and reduce health care costs owing to shorter LOS and reduced institutionalisations.

Cost effectiveness

- Integrated stroke services are associated with lower costs and higher life time QALYs, i.e. stroke services dominate usual care.
- Integrated stroke services offer a cost saving of € 5,990 and a QALY gain of 0.51 compared to usual care.
- The point estimate for the ICER is €11,685 saved per QALY gained; €14,211 and €7,745 saved per QALY gained for men and women respectively.
- The probability that the stroke service intervention is both effective and cost saving is over 90%.

Cost impact

- The lower costs in integrated stroke services result from shorter mean length of stay (LOS) in hospital in the acute period after stroke (13 vs. 29 days) and the reduced number of patients institutionalised one year post stroke (14% vs. 23%).
- For men the overall life time costs are € 32,284 in the integrated stroke service setting and €39,335 in usual care while the life time QALYs are 2.92 and 2.42 respectively.
- For women overall costs are € 38,443 in the integrated stroke service and
  - €42,944 in the usual care while the life time QALYs are higher at 3.33 and 2.75 years respectively.
- When results are standardised for gender the stroke services have average costs of € 35,361 and 3.12 QALYs and for the usual care setting the average cost is €41,352 and 2.61 QALYs.
- Integrated stroke services are related to lower costs and higher life time QALY's.

Resources used

- Patient level resource use data, including location, is sourced from the EDISSE study (including hospital and residence data):
  - LOS is the most important cost driver during the first 6 months.
  - After the first half year costs (which cost vary by resident location), are believed not to differ between integrated stroke service and usual care.

Implementation costs - not considered

2. A cost utility analysis by **Van Exel et al. (2005)**, evaluates the costs and effects of integrated stroke services on patients in three experimental settings (n=411), compared to a group of stroke patients receiving current standard care (n=187) in

the Netherlands over a six month follow-up period. Van Exel et al. (2005) define an integrated stroke service as *"a setting integrating all relevant institutions: hospital, nursing homes, rehabilitation centres, general practitioners and home care providers working together to provide multidisciplinary, coordinated care through organised patient transfers and protocols"* (p. 417).

Summary point

Van Exel et al. (2005) find that costs of integrated stroke services are dominated by institutional and accommodation costs. Integrated stroke services may lead to significant improvements in health and reduce costs; however the cost effectiveness of the service may depend on the organisation and focus of the integrated setting.

The experimental stroke settings chosen for the studies are as follows:

- Delft was chosen as it has continuity in care, with a relatively simple structure (one hospital, one nursing home and one home care organisation) and with case management by specialised stroke nurses.
- Haarlem was selected because of its specific interventions in the rehabilitation phase.
- Nijmegen has a more complex setting: two hospitals, various nursing homes and with specific interventions in the chronic phase (specialised home care and out clinic consultation by the hospitals).

Cost effectiveness

- Integrated stroke services in Delft show higher health gain at comparable costs per patient (ICER is €19,350 less per QALY gained). The probability that the experiment is acceptable at an ICER limit of €35,000 is 0.75.
- In Haarlem the stroke service is not cost effective with higher costs and reduced health effects (ICER is €78,480 per QALY lost).
- Similarly, in Nijemgen the stroke service is not cost effective and the study indicates that costs are consistently higher, while the chances of positive health effects are slightly greater than the chance of reduced health effects (ICER is €3,041,550 per QALY gained). The probability that the experiment is acceptable at an ICER limit of €35,000 is 0.01.
- This study shows that integrated stroke services may lead to significant improvements in general health status after stroke in a cost-efficient way. Delft, the setting with the most structured and complete care continuum indicates the best results, and is a cost-effective alternative for traditional care for stroke patients.
- Van Exel et al. (2005), when comparing the outcomes of all three experiments, find that the cost-effectiveness of an integrated stroke service may depend on the organisation and focus of the integrated stroke setting.

Cost impact

- Costs are dominated by institutional and accommodation costs (43% hospital costs, 32% nursing home costs, 13% rehabilitation centre costs, and 13% extramural costs).
- The average total costs of care per patient for the 6-month follow-up are estimated at €16 000 (95% CI €14,670 – €16,930).
- Mean total costs per patient:
    - Delft - €13,160
    - Haarlem - €16,790
    - Nijmegen - €20,230
    - Control regions: €13,810

Resources used

- Costs of stroke are measured at the patient level and are based on individual health care utilisation and unit costs of health resources.

Implementation costs

- Van Exel et al. (2005) do not consider implementation costs in the cost-effectiveness ratio calculations as they consider them irrelevant in the long-run. Nevertheless the following implementation costs are reported:
    - Start-up costs are estimated at €96,000 per region (range €66,000–€134,000) during the implementation period (2 to 3 years).
    - Structural costs per patient range between €175 and €260 (approximately 3% of total patient costs).

3. **McRae et al. (2008)** examine the cost utility and effectiveness of an integrated approach to supporting GP's with diabetes management in an Australian Division of General Practice compared to conventional treatment. This cost utility analysis is carried out using a decision analytic approach and applied to the United Kingdom Prospective Diabetes Study (UKPDS) outcome model to project outcomes of 80 patients over a time horizon of 40 years (Clark et al. 2004).

Summary point

The results from the McRae et al. (2008) study show that a program using a centralized computer-based register, and providing some centralized services is highly likely to be cost effective although at an increased net cost.

Cost effectiveness

- McRae et al. (2008) estimate that the diabetes programme will achieve an increase in discounted life expectancy of 0.36 years and an increase in discounted quality adjusted life expectancy (QALE) of 0.30 years.

- The net program cost per patient over 40 years (discounted at five per cent) is estimated at AUS$2,919.
- The cost-effectiveness ratios are AUS$8,108 per life year saved, and AUS$9,730 per year increase in QALE.

Cost impact

- The estimated impact of the program is overall treatment costs savings of AUS$34 per patient per year against the cost of the diabetes program of AUS$196 per patient per year.
- Total costs of programme to practices vary whether electronic or paper systems are used and range from AUS$146 to AUS$ 196 per patient per year.
- Costs of additional compliance with guidelines (the ratio of costs of treatment when compliant versus treatment which does not comply range from AUS$10 to AUS$90 per patient per year).
- Costs for treatment of complications over 40 years derived from the UKPDS model, achieves an estimated 7.4% reduction in treatment costs, i.e. a saving of AUS$44 per patient per year.
- Anti - diabetic prescribing saves AUS$40 per patient per year

Resources used

- Programme cost per patient:
  - Divisional costs (51% of total cost)
  - Dietician costs (5%)
  - Exercise programme (3 %)
  - Costs to practices (41%)
- Costs of compliance with guidelines
- Pharmaceutical costs
- Cost of hospitalisations

Implementation costs – not considered

Overview of Partial Economic Evaluations

Cost Analyses – outcomes also reported organised by disease type:

Diabetes:	Giorda et al. (2014)
COPD:	Roberts et al. (2010)
Cardiovascular Disease:	Delate et al. (2010)

4. **Giorda et al. (2014)** compare the direct costs of four different diabetes care models in Turin, Italy, (ranging in organisation from highly structured care to progressively less structured care) and health outcomes (n= 25,270). This study examines whether better outcomes incur increases in cost from the national health care perspective.

   Giorda et al. (2014) characterise the four diabetes care models as follows:

   (i) Structured Care: patients visit diabetes clinic and are screened for complications. (n=41% of patients).
   (ii) Only Specialist: patients seeking specialist consultation but no basic screening for complications (n=28% of patients).
   (iii) Unstructured care: patients neither seen by specialist nor screened for complications (n=26% of patients).
   (iv) Only Guidelines Composite Indicator (GCI): patients who receive appropriate care from primary care physician without any consultation with a diabetologist (n=5% of patients).

Effectiveness

- During the 4-year follow-up period, all-cause mortality is 84% higher (77% from cardiovascular disease) for patients managed according to the “unstructured care” model than for those managed according to the “structured care” model.
- The hospitilisation rate is 19% higher for patients cared according to the less structured level of care.

Summary point

Giorda et al. (2014) find that a care model that integrates primary and speciality care, along with practices that adhere to guidelines, are associated with better health outcomes and are slightly less expensive than other care models for Diabetes.

Cost impact

- “Only specialist” and “unstructured care” models are the most expensive.
  - Inpatient care is 31% higher in the “unstructured care” model compared to the “structured care” model.
  - Emergency care is 20% higher for those managed according to “unstructured care” compared to the “structured care” model.

- Cost ratios: Structured care: 1; Only GCI: 1.05; Only Speciality: 1.11; Unstructured care: 1.08.

Resources used

- Health care costs: hospitalisations, specialist visits, lab tests, other outpatient services, emergency care and drugs.

Implementation costs - not considered

5. **Delate et al. (2010),** observe the impact of a collaborative cardiovascular risk reduction service (Collaborative Cardiac Care Service [CCCS] n = 628 patients) on total health care expenditures after an acute coronary event compared to standard care (n = 628 patients) in Colorado, USA.

   The CCCS is described as *a collaborative effort between registered nurses and clinical pharmacy specialists under the oversight of a physician director* (Delate et al. 2010, p. 1129). After hospital discharge for an acute coronary event, patients are enrolled for 3–6 months into a registered nurse–managed cardiac rehabilitation program focused on interventions (smoking cessation, dietary modifications and exercise, and early initiation of secondary prevention drug therapy). On completing the registered nurse portion of CCCS, patient care is transferred to the Clinical Pharmacy Cardiac Risk Service (CPCRS), where clinical pharmacy specialists focus on long-term drug therapy management.

Summary point

Delate et al. (2010) find that a multidisciplinary programme co-managed by clinical pharmacy specialists and registered nurses, that place an emphasis on secondary cardiac prevention strategies using a system that follows-up and monitors patients, is associated with reduced mortality and reduced health care expenditures. The majority of expenditures occur during inpatient hospitalisation.

Effectiveness

- A total of 16 (2.6%) and 188 (29.9%) patients died from any cause, and 12 (1.9%) and 98 (15.6%) died from a coronary artery disease -related cause during follow-up in the intervention and usual care groups, respectively.

Cost impact

- The mean and median total health care expenditures per day are $39 and $20 for the CCCS group and $108 and $45, respectively for the No CCCS group (all p<.001).
- The vast majority of expenditures occur during inpatient hospitalisation (60.8%), outpatient hospitalisation (11.0%), and medical office consultations (10.7%).
- The CCCS and No CCCS groups have a mean ± SD inpatient hospitalisation expenditures/day of $19 ± $69 and $69 ± $194 (adjusted p<.001), outpatient hospitalisation expenditures of $3 ± $9 and $12 ± $23 (adjusted p <.001) and medical office expenditures of $7 ± $5 and $8 ± $10 (adjusted p=0.010), respectively.
- The CCCS group have a lower mean pharmacy cost of $4 versus $5 for the No CCCS group, adjusted p=0.030.

Resources used

- Inpatient hospitalisation, outpatient hospitalisation (e.g., emergency department visits, rehabilitation day hospitalisation), ambulatory surgery, non-KPCO medical office visits, KPCO medical office visits, inpatient extended-care stay, ambulatory radiology, ambulatory laboratory, other (e.g., ambulance, home health care) encounters and drug purchases.

Implementation costs - not considered

6. **Roberts et al. (2010)** evaluate the impact of an integrated service model for COPD (n = 5,491) post year one of implementation in Salford, UK. The purpose for the redesign of COPD services in Salford is to promote safe, effective and responsive care through integrated services closer to the patients' home. Roberts et al. (2010) identify two stages to the process: Stage 1 involves improved diagnosis, stratification of general practice COPD registers by disease severity, implementation of self-management plans, and monitoring of hospital referrals and admissions. Stage 2 involves an integrated strategy for the management of COPD with an emphasis on improved management in primary care and access to specialist services where appropriate.

Summary point

Roberts et al. (2010) find that an integrated COPD service model is successful in increasing diagnosis, reducing hospital admissions and reducing length of hospital stay.

Effectiveness

- Following implementation of the integrated service model the number of patients with moderate or severe COPD who completed pulmonary rehabilitation increased from 84 at baseline to 143 at 12 months.

Cost impact

- A reduction in the number of unscheduled hospital admissions for COPD, from 935 (2006 – 2007) to 840 (2007 – 2008).
- A decrease in the mean length of stay from 8.3 (2006 – 2007) to 7.7 days (2007 – 2008).
- The costs of COPD admissions, decreased from £1,772,865 (2006 – 2007) to £1,528,080 (2007 – 2008).

Resources used

- Hospitalisations;
- Education programme - monthly workshops, study days, a PCT hosted website, consultant led support via a virtual MDT. 2 x COPD DIP courses for practice nurses (funded by PCT). IT support for GP audit tool and training (GSK funded) and PCT specialist nurse to work alongside practice nurse (GSK funded).

Implementation costs – not considered.

7. **Tummers et al. (2012)** in a systematic review assess the evidence on the relative cost or cost effectiveness of integrated care arrangements for stroke patients compared to usual care. Fifteen studies are included in the review, and studies range from n = 83 to n = 598 subjects.

   Integrated care arrangements:
   - Early supported discharge – 6 x studies: (Anderson et al. 2000; Beech et al. 1999; Hui et al. 1995; McNamee et al. 1998; Teng et al. 2003 & Van Koch et al. 2000):
     - Tummers et al. (2012) conclude that six out of six studies report that early discharge decreases costs with similar (n=5) or better (n = 1, Teng et al. 2003) health outcomes compared to usual care.
   - Home – based rehabilitation – 4 x studies: (Andersson et al. 2002; Gladman et al. 1994; Markle-Reid et al. 2011 & Roderick et al. 2001)
     - Tummers et al. (2012) observe that home-based rehabilitation is likely to be cost neutral from a societal perspective however; it can lead to improved quality of life.
   - Stroke unit care – 2 x studies: (Moodie et al. 2006 & Patel et al. 2004)
     - Tummers et al. (2012) report that the use of stroke units provide better health outcomes but at a higher cost in comparison to conventional care.
   - Stroke services – 3 x studies: (Claesson et al. 2000; Fjaertoft et al. 2005 & Van Exel et al. 2005)
     - Tummers et al. (2012) conclude that the three studies that reported on integrated stroke services, differed substantially in their level of integration, however their results suggest that integration can be cost saving for stroke care.

Summary points

Cost Effectiveness: 2 x studies report on cost effectiveness – Moodie et al. (2006) report integrated stroke services cost effective whilst Patel et al. (2004) find integrated stroke services achieve better health outcomes but are more expensive.

Cost impact

Early – supported discharge

All 6 studies find that early-supported discharge reduces costs compared to usual care.

Home – based rehabilitation

3 out of 4 studies report higher costs and all 4 studies find better health outcomes.

Stroke units

2 out of 3 studies find stroke units are more expensive but lead to better health outcomes.

Stroke services

All 3 studies looking at integrated stroke services differ in their level of integration. 2 out of 3 studies report a cost reduction against similar or better health effects.

Cost Effectiveness[14]

- Stroke unit care
    - Moodie et al. (2006) observe that the ICER of stroke unit care over conventional care is AUS$9,867 per patient achieving thorough adherence to clinical processes and AUS$16,372 per patient with severe complications avoided. The authors conclude that dedicated stroke unit care is cost-effective.
    - Patel et al. (2004) find that stroke unit care was the most expensive of the three interventions but also achieves better health outcomes. The ICER of stroke unit care is £89, 132 per quality-adjusted life year (QALY) gained compared to usual care. Patel et al. (2004) advise however that these results should be interpreted with caution as only patients with a moderately severe stroke, who can be supported at home, are included in their study.

Cost impact

- Early – supported discharge
    - Six out of six studies show that early-supported discharge results in lower costs (4–30%) compared to usual or conventional care, but only in the study of Teng et al. (2003) the difference proves significant.
- Home – based rehabilitation
    - Three out of four studies (Gladman et al. 1994; Roderick et al. 2001; Markle-Reid et al. 2011) report non-significant higher costs for the intervention and one study, Anderson et al. (2002), report similar costs for home-based rehabilitation compared to hospital rehabilitation.
    - Tummers et al. (2012) suggest that delays with adjustments in the home for home-based rehabilitation contributed to delays in discharge from expensive acute facilities compared to hospital based group which negatively impacts cost effectiveness of home-based rehabilitation.
- Stroke unit care
    - Moodie et al. (2006) report the costs of stroke unit care are 26% more than conventional in-hospital care.
    - Patel et al. (2004) identify stroke unit care as the most expensive of the three interventions evaluated in their study.
- Stroke services
    - Claesson et al. (2000) find that integrated stroke services result in a non-significant cost savings of 11% after the first year compared to usual care.
    - Fjaertoft et al. (2005) observe a similar cost reduction of 13%.
    - The Van Exel et al. (2005) is examined within this systematic review – study 2)

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[14] Remaining studies did not report on cost effectiveness

Resources used

- Early – supported discharge
    - Anderson et al. (2000) include direct and indirect costs of health care, rehabilitation, patients and informal care giver.
    - Beech et al. (1999) includes patient utilisations of health and social services along with hospital costs.
    - Hui et al. (1995) include use of acute and rehabilitation beds, and number of days of geriatric day – hospital attendance and outpatient clinic visits.
    - McNamee et al. (1998) include health services, social services, rehabilitation costs and travel time per visit.
    - Teng et al. (2003) include acute care costs, home intervention costs, usual care costs, readmission costs, and physician costs.
    - Van Koch et al. (2000) include inpatient hospital care, outpatient health care, use of health-related services and cost of health care
- Home – based rehabilitation
    - Andersson et al. (2002) include acute care, hospital and home – based rehabilitation costs, home help services and nursing home costs.
    - Gladman et al. (1994) include costs associated with the domiciliary team, day hospital and outpatient attendances, professional costs, as well as the cost of medications and lab services; indirect costs including pension, worker’s compensation, employment insurance and private insurance.
    - Markle-Reid et al. (2011) include the costs associated with primary care, emergency departments, hospital days, health and social costs.
    - Roderick et al. (2001) include health service and social service costs including transport costs.
- Stoke uUnit care
    - Moodie et al. (2006) report health sector resource use including pre- and post- hospital use.
    - Patel et al. (2004) report health care, social services and informal care costs.
- Stroke services
    - Claesson et al. (2000) report hospitalisation costs, and other costs associated with institutionalised living, outpatient care, different kinds of support, and informal care givers.
    - Fjaertoft et al. (2005) include costs associated with the use of health services and hospital expenses.
    - The Van Exel et al. (2005) paper is examined within this systematic review – study 2).

Implementation costs – not considered.

Overview of Mixed Effects Regression

8. **Reich et al. (2012)**, in a mixed effects regression analysis, examine the efficiency effects in integrated care models (ICM) compared to the basic compulsory insurance scheme in Switzerland. Reich et al. (2012) hypothesise that by vertically integrating health insurance and health care provision, could improve the allocation of resources while limiting health care expenditure. This study looks at three categories of contracted ICM (a capitation model (CAP), a family doctor model (FDM) and a telemedicine doctor (TEL)) and compares them to the basic insurance plan. They analyse cost as a function of the type of health plan (i.e. integrated or not) and other variables based on data from 399,274 Swiss residents that had compulsory health insurance with the Helsana Group, covering the years 2006–2009.

Summary point

Reich et al. (2012) conclude that integrated care models have the potential to improve care for patients with chronic diseases whilst also having a positive impact on health care

Cost effectiveness –not considered

Cost impact

- The analyses reveal that the cost ratios of all integrated care models are lower than in the sample covering the basic compulsory insurance model. The total effect of cost savings per model compared to the basic insurance scheme is –29.7% for the CAP, –21.1% for the FDM and –22.5% for TEL.
- Empirical analyses show that the different insurance plans vary, revealing the following efficiency gains per model: the CAP model attains 21.2% in comparison to the basic insurance scheme, the FDM and TEL models show a lower cost saving of 15.5% and 3.7% respectively. The remaining 8.5%, 5.6% and 22.5%, respectively, of the variation in total health care expenditure is attributed to the effects of selection.

Resources used

- Cost ratio of total costs per person is a function of: hospital stay, nursing home stay, type of plan (CAP/FDM/TEL and basic plan), accident coverage, the preceding years cost ratio, claims billed over 500 Swiss francs per quarter and deductibles higher than 500 Swiss francs.

Implementation costs – not considered.

Grey Literature Search Results

From the review of title/abstract in the grey literature one paper (Cramm et al. 2012) was for inclusion. In addition, 20 references were yielded from a check of all references from relevant studies against the inclusion criteria, none of the studies adhered to both economic and clinical inclusion criteria.

Study results

Cramm et al. 2012, follow eight cardiovascular disease management programmes during the early stages of implementation in various Dutch regions. They examine the processes and challenges of developing and implementing cardiovascular disease management programmes in the Netherlands.

The study concludes that implementing cardiovascular disease management programmes is time-consuming and challenging as they require complex changes in routine care. Furthermore, as care pathways become more complex, they also become more costly. In the case of cardiovascular disease management programmes, they find that costs are mainly attributable to delays in implementation.

Summary points

Cramm et al. (2012) highlight that labour costs account for more than two thirds of disease management programme costs. They also identify the main factors that contribute to the variations in the development costs as:

- Duration of the development phase
- No. of professionals involved

The authors suggest that improved readiness, incremental implementation plans, and training might lessen the implementation period and, thus reduce costs.

Cost effectiveness – not reported.

Cost impact – direct costs of health care utilisation

- The mean total health care costs are €350 per patient (range: €252 to €628 per patient).
- The mean health care professional costs are €258 when averaged over all patients and €305 when averaged over the patients who contacted at least one health care professional during the last 3 months (85% of all patients).
- Mean hospitalisation costs are €855 averaged over all patients and €7,399 per patient who had at least one hospital admission (1% of all patients).
- The mean pharmaceutical costs are €31 per patient and €37 per patient who reported medication use (95% of all patients).

Implementation costs

- Development costs for each disease management programme are estimated by including costs such as capital costs, labour costs, training costs, material costs, maintenance costs of equipment and technology.
- The implementation costs that occur after the start of providing disease management interventions to the patients are not included in this analysis.
- The study finds that total development costs of the eight disease management programmes vary considerably (from €26,800 to €274, 800).
    - Two important factors contributing to the variation in costs are the duration of the development phase (longer duration is associated with higher costs) and the number of professionals involved in programme development. In all the programmes, labour accounts for more than two thirds of total costs. The study also notes that information and communications technology did not contribute substantially to the total development costs.

Discussion

Studies included in the systematic review for the economics arm of the study vary across four chronic conditions (stroke, COPD, diabetes and cardiovascular disease) from the Netherlands, USA, Australia, Italy, Switzerland and the UK. Six of the economic evaluations (Baeten et al. 2010; Van Exel et al. 2005; McRae et al. 2008; Giorda et al. 2014; Delate et al. 2010 & Roberts et al. 2010) and the systematic review (Tummers et al. 2012), compare integrated models of care to usual or conventional care. Another study examines the efficiency gains of different types of integrated models (Reich et al. 2011). Lastly, the paper yielded from the grey literature search (Cramm et al. 2012) evaluates eight different types of disease management (DM) programmes.
Despite the variations in the studies included in this review, the results appear somewhat consistent in the areas of cost effectiveness, cost impact and resources involved.

Summary points

- 7 out of 9 studies compare integrated care models to usual care.
- 1 out of 9 studies analyses the efficiency gains of different types of integrated care models.
- 1 out of 9 studies evaluates different types of DM programmes.

Cost Effectiveness

As cited in Cramm et al. (2012), Coleman et al. (2009) suggest that evidence of cost effectiveness of chronic care models is only beginning to emerge. So it is not surprising that there are only three full economic evaluations included in this systematic review, of which two are in the area of stroke (Baeten et al. 2010 & Van Exel et al. 2005) and the third is an evaluation of type 2 diabetes (McRae et al. 2008). The two stroke studies compare integrated stroke services with usual care and find that the integrated service has lower costs and delivers greater health benefits, thus dominating usual care in the Netherlands. However, it is worth noting that this finding was only for one of the three regions in the Van Exel et al (2005) study, who finds that existing infrastructure and systems influence costs and health outcomes and therefore the cost effectiveness of integrated models of care. Similarly, McRae et al. (2008) in Australia observe that integrated models of care generate cost savings for additional expected life years for the type 2 diabetes population.

While the three remaining evaluations are partial economic evaluations (cost analyses) they also report on health outcomes but do not estimate cost effectiveness ratios. Giorda et al. (2014) find that the “structured care model” for type 2 diabetes does not incur excess costs and boasts less all-cause mortality and hospitalisations compared to the less structured models in Italy. Delate et al. (2010) examining the impact of collaborative cardiac care services (CCCS) compared to No CCCS in the USA find that CCCS is associated with reduced health care expenditures and improved health outcomes. Roberts et al. (2010) evaluating an integrated services model for COPD in UK, find a reduction in admissions and improvement in rehabilitation completion rates with the model.

A systematic review of integrated care for stroke is included in this analysis (Tummers et al. 2012). The review finds that early supported discharge reduce costs; home based rehabilitation achieves better health outcomes but is unlikely to lead to cost-savings; stroke units are more expensive but result in better health outcomes and integrated services report a cost reduction against similar or better health effects.

Reich et al. (2012), using a mixed effects analysis, investigate the efficiency effects in integrated care models compared to the basic compulsory insurance scheme in Switzerland. The study concludes that integrated care models have the potential to improve care for patients with chronic diseases whilst simultaneously having a positive impact on health care expenditures.

From the grey literature, Cramm et al. (2012) indicate in the Netherlands (Vrijhoef et al 2001; Jaarsma et al. 2008; Steuten et al. 2006, & Cramm et al. 2012) that cost effectiveness results vary across health care setting, disease and target groups (Coleman et al. 2009; Pearson et al. 2005, & Tsai et al. 2005).

Cost Impact

Five of the studies which compare an integrated care system to usual or conventional care find that integrated care models reduce costs. The main cost driver is hospitalisations and it is the reductions in admissions (inpatient and outpatient) which contribute to reduced costs across the interventions considered (these are explicitly detailed in five studies: Baeten et al.(2010); Van Exel et al. (2005); Giorda et al. (2014); Delate et al. (2010); and Roberts et al. (2010).

This is contrast to the conclusions of the systematic review of 15 studies which find thattwo of the four integrated care arrangements they examined (early – supported discharge; home – based rehabilitation; stroke units and stroke services) indicate that integrated stroke services are likely to be more expensive and/or not lead to cost savings. The review finds that home based rehabilitation achieves better health outcomes but is unlikely to lead to cost-savings and stroke units are more expensive but result in better health outcomes. There are a number of potential explanations for this contrast in findings.

Firstly, the systematic literature review performed for this study yielded two economic evaluations in the area of stroke, both of which are for the Netherlands where existing infrastructure and systems may contribute to ease of implementation of integrated services. This is also acknowledged by Van Exel et al. (2005), where they find integrated services cost effective in only one of the three regions examined.

Secondly, the economic evaluations (full and partial) included in this review exclude programme costs. Only Van Exel et al. (2005) refer to implementation costs but they exclude them from the calculation of cost effectiveness as they are not deemed relevant in the longer term. In addition, McRae et al. (2008) indicate that despite the estimated improvement in health outcomes and reduced hospital costs, they estimate an increase in the overall net programme costs.

Thirdly, five out of the eight studies examined in this review consider cost effectiveness or effectiveness of integrated care models for a period of less than five years (Van Exel et al. 2005; Giorda et al. 2014; Delate et al. 2010; Roberts et al. 2010 & Reich et al. 2011). Two studies have a time frame of one year or less (Van Exel et al. 2005; Roberts et al. 2010). Only two studies estimate cost effectiveness over the patient's life time (Baeten et al. 2010) or 40 years (McRae et al. 2008) inputting short term data into models to predict costs and outcomes. It is important to note that the studies considering the short term cost effectiveness of integrated care programmes may not have taken maintenance or upgrade costs into account.

Summary point

The main cost driver is hospitalisations and it is the reductions in admissions (inpatient and outpatient) which contribute to reduced costs across the interventions considered

Resources Involved

Amongst the six economic evaluations (three full economic evaluations and three partial economic evaluations) and regression analysis, four include direct medical costs (Baeten et al. 2010; McRae et al. 2008; Giorda et al. 2014; Delate et al. 2010), two include direct medical costs incurred in hospital along with rehabilitation and home adaptation/nursing home costs (Van Exel et al. 2005; Reich et al. 2011) and one study includes direct hospital costs as well as costs for information technology and education programmes (Roberts et al. 2010).

Tummers et al. (2012) in their systematic review, report that included costs vary across the 15 studies: health care costs only (1 study – Fjaertoft et al. 2005); direct hospital, post discharge (including rehabilitation) and/or primary care costs (11 studies – Andersson et al. 2000; Hui et al. 1995; McNamee et al. 1998; van Koch et al. 2000; Anderson et al. 2002; Gladman et al. 1994; Markle-Reid et al. 2011; Roderick et al. 2001; Patel et al. 2004; Claesson et al. 2000; Van Exel et al. 2005) and direct and indirect costs in hospital and post discharge (3 studies – Beech et al. 1999; Teng et al. 2003 & Moodie et al. 2006). Also, Tummers et al. (2012) note that from the studies included within their systematic review, complications associated with the chronic condition and associated impact on cost and health outcomes are not considered in such short term analyses.

Implementation Costs

As previously outlined, only one of the studies included within this systematic review, identify implementation costs but exclude them from their cost effectiveness estimations. Van Exel et al. (2005) report start-up costs per region for the Netherlands at €96,000 (range €66,000-€134,000) over a 2 – 3 year implementation stage. Structure costs per patient are reported to range from €175 - €260 which represents approximately 3% of patient costs. Cramm et al. (2012) identify that the main cost drivers are personnel costs which are influenced by the length of the development period and the number of disciplines involved during the development phase.

Economic Implications of Evidence for Ireland:

The studies included in this systematic review vary in complexity, by chronic condition and model of care evaluated. While definitions of the interventions are explicitly stated for most studies, the comparators (usual or conventional care) are not comparable across studies. This is not surprising: health systems worldwide vary in terms of structure, infrastructure, culture etc. As a result of this, along with the ‘polymorphous nature’ (Nolte & Pitchforth 2014, p. 36) of models of care themselves and other factors discussed below, the positive cost effectiveness findings presented above need to be interpreted and considered with caution.

Only one study within this review discusses implementation costs, thus it is difficult to measure or gauge the level of investment and structural reform required to implement integrated models of care. Tummers et al. (2012) indicate that '*the devil is in the details'* (p. 12) that is to say context, culture and infrastructure all play an integral role in the success or failure of an integrated model. This very point is also highlighted in the Van Exel et al. (2005) study which reveals that amongst the three regions examined, integrated stroke services are found to be cost effective in only one jurisdiction. Consequently, a review of infrastructural and system reform and investment should be considered in order to determine the cost effectiveness of implementing such models in an Irish setting.

By their very nature, integrated models require sharing of activity and cost data across inpatient and outpatient hospital settings and community thus ICT systems will need to be linked and shared for the models to operate efficiently and effectively. While such systems in themselves may not present a significant budgetary impact, the time taken to develop and implement them (including training) may increase implementation costs (as for Cramm et al. 2012).

Given the lack of evidence on implementation and maintenance costs included in the cost effectiveness analyses evaluated for this study, the costs of the integrated care models may be understated which may have implications for the cost effectiveness estimates. Currently, the evidence suggests that the interventions are less costly and more effective than usual or conventional care. However, should the costs increase the interventions may be more costly and more effective than usual care and a judgment would be required to evaluate if the additional benefits are worth the additional costs. The standard threshold employed, as per HIQA (2014b) is the cost effectiveness threshold which indicates that interventions with an incremental cost effectiveness ratio (ICER) greater than €45,000 / QALY are not cost effective. However, using this threshold would require the valuation of health outcomes in QALYs.

Summary points

- Paucity of full economic evaluations conducted, only three of nine studies in this review are full economic evaluations.
- Context, culture and infrastructure are important to the success or failure of an integrated model.
- Caution is needed with interpretation and generalizability of the results owing to differences in countries and system.
- For full economic evaluations, long term evidence is needed, especially on economic parameters.

Long term evidence is lacking to date and complications and associated costs and health impacts have not been considered in the majority of cost effectiveness studies on integrated models of care. Nolte & Pitchforth (2014), citing Goodwin et al. (2012), suggest that investment in research is required, in tandem with supporting the development and implementation of integrated care, to ensure that future evaluations can inform service development. This is important for Ireland moving forward. While this systematic review of the economic literature did not contain any Irish studies the clinical arm of the study references some pilot/demonstration examples which are in place. It is imperative that data collection is ongoing for such examples. While ideal, randomised trials may not be feasible in such settings, registries could be established and would be key to tracking patient outcomes, resource use etc. In addition, such Irish examples should be examined to identify implementation requirements and necessary investment for application in a broader context.

Finally, the majority of the economic evaluations examined in this systematic review are from the health care provider/national health service perspective which is in accordance with HIQA (2014b) guidelines on economic evaluations. However, given the complex nature of integrated care, particularly for chronic conditions, perhaps a broader perspective would be more suitable (as advocated by Nolte & Pitchforth 2014). In an Irish setting this could consider hospital and community health costs as well as patient costs.

Chapter 6

Summary, Conclusions and Recommendations

Introduction

This closing chapter of the review offers a summary of key messages, conclusions, and recommendations.

Key Messages

Health Service Reform

- The implementation of ICPs and generic models of care for chronic disease prevention and management has become a core feature of health service reform in countries across Europe with an emphasis on serving populations
- The prevention and management of chronic diseases through integrated care and models of care is predominantly located in primary care practices supported by specialist services and health care professionals
- Specialist nurses embedded in primary care is growing across Europe and internationally
- Most evidence on reform relates to tackling single diseases, and evidence specific to developing services to address multimorbidity is sparse. The *House of Care* with an emphasis on collaborative and scheduled care planning with patients with multiple conditions is emerging in the UK.
- Most evidence relates to disease management and secondary prevention. Further studies are required on the implementation of integrated care programmes or generic models of care for primary prevention of chronic disease or with a primary emphasis on promoting health and wellbeing.

Integrated Care Programmes

- The most common approach to ICPs has been at clinical level (i.e. patient care coordination across various professional and organisational boundaries).
  ICPs at professional level (i.e. shared competences, roles, responsibilities and accountability) were less common. ICPs identified as least common were at organisational (i.e. interorganisational relationships, shared governance) and systems (i.e. targeting whole population) levels.

- The most common components of ICPs are: nurse led/specialist care in primary care; shared or centralised information systems; and shared clinical decision support tools (e.g. guidelines).

- The range of outcomes most commonly assessed include patient outcomes (changes in clinical status, quality of life and satisfaction with care); process outcomes (health monitoring), and service outcomes (hospital admissions/readmissions, ED visits and length of hospital stay).
- Overall, integrated care interventions positively impact on most or all patient process and service outcomes.
- The type of programme ranking highest for positive impact on all or most individual outcomes is planned and shared care co-ordination between primary and secondary care.
- The most common approach to evaluating the impact of integrated care is through RCTs with short follow up timeframes and little attempt to compare programmes. Little is known about their longterm effectiveness.
- For national clinical programmes in European countries, small scale pilot projects are common with a goal of scaling up to whole populations. A mixed methods approach to evaluating these programmes is common.
- The barriers and enablers to implementing programmes mostly centre around education and training of HCPs including preparation for new roles, MDT relationships across sectors, infrastructure of clinical information systems, collective leadership and shared vision.

Generic Models of Care

- The term ‘generic’ model of care is seldom cited in the literature apart from some reports on national strategies and approaches to disease management. There is a preference for generic models over disease specific models so that a range of chronic diseases can be addressed in national programmes including multiple diseases in the same individuals
- The most common generic models of care reported in the literature are the chronic care model and disease management programmes.
- Disease management programmes are most common in national clinical programmes in Europe which involve structured, proactive approaches to chronic care including a division of tasks across primary and secondary care. The programmes have a strong emphasis on strengthening primary care, strengthening ambulatory care, and strengthening the role of nursing in primary care.
- Specialist nursing in primary care is a critical success factor in the implementation of generic models of care/disease management programmes. The role involves: patient self-management support through scheduled face to face contact and follow up telephone calls; prioritising high risk and complex cases; acting as specialist resource, and providing education and support for primary care teams.
- The most common approach to evaluating generic models of care has been through RCTs and the same limitations apply. A mixed methods approach to

evaluating these models is common for national clinical programmes in Europe as part of the phasing in and piloting of disease management programmes within the move to integrated care services.

- The barriers and enablers to implementing programmes mostly centre around education and training of HCPs, time demands, infrastructure and integration of clinical information systems including support to use technology, leadership and team effectiveness as well as availability of local champions.

Economic Evidence

- The economic evidence shows that the existing health infrastructure and systems within a country influence the health outcomes and cost effectiveness of the implementation of integrated care programmes, the Netherlands cited as a successful case exemplar.
- The main cost driver is admission to hospital and it is reductions in admissions (inpatient and outpatient) which contributed to reduced costs across the interventions considered.

Conclusions

A well-designed generic model of chronic disease prevention and management within an integrated care approach to service delivery can lead to positive clinical, process and service utilisation outcomes. The economic benefits relate to reduced costs associated with reductions in hospital admissions (inpatient and outpatient

The health service reform for Ireland set out in *Future Health* is consistent with reforms already underway and progressed across Europe with a notable shift in CDM from hospital-centric services and care to integrated services led by primary care. Similar to the current situation in Ireland, national clinical programmes for CDM in other countries predominately target single diseases. To date, there is little evidence of programmes for managing multimorbidity. Future evaluations of the programmes such as the *House of Care* in the UK may offer some additional insights on how best to integrate services and design a generic model of care to tackle the problem and complexity of multi-morbidity.

However, it is clear from the evidence in this review that case management and risk stratification are critical to managing complexity in patients at high risk of complications. Intensive and proactive follow up of these high risk patients are needed rather than targeting the overall population of patients with low frequency of contact.

The role of specialist nurses in primary care is key to the case management of high risk patients.

In Ireland's national policy, chronic disease prevention is a priority as articulated in *Future Health* and *Healthy Ireland* frameworks. In 2012, the Prevention for Chronic Diseases Programme was established. Work has already been done on mapping the burden of chronic disease and known risk factors as well as the impact of those risk factors on people's health (Jennings 2014). Our review is limited however in terms of the available evidence supporting this programme. Compared to the emphasis on managing chronic diseases, there is little published evidence from other countries on national programmes relating to chronic disease prevention, particularly, primary prevention.

The evidence from our review is supportive of recommendations made in a recently published series of Irish surveys in chronic disease management (Darker et al. 2011, 2014a,b,c; 2015). To recall from Chapter 1, these recommendations are:

- care integration in CDM is best located in general practice
- general practice should be strengthened as the hub for CDM with spokes of speciality care feeding in
- a well resourced integrated clinical information systems within and across services needs to be put in place with particular attention to deficits in the hospital sector
- regional models for shared care between primary and secondary care services need to be developed
- practice nurses are ideally suited for CCM
- more practice nurses need to be recruited and trained in CDM

Our evidence builds on these recommendations, all of which are outlined below. One area of expansion specific to recommendations made by Darker and colleagues relates to the role of nursing. Darker et al. (2014a) called for an increase in the number of practice nurses in primary care and that these nurses are ideally suited for CDM. Our evidence is supportive but emphasises the role of practice nurses as generalists working with low risk patients with chronic illnesses. Our conclusion is that:

The evidence provides a strong case for strengthening the presence of specialist nurses in primary care working across clusters of practices and with a link into secondary care specialists.

Increasing clinical nurse specialist roles in primary care in Ireland will mark a significant shift away from the predominant hospital-centric and outreach services currently in place to support CDM. In presenting the recommendations below from this review, the specific details of the role of clinical nurse specialists are outlined.

Recommendations for Policy Makers and Clinicians

Our recommendations are intended to be pragmatic and supportive to policy makers and clinicians directly involved in chronic disease prevention and management. The recommendations are categorised into:

- Primary care led services
- Clinical care
- Economic implications
-

Primary Care Services

1. The principal point of care for chronic disease prevention and management needs to be located in primary care supported by specialist health care professionals and secondary care specialist services; the evidence supports the employment of disease specific specialist nurses situated in primary care with a link into the secondary care specialist services (see Recommendation 4).

2. Shift from 'individual patient' care to include a population based philosophy and approach to chronic disease prevention and management with an added emphasis on primary and secondary prevention for health and wellbeing in keeping with the vision for the '*Healthy Ireland'* strategy (Department of Health 2013). Population based philosophy and approach emphasises groups of people e.g. individuals with diabetes, COPD or multimorbidity.

3. Identification of high-risk population groups using risk stratification techniques followed with implementation of targeted interventions.

4. Strengthen the role of nursing in disease-specific prevention and management by increasing the number of specialist nurses working across clusters of primary care practices and who will support integrated care between primary care and secondary care specialist services.

5. Health service reform towards primary care is best implemented using a phased and pilot approach with a longer goal of scaling up to larger populations and to national level. Evaluation of programmes needs to be built into implementation using mixed methods. Careful selection of primary outcomes is needed with consideration to those identified by the Core Outcome Measures in Effectiveness Trials (COMET) Initiative.[15]

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[15] The COMET Initiative aims to develop agreed standardised sets of outcomes, known as a 'core outcome set.' These sets should represent the minimum that should be measured and reported in all clinical trials, audits of practice or other forms of research for a specific condition. They do not imply that outcomes in a particular study should be restricted to those in the core outcome set. Rather, there is an expectation that the core outcomes will be collected and reported to allow the results of trials and other studies to be compared, contrasted and combined as appropriate; and that researchers will continue to collect and explore other outcomes as well. More information from: http://www.comet-initiative.org/.

Clinical Care Delivery

6. Clinical care delivery in primary care needs to be implemented with the ‘critical ingredients’ for successful integrated services and models of care:
    - specialist nurses (disease specific)
    - shared and centralised information systems
    - shared clinical decision support tools

7. Move towards a strong presence of clinical nurse specialists in the community working across a cluster of primary care practices including:
    - scheduled visits and consultations with patients in GP practices
    - providing self-management education and support for a select group of high risk patients (as identified by the GP) in line with risk stratification guidelines
    - structured telephonic support for patients
    - acting as a specialist resource in educating and supporting GPs, practice nurses (as generalists) on disease specific aspects of care,
    - supporting practice redesign (e.g. implementation of guidelines, auditing)
    - coordinating role between primary and secondary care specialist services.

8. Shared and centralised information systems are needed with consideration to:
    - adequate infrastructure and support for information systems shared across and within services i.e. primary care and hospital sector
    - addressing the current deficiencies in Ireland with the hospital sector in particular known to be more inadequate and fragmented than primary care services
    - priority areas identified in the eHealth strategy applicable to evidence from our review i.e. online referrals and scheduling, patient summary records and open access to health information.
    - additional areas identified from this review i.e. electronic patient records, disease registries, patient registries, and electronic access to decision support tools such as guidelines
    - ensuring easy and secure internet access across services
    - competence based education and training of health care professionals in eHealth
    - adequate infrastructure and support for information systems shared with patients e.g. tele-monitoring.

9. Self-care and self-management support is crucial – patients should be actively involved in the development and implementation of their individualised care

plans. Self-management needs to be promoted across systems to empower patients, and ensure the provision of patient-centred individualised care.

10. Implement standardised clinical decision making tools across primary care services and across primary care and secondary care services. These include but are not limited to clinical guidelines, protocols, regulatory standards of care, and e-prescribing. Consideration needs to be given to:
    - empowering patients to engage in decision making regarding their own health
    - person centred, tailored and individualised care plans
    - addressing the complexity of chronic disease management for individuals with multiple conditions i.e. multimorbidity
    - optimising the potential of networks so that the multidisciplinary team
    - members can work and learn together.
    - the evidence base

Economic Implications

11. Longitudinal full economic evaluations (i.e. over a longer term e.g. 5 years) should be planned to run concurrently with the implementation of integrated models of care whilst being cognisant of set up costs (the level of investment and structural reform required for implementation) and ongoing maintenance costs (e.g. patient, community and hospital costs).

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APPENDICES

Appendix 1: CINAHL Search Strategy Clinical Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.
Given two distinct clinical components to this review, (i.e. Models of Care and Integrated Care Programmes) in relation chronic disease prevention and management, search strings were developed within the following broad groupings

CHRONIC DISEASES SEARCH STRING
CHRONIC DISEASE PREVENTION AND MANAGEMENT
MODELS OF CARE
INTEGRATED CARE

The search combinations were as follows:
A AND B AND C for papers on *Models of Care*
A AND B AND D for *Integrated Care Programmes*
Limits Applied = 1st Jan 2005 – Mar 31 2015 & English Language; Peer Reviewed
PT and publication terms applied at the end for (A and B AND C) and (A AND B AND D)

GROUP A: CHRONIC DISEASES SEARCH STRING

Chronic Disease Terms

1. chronic* or long-term or "long term" or longterm ti/ab
2. disease* or ill* or condition or conditions or disorder* ti/ab
3. chronic* or comorbid or co-morbid* or multimorbid* or multi-morbid* ti/ab
4. "Chronic Disease" MH
5. S1 and S2
6. S3 or S4 or S5 (n=164,667)

Respiratory Disease Terms

7. respiratory or pulmonary or lung or airway ti
8. disease* or illness* or condition* or disorder* or co-morbid* or comorbid* or "multiple morbid*" or multimorbid* or multi-morbid* ti/ab
9. COPD or asthma ti
10. "Asthma" MH
11. "Lung Diseases" MH
12. "Pulmonary Disease, Chronic Obstructive" MH
13. S7 and S8
14. **S9 or S10 or S11 or S12 or S13 (n=55,049)**

Cardiovascular

15. cardiovascular or cardiac or "heart failure" or coronary or cerebrovascular or arteriosclerosis or angina or hypertens* or stroke ti
16. Angina, Stable" or "Angina, Unstable" MH
17. "Cardiovascular Diseases" MH
18. "Coronary Arteriosclerosis" MH
19. "Hypertension" MH
20. "Heart Failure" MH
21. "Stroke" MH
22. **S15 OR S16 OR S17 OR S18 OR S19 OR S20 or S21 (n=208,890)**

Diabetes

23. diabetes or "glycemic control" or "glycaemic control" ti
24. "Diabetes Mellitus" or "Diabetes Mellitus, Type 1" or "Diabetes Mellitus, Type 2" MH or "Glycemic Control"
25. **S23 or S24** (n = 99,610)

Musculoskeletal

26. arthritis or musculoskeletal or musculo-skeletal or osteoarthritis ti
27. "Musculoskeletal Diseases" MH
28. S26 or S27 (n=33,108)

Combined Search

29. **S6 OR S14 OR S22 OR S25 OR S28** N = 503,489
30. **Limits applied** **N = 299,788**

GROUP B: CHRONIC DISEASE PREVENTION AND/OR MANAGEMENT

31. prevent* or "primary care" or "public health" ti/ab
32. screen* ti
33. "Preventive Health Services" MH
34. S31 OR S32 OR S33 (n=172,829)
35. manag* N3 (care or case or disease* or chronic* or self or comprehensive or shared) ti /ab
36. care N3 (disease* or chronic* or self* or comprehensive or shared) ti/ab
37. rehabilitat* ti/ab
38. "Disease Management" MH
39. "Case Management" MH
40. S35 OR S36 OR S37 OR S38 or S39 (n = 133,451)
41. S34 or S40 (n = 301,817)
42. **Limits applied** (N=212,509)

Combined Search GROUP A AND B

43. S30 and S42 (n=52,647)

GROUP C: Models of Care

44. model or models or program* or tool* or intervention* or framework* or pathway* or policy or policies ti (Limits applied) (n= 487,846)

Group (A AND B) AND Group C

45. S43 AND S44 (n= 24,663)

GROUP D: Integrated Care

46. integrated ti/ab
47. "Delivery of Health Care, Integrated" MH
48. **S46 or S47** (n=23,023)

Group (A AND B) AND Group D

49. S43 AND S48 (n=1,191)

Final search output was limited to Publication Type (PT) and to a combined search with publication related terms as follows:

50. meta-analysis or "randomized controlled trial" or "systematic review" PT
51. **"**systematic review" or "systematic literature review" or "randomized controlled trial" or "randomised controlled trial" or "meta analysis" or meta-analysis or "meta review" or meta-review" or "meta synthesis" or meta-synthesis ti/ab
52. S50 or S51 (n=82,101)

Final Combined Search

Models of Care	**Integrated Care Programmes**
Chronic Diseases AND Prevention-Management AND Models of Care	**Chronic Diseases AND Prevention-Management AND Integrated Care**
i.e Groups (A AND B) AND C	**i.e Groups (A AND B) AND D**
Combined with PT limit and publication terms (S52)	**Combined with PT limit and publication terms (S52)**
= (n=2960)	**= (n=94)**
SEARCHES COMBINED FOR SCREENING = n=2,981	

Appendix 2: MEDLINE Search Strategy Clinical Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.
Given two distinct clinical components to this review, (i.e. Models of Care and Integrated Care Programmes) in relation chronic disease prevention and management, search strings were developed within the following broad groupings

CHRONIC DISEASES SEARCH STRING
CHRONIC DISEASE PREVENTION AND MANAGEMENT
MODELS OF CARE
INTEGRATED CARE

The search combinations were as follows:

A AND B AND C for papers on *Models of Care*
A AND B AND D for *Integrated Care Programmes*
Limits Applied = 1st Jan 2005 – Mar 31 2015 & English Language; Peer Reviewed

PT and publication terms applied at the end for (A and B AND C) and (A AND B AND D)

GROUP A: CHRONIC DISEASES SEARCH STRING

Chronic Disease Terms

1. chronic* or long-term or “long term” or longterm ti/ab
2. disease* or ill* or condition or conditions or disorder* ti/ab
3. chronic* or comorbid or co-morbid* or multimorbid* or multi-morbid* ti/ab
4. “Chronic Disease” MH
5. S1 and S2
6. **S3 or S4 or S5** (n=480,210)

Respiratory Disease Terms

7. respiratory or pulmonary or lung or airway ti
8. disease* or illness* or condition* or disorder* or co-morbid* or comorbid* or “multiple morbid*” or multimorbid* or multi-morbid* ti/ab
9. COPD or asthma ti
10. “Asthma” MH
11. “Lung Diseases” MH
12. “Pulmonary Disease, Chronic Obstructive” MH
13. Pulmonary Emphysema“ MH
14. S7 and S8
15. **S9 or S10 or S11 or S12 or S13 or S14** (n=71,640)

Cardiovascular

16. cardiovascular or cardiac or “heart failure” or coronary or cerebrovascular or arteriosclerosis or angina or hypertens* or stroke ti
17. Angina, Stable" or "Angina, Unstable" MH
18. “Cardiovascular Diseases” MH
19. "Coronary Artery Disease" MH
20. "Hypertension" MH
21. "Heart Failure" MH
22. “Stroke” MH
23. **S16 OR S17 OR S18 OR S19 OR S20 or S21 or S22** (n=326,211)

Diabetes

24. diabetes or “glycemic control” or “glycaemic control” ti
25. “Diabetes Mellitus” or "Diabetes Mellitus, Type 1" or "Diabetes Mellitus, Type 2" MH
26. **S24 or S25** (n =109,967)

Musculoskeletal

27. arthritis or musculoskeletal or musculo-skeletal or osteoarthritis ti
28. "Musculoskeletal Diseases" MH
29. S27 or S28 **(n=44,348)**

Combined Search

30. **S6 or S15 or S23 or S26 or S29**
31. **Limits applied** **N = 926,589**

GROUP B: CHRONIC DISEASE PREVENTION AND/OR MANAGEMENT

32. prevent* or "primary care" or "public health" ti/ab
33. screen* ti
34. "Preventive Health Services" MH
35. S32 OR S33 or S34 **(n=607,079)**
36. manag* N3 (care or case or disease* or chronic* or self or comprehensive or shared) ti /ab
37. care N3 (disease* or chronic* or self* or comprehensive or shared) ti/ab
38. rehabilitat* ti/ab
39. "Disease Management" MH
40. "Case Management" MH
41. S36 OR S37 OR S38 or S39 (n =128,535)
42. S35 or S41 **(n = 712,816)**

Combined Search GROUP A AND B

43. S31 and S42 (n=151,198)

GROUP C: MODELS OF CARE

44. model or models or program* or tool* or intervention* or framework* or pathway* or policy or policies ti (Limits applied) (n= 412,629)

GROUP (A AND B) AND GROUP C

45. S43 AND S44 (n= 14,541)

GROUP D: Integrated Care Programme

46. integrated ti/ab
47. "Delivery of Health Care, Integrated" MH
48. **S46 or S47** (n=87,120)

GROUP (A AND B) AND GROUP D

49. S43 AND S48 (n=2,888)

Final search output was limited to Publication Type (PT) and to a combined search with publication related terms as follows:

50. meta-analysis or "randomized controlled trial" PT
51. "systematic review" or "systematic literature review" or "randomized controlled trial" or "randomised controlled trial" or "meta analysis" or meta-analysis or "meta review" or meta-review" or "meta synthesis" or meta-synthesis ti/ab
52. S50 or S51 (n=257,534)

Final Combined Search

Models of Care	**Integrated Care**
Chronic Diseases AND Prevention-Management AND Models of Care i.e Groups (A AND B) AND C	Chronic Diseases AND Prevention-Management AND Integrated Care
	i.e Groups (A AND B) AND D
Combined with PT limit and publication terms	Combined with PT limit and publication terms
n= 2,560	n=288
SEARCHES COMBINED FOR SCREENING N=2,742	

Appendix 3: Cochrane Library Search

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

Includes: Cochrane Reviews, Other Reviews (DARE), Trials (CENTRAL) Technological Assessments (Health Technology Assessment Database)
Publication date & language limitations

Search Terms & combinations	No. of hits	Retrieved for screening
"Integrated care" AND the following terms (in title/abstract or keyword)		
chronic*	49	9
"long term"	24	2
MeSH descriptor		
Delivery of Health Care, Integrated	270	25
"Chronic disease" AND the following terms (in title/abstract or keyword)		
"model of care"	25	3
TOTAL	Duplicates removed	28

Appendix 4 Grey Literature Search Strategy

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

Source & Link & location if applicable	Search terms (No. of hits)	Retrieved for screening
Open Grey http://www.opengrey.eu/search/ in Subject: Biological & Medical Sciences	Integrated (care"(6)/services (2)/health (3) "Chronic disease" and management (24)/ prevention (7)/model (15)/program (5); "Chronic illness" and management (n=6)/ prevention (n=0)/model (9)/program (1)	2 3
in Subject: Humanities, psychology & Social Sciences subcategory Health services, health administration, community care services Publication dates & language restrictions not applied.	Integrated (care"(0)/services (106)/health (106) "Chronic disease" and management (4)/ prevention (0)/model (2)/programme (0); "Chronic illness" and management (4)/ prevention (0)/model (0)/program (0	8 0
Grey Literature Report http://www.greylit.org/ published by New York Academy of Medicine http://www.nyam.org/ Limited to 2005-2015 and categories of Health policy,, policy making, delivery of health care, health care reform, health promotion, health care reform, program evaluation.	Integrated (care"(25)/services (10)/health (18)) "Chronic disease" and management (133)/ prevention (33)/model (26)/program (72); "Chronic illness" and management (25)/ prevention (22)/model ()/program (19)	9 35
WHO http://www.who.int/en/ within Publications Limited to title search & English language.	Integrated (care"(14)/services (7)/health (18)) "Chronic disease" and management (4)/ prevention (11)/model (0)/programme (1); "Chronic illness" and management (0)/ prevention (0)/model (0)/program (0)	4 6
AHQR The Agency for Healthcare Research and Quality http://www.ahrq.gov/research/findings/index.html# Limited to title search & English language .	Integrated (care"(24)/services (4)/ health (13)) "Chronic disease" and management (32/ prevention (8)/model (2)/program (7); "Chronic illness" and management (10)/ prevention (0)/model (0)/program (1)	7

The Kings Fund www.kingsfund.org.uk Filters as applicable applied e.g. NHS reform, integrated care, service redesign social care, primary & community care . Kings Fund Publications search also applied using topic “Integrated Care”	“Integrated care” (58) and “chronic disease” (28) Integrated Care (topic in publications) (63)	11 7
Lenus, the Irish Health Repository	Chronic disease/integrated care (550)	25

Appendix 5: ICP Data Extraction Disease Specific

Authors, Date, Country **Type of evidence (dates of evidence if synthesis papers & countries represented if reported)**	**Aim**	**Q.1. Definition(s) of IC** **Q.2. Description of IC**	**Q.3.Features/Components of IC** **Q4. Shared/Different features/components if applicable (i.e. more than one IC reported** **Q5. Chronic Disease(s) Context**	**Q.6 & 7. Outcomes assessed & Effects/Impact on outcomes** Findings presented as IG vs CG/FUP unless otherwise stated. S = statistically significant NS = not statistically significant. NR=not reported **Q. 8. Features/components of ICP associated with improved results**	**Q.9. Evaluation of ICP** (Intervention Group = IG; Control Group = CG; Follow up = FUP). **Q.10. Implementation Barriers** **Q.11. Implementation Enablers**	**Researcher Comments &/or UCC Authors' comments .**
MULTIPLE CHRONIC CONDITIONS (i.e. Multiple/single diseases addressed in papers)						
Martinez-Gonzalez et al. (2014) Switzerland Meta-Review (n= 27 SRs of which 18 were Meta-analysis) 1946-2012	"To review systematic reviews and meta-analyses of integrated care programmes in chronically ill patients, with a focus on methodological quality, elements of integration assessed and effects reported".(p.561)	**Q 1:** IC: "is an organizing principle for care delivery; integration describes the methods, processes and models to achieve such delivery of care". (p. 561 cited from Ouwens et al)[16]. **Q.2:** Multidimensional with orientation of services, type & the focus of integration. Orientation of services: (i) horizontal i.e. similar professionals/care organizations at the same level of care join together"& (ii) "vertical integration, i.e professionals/care organizations align over	**Q.3:** Comprehensive services across the care continuum (n=26), Standardized care through inter-professional teams (n=25), Performance management (n=17), Physician integration (n=15), Information systems (n=13), Organizational culture and leadership (n=5), Geographic coverage and rostering (n=1), Governance structure (n=1), Financial management of funds across services (n=0). **Q.4:** See Q.3. Most common components (> 50% of studies): Comprehensive care, Standardized care through IP teams, Patient focus, Performance management & Physician integration. Least common components	**Q.6 & 7: Note:** only (S) results were reported in paper regarding positive effects. **Patient Outcomes:** Change in clinical status (n=10**)** Improved Glycaemic control DM (n=4/7), Improved BP control(n= 1/4) Mortality Reduced for CHF(n =5/8), COPD(n=0/3) Functional status (n=12) Improved exercise/function CHF(n= 2/2) ; DM (n= 2/3), COPD (n= 2/4) Asthma (n=1/3) QOL (n=20) Improved CHF(n=4/8); DM(n=4/5); COPD (n=0/5), Asthma (n=1/2) Satisfaction with care (n=10) Increased for DM(n= 4/4), COPD (n= 2/2) Asthma(n=1/2 but not for CHF (n=0/2))	**Q.9:** Meta Review to assess quality, elements & effects of IC programmes. **CG:** Usual care (if applicable), no further detail **FUP:** NR. **Q.10:** NR. **Q.11:** NR.	**Researchers' Comments:** A total of 824 primary studies were included across the 27 papers assessed in this meta-review. Noted that 'disease management was the most frequently used term for IC. **UCC Authors Comments :** Although evidence from data on barriers and enablers was not reported, the researchers noted at the outset that the components of Integrated Care (see Q. 3) represent 10 principles of successfully integrated healthcare systems which define key areas for restructuring, organizational flexibility and adaptation to local context (cited from Suter et al)[17]

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[16] Ouwens M, Wollersheim H, Hermens R et al. Integrated care programmes for chronically ill patients: a review of systematic reviews. Int J Qual Health Care 2005 .17:141–6.

[17] Suter E, Oelke ND, Adair CE et al. Ten key principles for successful health systems integration. Healthc Q 2009:13 Spec o:16–23.

		several levels with upstream & downstream care providers. The 'type of integration' involves institutional or service integration. The focus of integration is concerned with patients with specific chronic diseases.	were organizational culture and leadership, Geographic coverage and rostering, Governance structure, & Financial management of funds across services. **Q.5:** All single diseases CHF/Heart Failure (n=12), Diabetes Mellitus ((DM (n=7) COPD (n=7), Asthma (n=5), Hypertension (n=3), Cancer (n=2) and Rheumatoid Arthritis (n=2). Other sample details NR.	**Process Outcomes:** Guideline adherence: (n=20) Increased for CHF(n=2/5); DM(4/6); COPD(n=3/3), Asthma (5/5) Health monitoring (n=3) Increase in frequency of retinal & foot examination for DM (n=3) **Service Outcomes:** Service Utilisation **(**n=20) Reduced hospital admission for CHF, DM, COPD, Asthma (n=10/18, most in CHF) Reduced readmissions for CHF, COPD (n=7/12, most in CHF), Reduced LOS for CHF (n=4/6);DM (n=2/3);COPD(n=2/5), Reduced number of ED visit, CHF(n=2/3); DM(n=1/3), COPD(n=2/3), asthma (1/2) **Resource Outcomes:** Costs (n=17): Reduced CHF(n=1/8); DM(n= 1/4); COPD(n=0/3), Asthma (n= 1/2) **Q.8:** Noted that it was unclear which components or interventions to be prioritized in integrated care programmes to maximize their benefit.		. .

Ouwens et al. (2005). Netherlands Meta-review (n= 13 Syst. Revs. of which 6 were meta-analysis). 1996-2004	“To investigate effectiveness, definitions, and components of integrated care programmes for chronically ill patients” (p.141)	**Q.1:** Integrated care (IC) is “an organizational process of coordination that seeks to achieve seamless and continuous care, tailored to the patient’s needs, and based on a holistic view of the patient” (p. 142, sourced from Mur-Veeman et al. 2003)[18] **Q.2:** Organizational/professional or patient oriented. Programmes reviewed were: Disease management (n=8), care management (n=1), case management (n=1), MDT management (n=2), disease specific e.g. diabetes (n=1). .	**Q.3:** Self-management support & education (n=11); structured clinical follow up (n=8); MDT working (n=9). Systematic, evidence-based approach to care e.g. MDT clinical pathways (n=9), specialist nurse case management (n=6), feedback, reminders & HCP education on patient care (n=3). **Q.4:** See Q3- Most common features (> 50% of programmes): Self-management support; patient education; structured clinical follow up; MDT; Systematic, evidence-based approaches to care. Different/Least common feature: Feedback, reminders, and education for HCPs **Q.5:** Heart failure (n=5), Diabetes (n=2), Rheumatoid Arthritis (n=1), Cardiovascular disease (n=1), Stroke (n=1), COPD (n=1), Chronic diseases-general (n=2). Adult patients (no further details reported).	**Q.6 & 7: Patient Outcomes:** Functional status: (n=9); Positive trend (n= 1S in MA; & n=7 NS). Unclear (n=1) Mortality: (n=6); Reduction (n=1,S for Stroke) or Unclear (n=5); Patient satisfaction (n=3); Positive trend but NS. Quality of Life (n=6); Positive trend but NS **Process Outcomes: (n=5)** Examples only provided as guideline adherence & monitoring. Positive trend (n=1, S; n=4 unclear) **Service Outcomes:** Service Utilisation (n=7) Reduction in hospitalisation/ LOS/ Readmission (n=3,S) & n=4 NS) **Resource Outcomes:** Costs (n=7) Decreased trend (n=4, NS) or unclear (n=3) **Reported** that only 15% of effects reported in reviews were significant, mostly based on short-term evaluations. **Q. 8:** NR. but the trend of significant effects points to SM Support (for service utilisation)	**Q.9:** Meta-review to assess components, definitions & effects of IC **CGs:** NR **FUP:** Not explicit but stated that this was short term (time lines NR). **Q.10:** NR. **Q.11:** **Patient specific:** Patients capable of & motivated for self-management; **Service specific:** Supportive clinical information system; Specialized clinics/ centres; **Organizational specific:** Shared mission on IC between HCPs; Leaders with clear vision of the importance of IC; Commitment & support from management; Culture of quality improvement.	**Researchers’ Comments:** Reported that core components identified in this review for ICPs were consistent with Chronic Care Model (CCM). Recommended that: ICPs be based on CCM with at least one intervention in professional-directed, organizational and patient-related respectively (i.e. intervention in each) with each designed to support self-management. No reference to quality of papers other than risk of publication bias emphasising positive over negative results.
Foy et al. (2010) UK Meta-analysis (n=23 incl. 11 RCTs, 1 non-RCT, 3	“To assess the effects of interactive communication between collaborating primary care	**Q.1:** Interactive Communication defined as; “Methods or systems enable timely exchange and incorporation of pertinent clinical information shared by	**Q.3:** Four core features of Planned Collaboration are: Interactive communication as defined in Q.1, Quality of information (i.e. structured forms/ pathways/reports) (n=0), Needs assessment (i.e.	**Q.6&7:** **Note**: Results specific to diabetes only presented (n=5) **i.**e. not mental health conditions. Studies on diabetes were all non-RCTs; results are pooled effects. **Patient Outcomes:**	**Q.9:** Meta-analysis of non-RCTs (for diabetes) to assess effects on outcomes of interactive communication. **CGs**: not reported but pooled effects used to compare different interventions. **FUP**: Ranged from	**Researchers’ Comments:** Concluded that interactive communication has a potential role for improving the effectiveness of PCP & specialist collaboration.

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[18] Mur-Veeman I, Hardy B, Steenbergen M, Wistow G. Development of integrated care in England and the Netherlands: managing across public–private boundaries. *Health Policy* 2003; **65**: 227–241.

controlled before-after studies & 8 uncontrolled before-after trials) 2002-2008	physicians (PCPs) and key specialists on outcomes for patients receiving ambulatory care" (p.247).	primary care physicians and specialists (for example, through face-to-face, video conferencing, telephone, or e-mail exchanges). An integral mechanism must promote interaction between collaborating physicians (Communication cannot be solely 1-way)" (p.248). **Q.2:** Planned collaboration between PCPs & Specialists requiring integration of care across practice settings. Interventions included face to face meetings (n=9); paper letter notes (n=8), telephone discussions (n=7), electronic letters/records (n=2); Combination of methods (n=14).	systematic assessment by PCP & specialist with proactive tracking of continuing needs) (n=4), Joint care planning (with structured templates but individualised) (n=4). **Note**: 4 studies on diabetes in adults extracted (study on children excluded). **Q.4:** Needs assessment & Joint care planning in all 4 studies. Least common/not evident was quality of information. **Q.5:** Diabetes (n=5 with 4 on adults), Mental Health (n=18). Sample size in 4 adult studies ranged from 94-984, total n= 1768.	Changes in clinical status (n=5) Improved HbA1$_c$ x 1.4% (S) **Noted**: NS differences in outcomes between integrated and non-integrated systems. **Q.8:** Reported that "interventions to improve the quality of information exchange had statistically & clinically significant benefits in outcomes compared to those that did not" (p.253).	2/12-36/12 (median, 9.5//12 months). **Q.10:** NR **Q.11:** NR	**UCC Authors Comments:** The term integrated was used in this paper to describe the type of services as context for studies reviewed. This paper with an emphasis on 'planned collaboration' was included because it clearly addressed care delivery across health service providers and sectors inclusive of integrated and non-integrated services
Minkman et al. (2007) The Netherlands Syst. Review (n=37 incl. 1 Syst. Review, 1 Meta analysis, 1 RCT, 5 Control trials, 24 Non-controlled studies,%& 5	To identify the available evidence for performance improvement based on integrated quality improvement models in health care settings.	**Q.1:** IC:"seamless… during whole care process. For health care organizations, this requires 'horizontal' coordination, collaboration with other organizations and community partners" (p.91). **Q.2:** Three integrated quality management models reviewed; CCM	**Q.3:** CCM (n=21); Self-management (SM n=21), Delivery System Design (DSD n=20), Decision Support (DS n=21), Clinical Information Systems (CIS n=20), Community Resources & Policies (CRP n=14), HCO (n=14). In addition, expanded model of the CCM included patient safety, cultural aspects & coordination of the 6 performance dimensions of	**Q.6 & 7: CCM** **Patient Outcomes:** Changes in clinical status (n=9): Improved HbA1c (n=3, S; n=1 NS; n=2, S, NR), BP (n=2,S), non-HDL/HLDL (n=3, S) & self-monitoring of blood glucose (n=1,S) Quality of life (n=2) Improved (n=1, S); NS differences (n=1) Satisfaction with care (n=1) Increased(S), specifically education sessions & communication (S).	**Q.9:** Systematic literature review on 37 papers of which 21 related to CCM. CG or FUP NR **Q.10:** NR **Q.11:** NR	**Researchers' Comments:** Strongest evidence sourced from meta-analysis. Concluded that interventions based on the CCM may improve performance in terms of process and outcome measures. However the CCM would benefit greatly from increased emphasis on culture, leadership and business. Furthermore the model

descriptive, non-analytical. 1995-2006 Data drawn from 9 specified countries& 1 'international study'(syst. review (n=39).		(n=21), Malcolm Bridge Quality Award (MBQA) criteria (n=5), & The European Foundation Quality Management (EFQM) Excellence Model (EM) (n=11). **Note**: Only those papers on the Chronic Care Model as an IC programme explicitly included chronic diseases. Papers on the MBQA or EFQM addressed integration across services without specific reference to chronic diseases and therefore are excluded from data extraction for the remaining questions in this table.	the IOM's definition of quality (NR). **Q.4:** See Q. 3. Features in >50% of programmes were CCM, SM, DSD, DS, CIS. Lease common were: CRP & HCO No reference made to inclusion of components of expanded CCM. **Q.5** Diabetes (n=18), Asthma (n=5) Depression (n=2) Cardiovascular disease (n=3), multiple (single) diseases (n=2), multi-morbidity (n=3) Unclear. Reporting varied from number of services to number of patients.	**Process outcomes:** Monitoring health Improved monitoring (peak flow, action plans) & overall process measures (n=4, S) & whole care diabetes monitoring (n=1, S), & goal setting (n=1, S) **Service outcomes:** Service utilisation (n=2) Increased primary care visits (n=1, NS), Specialist visits –No differences (n-1, S,NR), Decreased hospital admissions, LOS & ED visits in both groups (n=1, S) **Resource specific:** Costs 9 (n=1) Increased due to additional nurse & clerk (n=1, S, NR). **Q. 8:** Reported for some papers. Studies with ≥ 4 CCM components more likely to improve outcome compared to fewer components (n=1 with 39 studies on diabetes care). Process and outcome effects strongest for SM (n=2), DSD (n=2), DS (n=1), CIS (n=1). **See note in final column.**		would benefit by including measures of worker satisfaction, patient judgement, and measuring financial performances. **Note on Q. 8** It was concluded that uncertainty remains about which components contribute most to performance and to which confounding & context variables are present.
Smith et al. (2007, 2008) Ireland Cochrane Syst. Rev with some meta-analysis (n=20) incl. 19 RCTs & 1 controlled before and after studies	"To determine the effectiveness of shared-care health service interventions designed to improve the management of chronic disease across the primary-specialty care interface"	**Q.1:** Shared Care:" the joint participation of primary care physicians and specialist care physicians in the planned delivery of care for patients with a chronic condition, informed by an enhanced information exchange over and above routine discharge	**Q.3:** Majority were multi-faceted & complex incl. prior agreement of roles within each sector (n=3), clinical and referral guidelines/plans (n=15), defined patient reviews in each sector &/or multidisciplinary (n=15), education & training for patients & professionals (principally for primary care professionals & workers at the	**Q.6 & 7:** **Note:** Results specific to chronic conditions only presented (n=10) **i.**e. not mental health conditions. **Patient Outcomes:** Changes in clinical status (n=7); Improved Forced expiratory volume in one minute (FEV 1) in COPD (n=1, S); NS benefits for other physical health outcomes e.g. across studies e.g. systolic blood pressure (n=1), $HbA1_c$ (n=4,NS);	**Q.9:** Cochrane review without undertaking meta-analysis due to heterogeneity of studies. **CG** across studies included usual specialist care (n=5) including outreach service (n=1), usual specialist & GP visits (n=3) or usual care (NR, n=1); **FUP** varied from 3/12 to 24/12 with most at 12/12. **Q.10:** NR explicitly from evidence	**Reviewers comments:** Reported that because information on primary care practitioners was lacking from most studies, it was difficult to determine whether shared care was generalizable in each of the regions. The fundamental aspect of shared care is that is should involve a genuine

1966-2006 Data drawn from 7 countries.	(p.1)	and referral (p.2 Hickman et al. 1994).[19] **Q.2:** Shared care systems (i) liaison meetings between specialists and primary care team members where the ongoing management of patients within the services was discussed and planned; (ii) shared care record cards (usually patient-held); computer-assisted shared care and electronic mail where an agreed data set was collected in both primary and specialty-care settings and was circulated between sectors. This could also include centrally coordinated computerised registration and recall of patients.	interface) (n=12) & synchronised patient records and recall system (n=11). Noted designated professional with role of co-ordinating between specialist & primary care (usually nurse specialist (n=6 of which 2 were physical chronic disease) **Q.4:** The interventions appeared to be driven by the specialist sector in 9 studies with relatively limited analysis of activity in the primary care sector. The remaining 11 studies involved a clearer collaboration between both sectors and with more complete analysis of activity in both sectors. Most common components across interventions (>50% of programmes) were: clinical and referral guidelines/plans (n=15; 75%), defined patient reviews in each sector &/or multidisciplinary (n=15, 75%), education and training for patients and/or professionals (n=12, 60%) and synchronised patient records and recall system (n=11, 55%). Different/Least common component was: prior agreement of roles within each sector (n=3, 15%)	Wellbeing & Quality of Life (n=3) Improved for all domains (n=1, S) or physical domains only (n=1, S), NS differences (n=1); Functional impairment/disability (n=2) NS improvement (n=2) Satisfaction with care (n=3); More satisfied (IG n=1S; CG n=1, S). NS differences (n=1) **Process Outcomes:** Health monitoring: Improved quality of risk factor recording (n=1, S); NS differences (n=1); Use of the shared-care record -NS differences (n=1) Appropriate prescribing: (n=2) Increased (n=1, S); NS differences (n=1); **Service Outcomes:** Service utilisation (n=5) Reduced hospital admissions (n=2, S),NS differences (n=3); Reduced LOS (n=1, S); Increased disease-related visits (n=1, S), NS differences (n=3); Primary care/ specialist visits - NS differences(n=2) **Resource Outcomes** Lower direct patient costs (n=2, S) Shared care more expensive (n=1 S, NR). **Q.8.** Reported that interventions were complex, therefore difficult to determine the exact contribution of each component and to determine the 'active ingredient' within the	but raised in discussion as follows **Service specific** Lack of genuine involvement of all sectors Emphasising costs rather than improving patient care Lack of user involvement in designing shared care Limited use of information technology for organisation of shared care **Q.11:** NR explicitly from evidence but raised in discussion as follows; Organisation Genuine involvement of all sectors supported through the appropriate resourcing of providers, Involvement of service users in designing shared care; Use of information technology for organisation of shared care & the appointment of a liaison worker at the interface (usually a clinical nurse specialist).	collaboration between primary and speciality care. Furthermore, it should be focused on improving patient care, not reducing costs. Quality was assessed using standard EPOC criteria. Majority of studies were RCTs that varied considerably in their quality. Only three met all of the EPOC criteria. The authors concluded that the review did not provide evidence to support the introduction of shared care in clinical practice for the management of chronic conditions. **UCC Authors Comments**: (i) Evidence on outcome was included in Meta-Review by Martinez-Gonzalez et al. (2014), (ii) The term integrated was used in search strategy and is explicitly mentioned for interventions of some studies. This paper with an emphasis on 'shared care' was included because it clearly addressed care delivery across health service providers and sectors.

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[19] Hickman M, Drummond N, Grimshaw J. A taxonomy of shared care of chronic disease. *Journal of Public Health Medicine* 1994;**16**(4):447–54.

			Q.5. A range of single chronic diseases including Asthma (n=1), COPD (n=1), Cancer (n=1), CCF (n=1), Diabetes (n=4), Hypertension (n=1), Cardiac related problems incl. long term anticoagulation therapy (n=1), opiate misuse (n=1), depression (n=6), & chronic mental illness (n=3). Sample (n=9000 Participants)	range of interventions comprising the full shared-care service.		
Singh. (2005a* & b) UK Syst. Review (n=158 specific to Integrated Care incl. 34 Syst. Revs, 103 RTs & 21 other studies –details NR) Note- 63 of the above papers were specific to chronic conditions integration between primary and secondary from which data were extracted for this table.	To summarize "evidence about some of the strategies to improve chronic care… focuses on strategies that may work well across a range of chronic conditions, rather than disease specific interventions" (p.91).	**Q.1:** Integrated Care or shared care is, "collaborative working, commonly across care in the community (primary care) and (secondary) care…can also be used to refer to multidisciplinary working, and involving health specialists, social care, and voluntary organizations in care processes" (2005a, p.10). **Q.2:** Integrated care interventions described for each study. See final column for a summary of the various combinations of interventions.	**Q.3:** Integrating care across primary & secondary services (e.g. shared information, recall prompting, joint review/co-management (n=22), multidisciplinary team patient reviews/education (n=8), nurse led (n=14 GP nurse practitioner, primary care clinics, post-discharge follow up), chronic care clinics (n= 9, primary care group visits with MDT review & education, specialist outreach clinics) community outreach programmes (n=3, linked to community venues/voluntary sector), and integrated home care (n=7) **Q.4:** Most common feature within context of the above were: shared information, shared GP & specialist care,	**Q.6&7: Note:** Data extracted for physical conditions only. Although level of significance was not reported and NA for some studies, a narrative account on each study of positive, inconsistent or no changes in outcomes was presented. Due to the complexity of data extraction from this paper (2005a), the most common outcomes reported specific to the more positive trends across interventions (from Q.3) are reported. **Patient Outcomes:** <u>Changes in clinical status:</u> Inconsistent overall but improvements noted in small number of studies for outcomes clinical outcomes e.g. HbA1c (n=3/5, BP n=3/3), or reported generally as 'clinical outcomes (n=11/15). <u>Quality of life:</u> Improved (n=2/5) **Process Outcomes:**	**Q.9:** Systematic review to assess outcomes for integrated care (& other approaches to chronic disease management). **CG:** Some reported e.g. GP care only, conventional specialist care, GPs practice without nurse practitioners **FUP**: 2/12-4years **Q.10:** NR **Q.11:** NR	**Researchers Comments:** Concluded that "integrated primary and secondary care, working across boundaries, and multidisciplinary team approaches could have some impacts on quality of care, clinical outcomes, and healthcare costs" (p. 72). There remains uncertainty about which components are most effective. **UCC Authors' comments :** Above conclusion is based on all papers reviewed on integrated care inclusive of mental health conditions, and frail older adults. Our analysis based exclusively on the data presented for chronic diseases (n=63) shows positive trends as follows. **Structured** primary &

**Grey literature*			recall systems, & nurse led primary care clinics. **Q.5:** Asthma (n=3), COPD (n=7), Diabetes (n=18), Heart failure (n=7), Hypertension (n= 2), IBD (n=1), Rheumatoid arthritis (n=1), Stroke (n=1), Two or more chronic diseases reviewed (n= 11), Unclear e.g. reference to 'chronic conditions. Long term diseases (19) Mostly adults with some children (data on adults with chronic diseases only extracted i.e excluded mental health and frail elderly)	<u>Health monitoring</u> Improved (n=7/7) incl. referral/rapid access (n=7/7) **Service Outcomes:** Reduced hospital admissions (n=4/4) or readmissions (n=1/1) or ED visits (5/5), LOS (n=2/2), unscheduled GP visits (n=1/1) **Q.8:** Higher trend of positive effects across papers for multifaceted components with nurse led clinics in primary care consistently having positive clinical effects especially for stable or uncomplicated patients (n=7/7); shared PCP-specialist care & use of information & recall system increasing health monitoring & referrals, and reducing service utilisation.		secondary care teams services working together[20] with an emphasis on: ➢ Strong linkages between secondary and primary care (e.g. GPs) involving specialist outreach ➢ Practice redesign to encourage disease specific expert care team seeing patients jointly with PCTs **in** PC setting ➢ Nurse led clinics in primary care uncomplicated/ stable patients[21] ➢ Regular scheduled GP visits with review data returned to specialist in secondary care (& referral to secondary care specialist team by GP if appropriate or annual review in secondary care) incl. computerised prompting scheme for GPs & patients. ➢ Shared online/electronic patient data
Rosenberg et al. (2014) & Von Korff (2011) McGregor et al. (2011), Katon et al. (2010) USA	"to determine whether health behaviours relevant to chronic disease behavioural self-	**Q.1:** NR (only Team Care defined –not capturing IC) **Q.2:** Collaborative care intervention between registered nurses (experienced in diabetes	**Q.3:** Collaborative care intervention (nurse and primary care physician). Health behaviour change, patient empowerment in self-care management, and pharmacotherapy to improve	**Q.6&7: Patient Outcomes:** <u>Changes in clinical status:</u> Improved HbA1c (S), SBP (S), cholesterol (S) NS changes in BMI levels. <u>Quality of Life</u> Improved (S)	**Q.9:** RCT to assess the impact of the TEAM-care collaborative care intervention on health behaviour change. **CG:** Usual care through primary physician with enhancements (providers notified about patients'	**Researchers' comments:** Reported that "the individualized support for health behaviour change, in the context of improved medical management of chronic disease, may be

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6. Original papers sourced to clarify the focus on primary-secondary care integration, mostly outreach from specialist to primary care clinics.

[21] All original papers sourced to determine primary care context. Most were in outpatient departments with some involving direct access for GP referral.

RCT (n=277)	management were improved in a randomized trial of a multifaceted intervention for patients with comorbid depression and poorly controlled diabetes or CHD" (p.130).	education) and primary care physicians. Nurses and patients established self-care goals & activities in primary care setting every 2-3/52. Supervised by PC physician. Weekly case load reviews with mental health specialists. The programme integrated pharmacological and behavioural management of disease. The nurse educators had a 2 day course on depression.	health, motivational interviewing, electronic medical record review, use of clinical guidelines, case management tracking systems. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed**.** **Q.5:** CHD or poorly controlled Diabetes or both and with co-morbid 'major depression' depression. Managed in primary care. Average age: 57 years.	Health behaviours Improved dietary habits except fruit, veg. & high fats (S) & time spent in activity levels (S). No changes in sedentary time (S) or in smoking habits (S) Mental health Reduction in depression scores (S) Satisfaction with care. Improved (S) **Process outcomes:** Medication management More adjustment to medications (S). **Q.8:** NR	depression and poor control of disease, participants encouraged to discuss care for depression, diabetes and/or CHD with physician). **FUP** at 6/12 & 12/12. **Q.10:** **Practice specific:** Increased workload with documentation **Q.11:** **Practice specific:** Supportive patient education materials	beneficial and suggest that there is room for further health behaviour change to occur" (Rosenberg et al. 2011, p.133). Concluded that "an intervention involving nurses who provided guideline-based, patient-centred management of depression and chronic disease significantly improved control of medical disease and depression (Katon et al. 2010, p.1). **UCC Authors Comments:** Although this study is primarily about integrating management of disease and mental health, we included the paper because it clearly indicated that the intervention involved integration of visiting diabetes nurse educators into primary care practices.
DIABETES						
Van Bruggen et al. (2007) The Netherlands Syst. Review (n=22 consisting of 11 Syst. Revs, 7 RCTs, 1 trial & 3 non-controlled studies). Data drawn	To evaluate whether "sharing care and allocating care tasks lead[s] to improved quality in diabetes care and a reduction in the cardiovascular risks in diabetes patients" (p.60).	**Q.1:** Shared care: "the joint participation of hospital consultants and general practitioners in the planned delivery of care informed by an enhanced information exchange over and above routine discharge and referral notices" (p. 60. sourced from Hickman et al. 1994, see footnote 4). Transmural care; "a	**Q.3:** Multidisciplinary consultation (n=1), Nurse–led care (n=12), Education (n=2), Self-management (NR). **Q.4:** See Q3- Most common feature was: Nurse led care (n=12). Least common was: Education (n=2). **Q.5:** Type 2 Diabetes Adults (n=47,326 ranging from 84-31,760). Sample	**Q.6&7:** **Patient Outcomes:** Changes in clinical status:(n=22) HbA1c: decrease (n=11, S), no changes (n= 8) or increase (n=1); Blood pressure: decrease (n=5,S), no changes (n= 12,S, NR) or increase (n=1, S,NR); Cholesterol: decrease (n=5,S), no changes (n= 12, S,NR) or increased (n=2, S,NR), Decreased lipids (n=2, S), Increased Creatinine (n=3, S,NR).	**Q.9:** 11 Syst. Review to assess effects. **CG**: NR or not explicit. FUP: 3/12 -72/12. **Q.10:** NR **Q.11:** NR	**Researchers' comments:** Evidence on the effects of delegating care to decrease the cardiovascular risk factors for diabetes patients is inconclusive. However, noted that the conclusion from review papers examined "with the combined aspects of sharing and delegating care is unanimous: disease management encourages improvements in glycaemic control and the way in which

from 13 countries.		Dutch care concept that is aimed at tailor- made care to fit the needs of the patient, and is provided on the basis of agreements on collaboration and direction between general practitioners and hospital consultants and where, although responsibilities are shared, professionals keep their own, well defined, sub-responsibilities" (p.60, Raad voor de Volksgezondheid et al. 1995).[22] **Q.2:** Shared Care between primary and secondary care (n=5), Delegation of Care from specialists to nurses (n=13), Shared & Delegated Care (n=4). No further details provided.	sizes in syst. rev. NR.	**Process Outcomes:** Health monitoring: (n=10) Increased e.g. HbA1c (n=8, S,NR), cholesterol (n=3), blood pressure (n=3, S, NR), lipids test (n=2, S, NR), foot control (n=5, S,NR), creatinine test (n=2, S,NR); Increased referral to podiatrist (n=2, S,NR) Decreased referral to dietician (n=2, S,NR). **Q.8:** NR. However, trend toward positive effects seen in reviews specific to (i) shared care model involving nurse led/case management and (ii) shared & delegated care (specific detail on HCPs NR).		care is given and possibly has a positive influence in reducing blood pressure". Consideration needs to be given to closely monitoring new models of care with attention to long term effect. **UCC Authors' comments:** The significance values were extracted from narrative text because P values were not reported.
RESPIRATORY: COPD, ASTHMA						
Kruis et al. (2014a 2013a) Netherlands Cochrane Syst. Rev incl. Meta-analysis (n=26 RCTs & cluster RCTs).	"to evaluate the effects of integrated disease management (IDM) programs or interventions in people with COPD on	**Q.1:** Integrated disease management (IDM) is "a mean of improving quality and efficiency of care aimed at reducing symptoms and avoiding fragmentation of care, while containing costs" (p.6).	**Q.3:** Self-management (n=5) combined with exercise (n=1) or structured follow up (n=1), Exercise (n=13), Education (n= 1), Structured follow up/communications e.g. case management by nurses (n=5), MDT working (n=3) **Q.4:** Most common feature	**Q.6 & 7:** **Note**: Pooled effects presented**.** **Patient Outcomes** Change in Clinical status NS differences for lung function (n=1) or exacerbations (n=2) Mortality (n=5) NS differences Quality of life (n=22)	**Q.9:** Cochrane review with meta-analysis to assess effect. **CG:** Usual care –regular follow up to HCPs n=20); mono-disciplinary treatment (n=2), education only (n=4). **FUP**: 12-24 months **Q.10:** NR	**Researchers' comments:** Concluded that IDM showed short term (up to 12/12) benefits and that evidence was insufficient to refute long term benefits. Researchers need to provide more detail on intervention components in order to

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[22] Nationale Raad voor de Volksgezondheid CZ, Advies Transmurale zorg, NRV/CZV, Utrecht,1995

1994-2011 Data from 11 countries.	health-related QOL, exercise tolerance and number of exacerbations"(p4).	**Q.2:** Disease management interventions described focusing on prevention & management of one or more chronic conditions using a community wide systematic & structured multidisciplinary approach potentially employing multiple treatment modalities. Interventions included had to have at least 2 components (see Q. 3).	within context of the above was exercise only. The integrated component of studies was not always clear. Several mentioned MDT team working but few were explicit on the integration between primary and specialist services. Only 5 studies explicitly involved primary and secondary care. **Q.5:** COPD Adults with mean age of 68 years (n= 2523).	Improved (n=13, S) Self-efficacy Improved (S) Physical wellbeing Exercise capacity improved (n=18;S) Anxiety & Depression (n=4) NS differences Satisfaction with care (n=2) Increased (S, NR). **Process Outcomes** Co-ordination of/access to care, Improved (n=3,SNR) **Service Outcomes** Service utilisations NS differences in all-cause hospital admissions (n= 2) except lower for respiratory related admissions: pooled effects favoured IGs (20/100 patients vs CG 27/100 patients admitted to hospital over period of 3-6 months (n=7/7; S) Reduced LOS in the short term only (n=6, S), Reduced ED visits (n=4 NS differences on pooled effects. **Q.8** Reported that insufficient description of interventions made it difficult to determine which components are most effective. However, Self-management showed a positive trend for QOL (n=5/5)	**Q.11:** NR	determine which combinations are most effective.
Lemmens et al. (2009) The Netherlands Syst. Review (n=36 in 40 papers incl. 28 RCTs & 8	"to examine the effectiveness of multiple interventions as compared to single interventions or usual care on health	**Q.1:** IC not reported. "Disease management is a concept by which care delivery is better coordinated through the integration of several components across the entire delivery system and the application of tools	**Q.3:** Patient related education incl. target disease, prevention & treatment strategies, self-management, educational sessions of varying format e.g. individual/group /electronic with specialist nurse (n=36), Professional	**Q.6&7:** **Patient Outcomes:** Changes in clinical status (n=15): Pulmonary function: improved (n=5,S), NS changes (n=10) Symptoms/exacerbations: improved (n=5, S, mostly asthma) or NS changes (n=10). Quality of Life (n=31):	**Q.9:** Syst. Review to assess effects. **CG**: Mostly usual care (no further detail). **FUP**: 3-36/12 mostly 12/12 Reported that rigorous evaluation & determining practical feasibility is problematic due to the complexity of multiple diseases. RCTS difficult to conduct on organisational research.	**Researchers' Comments:** Reported that patients with greater severity of disease were more likely to benefit from interventions. Although some improvements noted for triple interventions, evidence on effects of

Controlled before & after studies) **Note**: Meta-analysis applied to some data. 1998-2008 Data drawn from 12 countries	outcomes and health care utilisation within the context of integrated disease management in asthma and COPD” (p.670).	specifically designed for the population in question, e.g. guidelines, education, information systems” (p.671 sourced from IOM 2001).[23] A generic definition of disease management (DM) also provided i.e. “a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant” (p.671 sourced from DMAA, 2004)[24]. **Q.2:** Disease management programmes (DMPs) involving multiple interventions (i.e. two or more) rather than single interventions. Key to DM is the implementation & integration of combined interventions.	related education incl. educational meetings, educational outreach visits all designed to increase understanding & awareness of clinical care/ recommendations (n= 19), Case Management incl. any system of coordinating diagnosis/ treatment/ continuity of care e.g. referrals/follow up tests by MDTs/ HCP with primary care clinicians (n=11), Structural and Organisational Changes incl. specialist team member visits to primary care, & expansion/ revision of roles, e.g. nurse specialist/ pharmacist in patient monitoring, (n=36). **Q.4:** Most common combination of interventions related to triple interventions that were patient related, professional related & organizational (n=19). Less common was a combination of 2 interventions i.e. patient related & organisational (n=17). **Q.5:** COPD (n=18), Asthma (n=16) or both (n=2). Adults ≥ 16 years Sample sizes ranged from 36 – 101,368,	Improved in all/some domains (n=14, S). NS (n=17, trend NR) Compliance (n=15): Improved (n=10, S) or NS changes (n=5) Knowledge/Self-Management (n=14): Improved (n=10) or NS changes (n=4) Satisfaction (n=6): Increased (n=4, S; n=1 NS). **Service Outcomes:** Service Utilisation (n=25): Hospitalisations/readmissions/: reduction (n= 7, S), NS changes (n=18) although individual studies (n=3) showed S reduction in at least one service area. LOS reduced (n=2 S) or increased (n=1, S) or NS changes (n=2). ES visits – reduced (n=3 S), n=15 NS). **Resource Outcomes** Costs (n= 4) Decrease (n=2, S) or NS changes (n=2) **Q.8:** Triple interventions more likely to yield positive effects i.e. interventions at patient, professional and organizational levels. Combining patient and professional education with active role of pharmacists	**Q.10:** NR **Q.11:** NR	multiple interventions remaining uncertain and inconclusive most likely due to short follow ups. More attention needs to be placed on the addition of process measures in future research.

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[23] IOM. Crossing the quality chasm. Washington D.C.: National Academy Press; 2001.

[24] DMAA. Disease Management Program Evaluation Guide. Washington: DMAA; 2004.

			between100-200 in most studies (n=20).			
STROKE						
Allen & Rixson (2008) UK Syst. Review (n=7 papers reported in 5 studies incl. 1 RCT, 3 before & after studies, 1 qualitative care study). 1993-2004 Data drawn from 3 countries	"to determine how 'service integration' was defined in evaluations of ICPs,(integrated care pathways) the type of evidence utilised in /measuring the impact of the intervention in supporting 'service integration', and the evidence of their effectiveness in this respect" (p.81).	**Q.1:** Reported at the outset that a clear definition of IC pathways does not exist. Definition adopted for review was: "a multidisciplinary tool to improve the quality and efficiency of evidence based care and is used as a communication tool between professionals to manage and standardise the outcome orientated care" (p.81 sourced from (Vanhaecht et al. 2005)[25]. **Q.2:** IC Pathways as defined in Q. 1 with multidisciplinary teams involving two or more disciplines (e.g. medicine, nursing, physiotherapy). Pathways supported by a dedicated coordinator role (n=2), underpinned by educational programmes (n=4), & specific strategies designed to secure compliance (n=1).	**Q.3:** Communication (n=2), Role clarity (n=1), Documentation (n=3), Planning/goal planning (n=2), Coordination (n=4) mostly nurses, Treatments/ therapies (rehabilitative therapy, treatment of hypertension, medication) (n=4); HCP education (n=4); MDT working applies to all **Q.4:** See Q. 3 with all components of the CCM evident in >50% of ICPs. **Q.5:** Stroke (acute care, rehabilitation, & long-term support) Adults across the care spectrum incl. acute stroke care (n=3), inpatient rehabilitation (n=1), & acute care & rehabilitation (n=1). Integrated care across organisation boundaries or community care related to notification of hospital discharge to primary care team. Overall, integration was limited to inter-professional and intra-organisational. Sample size and age groups NR.	**Q.6&7:** S -NA = Significance not applicable for qualitative study. **Patient Outcomes:** Changes in clinical status (n=2): Reduction in UTIs (n=1, S; n=1 NS) & number of patients affected by aspiration pneumonia (n=1,S). Mortality (n=2) NS differences at 5 days post discharge (n=1), Increased in ICP grp (n=1, NS) Quality of life (n=3): Improved (n=2, S) & in CG vs ICP grp (n=1, S) Perceived quality of care (n=1): Rarely participate in care planning (n=1, S-NA). Mental Health (n=1) Decreased Depression & Anxiety (S), Decline in both IG & CG (S). **Process Outcomes:** Documentation (n=1) Improved (S) Provision of therapies/clinical interventions (n=3) Increased (n=1 S) or timeliness (n=1S), NS differences (n=1). Care planning (n=1) NS differences **Service Outcomes:** Service Utilisation (n=4): Decrease in LOS (n=1, S) & maximum LOS (n=1, NS); NS differences for LOS (n=2) or discharge to institution (n=1).	**Q.9:** 1 Systematic review of ICP service evaluation studies to assess improvements in quality of care and reduction in hospital length of stay through service integration in stroke patients. **CG:** Reported that only 2 studies provided sufficient details: data from same population 2yrs prior to implementing ICP (n=1); consecutive patients (n=1); conventional MDT care (n=1) **FUP:** between 3/12–24/12. **Q.10:** NR **Q.11:** NR	**Researchers' Comments:** Studies reviewed had a number of methodological weaknesses. There remains lack of clarity on what the active ingredients of ICPs are. Further research is needed on this to focus on the factors and circumstances in which success is more likely, the theories which underpin them and the mechanisms ICPs entail. Research is also needed on the cost benefits of ICPs (development and implementation).

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[25] Vanhaecht K, Bollmann M, Bower K *et al. E-P-A International Survey on Clinical Pathways*. 2005 [Online] Available from: http://www.e-p-a.org/

				Resource Outcomes: Costs (n=1): Decreased costs **HCP Outcomes:** Role clarification (n=1) Improved (n=1, S,NA) **Q.8:** Reported that (i) “the theoretical basis for ICPs remain underdeveloped, and there is a lack of clarity about their active ingredients and their interrelations” (p.91), (ii) difficult to determine whether any of the observed changes can be attributed to the intervention.		
Joubert et al. (2009) Australia RCT (n=139)	“to implement and evaluate an integrated care programme in Stroke, specific to risk management”. (p.279)	**Q.1: “**The Integrated Care for the Reduction of Secondary Stroke (ICARUSS) model is a novel and multimodal programme aimed at facilitating the implementation of recommended stroke prevention strategies. The model inorporates a “shared care” component” (p.278). **Q.2:** The ICARUSS model was designed to address risk factors following stroke including bi-directional communication of clinical data between primary care and specialist teams. Process commenced in pre-discharge care Shared care involved specialist services and primary care physicians taking ‘‘contemporaneous	**Q.3:** Collaboration between primary and specialist teams, Evidence based practice using shared guidelines, Pre-discharge patient education (by nurse co-ordinator); scheduled regular appointments to GP every 3/12, Support material for GP (discharge summary, flow chart of goals & recommendations), Telephone tracking i.e. patient assessments by co-ordinator (i) prior to 3/12 GP visits & (ii) following GP visit to offer support, education on care plan as well as follow up with GP to advice on best practice recommendations if necessary, Bi-directional flow of information between GP and co-ordinator. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed. **Q.5:** Stroke**.** Adult ≥ 50 years	**Q.6&7:** **Patient Outcomes:** Changes in clinical status Reduction in SBP (S), BMI (S), cholesterol (S) Health behaviour Increased walking activity (S); NS differences in smoking or alcohol intake. Health advice translated into risk reduction behaviours (S) Functional status Improved (S) Quality of Life Sustained vs decrease in CG (S). Knowledge/Information recall Increased patient recall of receiving health advice (S). **Q.8:** Reported that efficacy of model can be attributed to: telephone tracking and feedback by co-ordinator, use of evidence-based guidelines, point-of-care reminders.	**Q.9:** RCT to assess effects. **CG**: Standard care by GP with the adoption of guidelines and actions left to the discretion of GP **FUP**: between 3/12–24/12. **Q.10:** NR **Q.11:** NR	**Researchers’ comments:** Clinically significant outcomes. Noted that IG were younger than CG which may account improvements in UG. The model has potential to address inadequacies in standard care associated with lack of systematic assessment in secondary care, lack of ongoing surveillance, unfamiliarity with guidelines, inadequate care and support for patients following discharge, and a disconnect in information flow between primary care and secondary care.

		responsibility’’ for ongoing management of patients. The GP had telephone access at all times to a stroke specialist for advice.				
RESPIRATORY: COPD, ASTHMA						
Hernandez et al. (2015) Spain RCT (n= 114)	“To explore the effectiveness of a community-based IC (integrated care) service in preventing hospitalisations and Emergency department (ED) visits in stable frail COPD patients” (p.1).	**Q. 1:** NR **Q. 2:** Intervention involved comprehensive assessment of respiratory, severity, and morbidity status & social support needed an educational programme and home visit jointly by hospital specialist nurse & primary care team. Accessibility to specialist nurse for primary care team continued through ICT platform including web-based call centre.	**Q.3:** Comprehensive assessment; Patient empowerment for self-management education by Resp. nurse, Access to resp. specialist nurse for PC team including web based call centre, Education of PC Team to enhance home-based management, Home visits by PC Team tailored to patient needs, Additional scheduled visits by respiratory specialist nurse through day hospital/home as requested by PC team. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** COPD in frail older adults without major restrictions regarding co-morbidities, although noted that many patients had severe co-morbidities. Aged ≥ 65 yrs.	**Q.6 & 7:** All at 12/12 (see note below re -6 years FUP). **Patient Outcomes** Changes in clinical status Fewer symptoms (S) Mortality Reduced (S) COPD SM & Knowledge Improved (S) Quality of life Improved (S) Mental health Lower depression & anxiety (S) **Service outcomes** Service Utilization: Reduced ED visits (S), Increased planned hospitalisation co-ordinated between PC & hospital teams (S. not computable) NS effect on hospital admissions **Note**: at 6yrs positive FUP, positive effects were not sustained. **Q. 8:** Not explicit.Noted in discussion that complexities of care require 2 key components: (i) appropriate health risk assessment (case finding) & subsequent patient stratification and (ii) efficient workflow designs across levels of care including IC services with shared-care agreements between specialised and PC including social support” (p.5). The workflow design involved specialist nursing support for patients and PC teams.	**Q. 9:** RCT to assess effects. **CG:** Usual care without input from respiratory specialist nurse & routine OPD visits. **FUP:** 12/12 & 6 years (passive follow up) **Q.10:** NR **Q.11:** **Practice specific:** Health risk assessment & patient stratification to support decision making Shared-care agreements Specialist support for PCTs **Organization specific:** Deployment of community based IC led by primary care teams Change management, workforce preparation, workflow designs across services	**Researchers’ comments:** Both key components (see Q. 8) are needed to be addressed in order to successfully implement an IC system offering personal care.

Titova et al. (2015) & Sunde et al. (2014) Norway RCT (n=130 at 12/12 & 100 at 24/12) 2014 paper describes intervention, 2015 paper reports on effects.	To develop, implement, and evaluate the COPD-Home model as an integrated approach to care between home care nurses/GP and specialist nurses (2014) & “to determine the efficacy of the intervention…in reducing hospital utilization among patients with COPD stage III & IV…discharged after hospitalization for acute exacerbations “ (p.1).	**Q.1:** Integrated care: “a concept bringing together inputs, delivery, management, and organisation of services related to diagnosis, treatment, care, rehabilitation and health promotion. Integration is a means for improving services in relation to access, quality, user satisfaction, and efficiency” 2014, (p.470, sourced from Grone & Garcia-Barvero 2001).[26] **Q.2:** COPD-Home involves integrated care towards increasing patients’ & community nurses’ deliberations and behaviours in accordance with COPD mana gement guidelines Intervention group divided into (i) care from community nurse (closer collaboration between hospital and primary health provider) with a minimum of weekly home visits, (ii) no care from community nurse (closer collaboration	**Q.3:** Education (3 hour nurse training programme, information about COPD, consultation with specialist nurse, advice on decision support, & e-learning programme for IG), Joint visits to patient’s home i.e. specialist nurse & home-care nurse & GP invite 3-14 days post discharge, then at 6/12 7 then annually year 1, 2 & 3. (transfer of knowledge & examinations from specialist nurse), Call centre for communication & support (specialist nurse calls patient at least monthly over 36/12 & can also be accessed by home care nurse or patient), Individualised self-management plan Noted that one of the main elements of COPD-Home *“is the clear role of the home-*care nurse” (p. 572). The specialist nurse liaises with pulmonologist and any clinical interventions/advice are communicated to GP by letter from pulmonologist. General responsibility for patient care at home lies with GP. **Q.4:** NA- will be included in Final Report with reference	**Q.6&7:** **Patient Outcomes:** Health behaviours Reduction in number of cigarette smokers by 4% at 12/12 & a further 4% at 24/12. Medication use Increased (NS) Mortality Higher (S) explained by age profile (≥ 80 years, greater disease severity) **Service Outcomes:** Service utilisation Reduced hospital admission x 12.6% at 12/12 (S) & by 46.5% at 24/12 (S) and LOS by 48.3% at 12/12 (S), sustained at 24/24 (S). **Resource outcomes:** Cost €40,000 spent in extra hours for home care nurse training. Personnel Required 100% nurse position weekdays 8am-3pm. **Q.8:** Reported that role of specialist nurse was essential to intervention.	**Q.9:** RCT to assess effect, **CG:** Usual discharge care (discharge summary to home-care nurse/GP, participation in rehabilitation, smoking cessation, training programmes). **FUP** at 12/12 & 24/12 (planned for 36/12). **Q.10:** Noted in general discussion. **Patient specific:** Inadequate symptom communication. **Practice design specific:** Call centre by specialist nurse is business hours i.e. not 24/7. Lack of electronic communication system for interaction between nurse, GP & hospital. Time constraints of GP to do joint home visits, Multiple home-care nurses rotating hours/shifts, Lack of education among home-care nurses. **Q.11:** **Practice specific:** Continuous dialogue & collaboration between the specialist, home care nurse & the patient. Specialist nurses ease of access to pulmonologist, Continuous reinforcement (healthcare personnel maintaining regular	**Researchers’ comments:** In contrast to Hospital at Home models typically described in previous literature where patients are managed by ‘hospital at home teams’ until stable, the COPD-Home approach requires that the patient is stable on discharge and there is follow up support by specialist nurses (& physician if needed). Home care nurses are generalists. .

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[26] Gröne, O., & Garcia-Barbero, M. (2001). Integrated care: A position paper of the WHO European office for integrated health care services. *International Journal Of Integrated Care, 1*, e21.

		between hospital and patient). Home care nurses are generalists.	to all papers reviewed. **Q.5:** Severe/v. severe COPD adults who are stable at discharge from hospital. Aged ≥ 65 years.		contact with patient), **Organization specific:** Clearly defined role of the home-care nurse.	
Kruis et al. (2014b; 2013b) Netherlands Cluster RCT (n= 40 general practices)	"To investigate the long term effectiveness of integrated disease management delivered in primary care on quality of life in patients with chronic obstructive pulmonary disease (COPD) compared with usual care".(p.1)	**Q.1:** NR **Q.2:** Integrated disease management (IDM) implemented in primary care involving a 2 day education of professionals (GPs, practice nurses & specialist physiotherapist with the option of other specialists attending if they wished) on integrated disease management as well as the development of a network plan and an implementation plan. Refresher course offered after 6/12 &12/12.	**Q.3:** (i) Education of practitioners incl. conducting & interpreting spirometry, assessment of disease burden, reviewing international guidelines, motivational interviewing for healthy lifestyle, self-management incl action planning, (ii) developing network platform involving prioritising elements of IDM for practice, role responsibilities, practice plan; feedback on plans, (iii) training on Web based decision support for audit and feedback with patient and professional portals. **Q.4:** NA – will be included in Final Report in relation to all papers reviewed. **Q.5:** COPD Adults (n=1086) with most patients (≥ 75%) in mild/moderate GOLD stage. Over 50% had co-morbidities (CVD & Hypertension).	**Q.6 & 7:** **Patient Outcomes** Changes in clinical status NS differences in COPD exacerbations. Increased physical activities (S) Quality of life NS differences **Process Outcomes** Follow up & Co-ordination Improved at 12/12 & 24/24 (S) **Service outcomes** Service Utilisation Reduced hospital admissions (NS) **Note** After 24 months, no differences were seen in outcomes, except for the PACIC follow-up/coordination domain **Q.8:**NR	**Q.9 :** Cluster RCT to assess effects **CG:** Usual care based on international guidelines **FUP**: 6/12 -24/12 **Q.10:** NR **Q.11:** NR	**Researchers' comments**: Noted that results were contrary to a previous systematic review (Kruis et al. 2013 see above in this table) with one possible explanation being that this intervention targeted professionals rather than patients and so may be of suboptimal intensity. Authors also noted that intervention was implemented at a time when integrated care was still lacking for COPD in the Netherlands. Although an improvement in follow up & care co-ordination were observed, this did not translate into positive health outcomes.
INTEGRATED CARE : TECHNOLOGY RELATED						
Health Quality Ontario (2013) Canada Syst. Review & Meta-analysis	"to examine the impact of electronic tools (e-Tools) for health information	**Q.1:** Informational Continuity of Care is "the continuous flow of information between multiple- care providers across different parts of	**Q.3:** Type of e-Tool reported without reference to specific components. e-Tools were: Electronic health record (EHR n=5), Electronic data interchange	**Q.6&7:** Patient Outcomes: Changes in clinical status (n=7): NS differences in: HbA1c (n=2), SBP (n=1), DBP (n=1), Total cholesterol (n=1), LDL-C (n=2) or Triglycerides	**Q.9:** System. Review with some meta-analysis to assess the impact of e-Tools on care coordination. CG: Usual care and avoided the use of e-Tools. FUP: between 6/12-60/12.	Researchers' Comments Concluded that the findings call into question the ability of e-Tools to independently improve the quality of outpatient care coordination

(n=11 incl. 4 RCTs & 7 observational studies). 1996-2012 Data drawn from 4 countries	exchange in the context of care coordination for individuals with chronic disease in the community". (p.13).	the health care system" (p.13). **Q.2:** Care coordination based on computer programmes to facilitate electronic information transfer and shared care; between hospital based and outpatient/community based health care providers (n=4), in a community setting to help coordinate care between PCPs and HCP (n=2), & in multiple care coordination efforts/not specified (n=5).	(EDI n=1), Diabetes Electronic Management system (DEMS n=1), Vermont Diabetes Information System (VDIS n=1), Computer software to automatically generate personalized discharge summaries (CPOE n=1), computers for prescribing or ordering tests or medical records (may/may not include internet/email) (n=1), Computerized system to support diabetes management (n=1). **Q.4:** Most common e-Tool used was EHR (n= 5, 36%). Other e-Tool were used in individual studies. **Q.5:** Coronary artery disease (n=1), diabetes (n=7), heart failure (n=1), multiple chronic conditions (n=2). Adult patients ≥ 18 y (mostly ≥ 50y) with sample sizes ranging from 235-27,207.	(n=1) or Adverse effects post following hospital discharge (n=1). Process Outcomes Health Monitoring (n=8): Frequency of tests/examinations Increased for HbA1c (n=2, NS & 3 S NR), fructosamine (n=1, NS), eye care (n=1, S; n=5 NS), foot care (n=1. S; n=2 NS), kidney management (urine protein (n=1, S; n=3 NS), creatinine (n=1, S; n=1, NS), weight (n=1, S), height (n=1, S), immunizations (n=2, S; n=1 NS). NS changes for a range of indicators incl. total cholesterol (n=3), triglycerides (n=3), blood glucose (n=1),), kidney management (urine protein (n=3), creatinine (n=1), urinalysis (n=1). Health Advice (n=4) Increase in behavioural advice for diet (n=2, S) & smoking assessment (n=1, S; n=1 NS), & for exercise and self-management advice (n=1S) or heart failure (n=1, S). Appropriate prescribing (n=8) NS differences for ACE inhibitors (n=2), anticoagulants (n=2), aspirin (n=1), ICD/CRT-D (n=1), aldosterone antagonist (n=1), CRT-P/CRT-D (n=1). Increased appropriate prescribing for statin prescription (n=1, S), & beta-blockers (n=1, S). Communication (n=3) Increased via number of letters sent from specialist Dr to GP but not the reverse (n=1, S) NS differences in timing of receipt of discharge summary (n=1) Increase in length of time PCPs and nurses spent with patients following	**Q.10:** NR **Q.11:** NR	e-Tools may not be able to overcome underlying process inefficiencies. Overall, the evidence was described as of moderate quality using the GRADE criteria. UCC Authors' comments: The term integrated was used in search strategy and does not appear elsewhere in the paper. This paper was included because it clearly addressed care delivery within context of transition across health service providers.

				diabetes management system (n=1, S),). Service Outcomes: Service Utilisation (n=3): Decrease in hospitalizations (n=1, S; n=1 NS), LOS (n=1, S), ED visits (n=1, S, 2, NS); NS differences in readmissions (n=1) or primary care visits (n=1). **Q.8:** Reported that "no outstanding trends were identified indicating that there was no single disease group, care coordination aspect, or technology that contributed more significantly to the observed impacts of e-Tools" (p.46).		
Pinnock et al.(2013) UK RCT (n=256)	"To test the effectiveness of tele-monitoring integrated into existing clinical services" (p. 1)	**Q.1:** NR **Q.2:** Tele-monitoring (TM)equipment & secure broadband installed in patients' homes with access to technological support. Daily health recording by patients sent to secure network for clinical team review, followed by telephone call to assess patients and implement actions (e.g. home visit, admission, review). 3 different service models in the 4 study regions: 7 day respiratory physiotherapy services; 5 day nurse specialist in long term conditions; GP with trained administrative assistant for TM . Sample were stratified into these services.	**Q.3:** Health monitoring by patient (e.g. symptoms, oxygen saturation), clinical team review of data, Follow up tele-call assessments, health advice & implementation of plans by nurse. Self management education. **Q.4:** NA – will be included in Final Report in relation to all papers reviewed. **Q.5:** COPD with comorbidities (NR). Adults ≥ 65 years. Most were in severe/very severe stage (GOLD criteria). In primary care setting.	**Q.6 & 7:** **Patient Outcomes** Changes in clinical status Increase in self-reported COPD (NS) exacerbations. Mortality NS differences Quality of life NS differences **Service outcomes** Service Utilisation NS differences for hospital admission or LOS. **Q.8:** NR	**Q.9:** RCT to assess effects. **CG:** usual care which incl. self-management education. **FUP**: 12/12. **Q.10:** **Patient specific** Moving from home to residential/relative Unhappy with equipment. Too ill for tele-monitoring **Resource specific:** Too expensive to install. Malfunction of equipment. Resource intensive (e.g. telephone consultations, home visits). **Q.11:** NR	

Appendix 6: ICP Data Extraction Country-Specific

Authors, Date, Country Type of evidence (dates of evidence if synthesis papers & countries represented if reported)	**Aim**	**Q.1. Definition(s) of IC** **Q.2. Description of IC**	**Q.3.Features/Components of IC** **Q4. Shared/Different features/components if applicable (i.e. more than one IC reported** **Q5. Chronic Disease(s) Context**	**Q.6 & 7 Outcomes assessed & Effects/Impact on outcomes** **Q. 8 Features/components of ICP associated with improved results**	**Q.9. Evaluation of ICP** (Intervention Group = IG; Control Group = CG; Follow up = FUP). **Q.10 Implementation Barriers** **Q.11 Implementation Enablers**	**Additional Comments / key recommendations/. Reported quality stated by authors.**
UNITED KINGDOM						
Naylor, Alderwick, & Honeyman (2015) UK Report based on 5 case studies in the UK prepared for The King's Fund.[27] Interview data. Grey literature	To explore "the role that acute hospitals can play in integrated care, drawing on learning from five case study sites in England where acute hospital providers have engaged actively with the integration agenda" (p..4) 5 cases of making progress were:	**Q 1**: NR **Q.2:** Need for closer integration between acute hospitals with other health care services in order to address changing needs of population and financial challenges. (Included chronic diseases in this context) This will involve: "moving from an organisational focus to a system-wide perspective, working more closely with local partners, including	**Q.3:**Building shared governance arrangements across the local system (vision, accountability for aspects of service, system wide metrics for defining successes), Horizontal networks between hospital (joint delivery of acute services becoming more common involving a 'core' & smaller hospitals), community MDTs, Out of hospital care e.g. Shared learning between	**Q.6.or 7:** **Service Outcomes:** <u>Service Utilisation:</u> Reduced hospital admissions & readmissions, Reduced ED visits Reduced bed usage. **Q.8:** Integration at Organization level with partnership between organizations.	**Q.9:** Case studies in 5 sites. Noted that robust evaluations of integrated models are still lacking. **Q.10:** **Organization specific:** Little engagement from primary care within whole system governance structures, Dominance of hospitals in the healthcare system. **HCP specific:** Professional inertia **Q.11**:	**Researchers' Comments:** Implementation of integrated models of care found to be quicker and easier if there was integration at organisational level with partnership between organizations. Future healthcare will involve going beyond hospital walls, through the development of new care pathways, new working arrangements &

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[27] The King's Fund is an independent charity working to improve health and health care in the UK. The Fund helps to shape policy and practice through research and analysis; develop individuals, teams and organisations; promote understanding of the health and social care system; and bring people together to learn, share knowledge and debate. Their reports aim to bring an independent view on health and social care. Accessed at: http://www.kingsfund.org.uk/

	Northumbria Healthcare NHS Foundation Trust, Sheffield Teaching Hospitals NHS Foundation Trust, Airedale NHS Foundation Trust, Yeovil District Hospital NHS Foundation Trust, South Warwickshire NHS Foundation Trust.	primary care, social care and community services, developing integrated service models that span organisational boundaries, providing services through horizontal networks with other acute hospitals" (p.4). Programmes in case sites included: high risk Patient Programme, Right First Time Programme, Discharge to Access, & Tele-health provision to Care Homes.	acute & primary care professionals, Developing job roles that span the acute & community settings. Appointing community matrons; Teams led by community nurses; telephone links for patients to nurses. Shared protocols and information systems put in place. **Q.4:** NA **Q.5:** Growing population with chronic diseases noted as one reason for why change is needed.		**Organization specific:** Collective leadership between acute & primary sector & between clinicians & managers,& between commissioners & providers, Investment of hospital leaders in building relationships with general practices in primary care sector. Facilitators include: e.g. Linkages between senior hospital leaders & GPs such as regular practice visits, Joint working between trust & primary care, Strong clinical leadership in general practice, Employment of senior staff with primary care background in acute sector, Joint educational sessions for consultants & GPs.	new organizational models. There will be an increased emphasis in prevention and population health. Primary recommendation is that: "acute sector leaders should be encouraged to take a leadership role in their local health systems, working with local partners to develop more integrated models of care, and taking greater responsibility for prevention and public health" (p.9).
Curry et al. (2013) & Greaves et al. (2013) UK Peer reviewed paper sourced through Grey literature document.	"to provide the results of a year-long evaluation of a large-scale integrated care pilot in north-west London (p. 2).	**Q 1:** IC: " an approach that seeks to improve the quality of care for individual patients, service users and carers by ensuring that services are well coordinated around their needs (p.2, sourced from Goodwin et al. 2012)[28].	**Q.3:** Risk stratification using the combined predictive model, Care planning across care settings, Multi-disciplinary group Meetings (i.e. joined up care by bringing different professionals together – from PC & hospital),	**Q.6.or 7:** **Patient outcomes:** Changes in clinical status Improved HbA1c at 3/12 for those on care plans (S) Decreased cholesterol (S) after 3/12 of pilot, Decrease in BP (NS), Satisfaction with care Most Satisfied with IC	**Q.9:** Mixed Method evaluation incl. (i) quantitative approach using routine primary and secondary data sources to measure clinical outcomes & quality of care, changes in service utilization, & costs, (ii) qualitative approach incl. Interviews, focus groups & observations, with patients and	**Researchers' Comments:** Reported that this pilot ICP was made possible by receiving £10 m from the London Strategic Health Authority (National Health Service London) which was invested in

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[28] Goodwin N, Smith J, Davis A, Perry C, Rosen R, Dixon A, et al. A report to the Department of Health and NHS Future Forum: integrated care for patients and populations: improving outcomes by working together. London: The King's Fund; 2012.

Mixed method evaluation study.		**Q.2:** The pilot ICP is described as bringing together a range of organisations covering over 100 general practices, 5 local authorities, 2 mental health trusts, 5 primary care trusts, 2 acute hospital trusts & 2 voluntary organisations. It aims to provide co-ordinated multidisciplinary care to reduce emergency admissions in people with diabetes and older adults. The pilot operates as a network whereby separate provider organisations work together towards common goals based on a set of contractual agreements.	New financial incentives for participating organisations, & A new information technology (IT) system to facilitate sharing of information & patient records between providers **Q.4:** NA- will be included in Final Report with reference to all papers reviewed**.** **Q.5:** Diabetes. **The** NWL ICP is to improve care for 15,000 people with diabetes & without diabetes aged ≥ 75 years (n=22,000).	(78%) e.g. use to better communication between all care providers, greater involvement in care planning (65%), & clearer understanding of how care planning works (79%), better relationships with HCPs (62%) easier access to services (58%). 54% reported no change in service provision. **Service outcomes:** NS reductions in emergency admissions or ED visits. **HCP outcomes:** <u>Satisfaction with services</u> Dissatisfaction with the degree of integration between the IT tool and other clinical information systems, especially the existing electronic patient records systems. Dissatisfaction with the amount of care planning running the risk of this becoming a 'tick box' exercise. Satisfaction with increased contact with clinical colleagues (57%) with increased inter-professional learning (79%), clinical knowledge	professionals in order to understand participant experiences as well & understanding pilot within the national policy context. **Q.10:** **HCP specific:** Time consuming e.g. in creating case plans, time spent at MD meetings. Skill deficits in MD teams to provide community based care **Service specific:** Complex IT system that is time consuming & costly, & a source of frustration re level of access to information, **Organization specific:** Complex governance arrangements can lead to lack of clarity on lines of accountability & decision making, Lack of clarity on roles & responsibilities, Lack of involvement of clinicians in planning & developing pilot, Implementing an over-ambitious pilot that risks disengagement amongst those who do not see improvements in one year. **Q.11**. **Practice specific:**	governance arrangements, a support team and a data-sharing platform. Concluded that progress has been made at a strategic level in terms of designing and implementing the pilot, bringing together a number of organisations with a common goal and visions. Large scale change is complex and time-consuming and successful integration ca be expected to take many years. .

				(76%) & collaborative working (72%). **Resource outcomes:** NS reduction in costs. **Q.8:** NR	Collaborative ways of working need to be adopted as “business as usual” rather than being seen as additional responsibilities. **Organization specific:** Participatory ethos Shared vision Leadership	
RAND (2012) UK Report prepared for DOH UK. National evaluation of IC pilot projects (n=16 pilot initiatives with a subset explicitly relating to chronic diseases (n=5) or long term conditions (n=X)	To report on a “real-time evaluation of the Department of Health (DH) Integrated Care Pilots (ICPs)”. (p.1)	**Q 1:** IC conceptualised rather than defined with reference to 4 key elements: “(a) the types of integration (e.g., functional, organisational, etc.); (b) the breadth of integration (i.e., vertical or horizontal); (c) the degree of integration; and (d) the process of integration (i.e., structural, cultural, social)” (p. 8). **Q.2:** Pilot projects were a 2 year DOH initiative that aimed to explore different ways of providing integrated care to help drive improvements in care and well-being in the UK. Organisations across the UK were invited to propose IC approaches	**Q.3:** Case management (n=2**),** Clinical care pathways (n=1), Care planning (n=3), Shared care plans across providers (n=2) including regular cross-provider communication & MDT meetings (n=1), Self-management support (SMS) (n=1), risk identification - secondary (n=4) & primary (n=1), Shift of specialist care into primary/community care, e.g. specialists going GP visits, community based geriatrician service & also involving a named key worker (nurses) involving care planning, monitoring & SMS visits, regular follow-up & contact as needed, liaising between	**Q.6.or 7:** **Note:** S value not applicable for some outcomes relating to qualitative data. Reported where applicable. Also- results are for all 16 pilots and data specific to the 5 sites on chronic diseases could not be extracted separately. **Patient Outcomes:** <u>Satisfaction with care</u> **Process outcomes:** <u>Communications</u> Increased team working and intra-(51%) & inter-organisation (72%) levels reported by staff. Fewer patients listed to (S) <u>Care co-ordination</u> Increased % patients following hospital discharge (S).	**Q.9:** Mixed method evaluation of pilot sites drawing on qualitative & quantitative data. Used surveys, interviews, non-participant observation, service utilization data & cost analysis. **Q.10:** **HCP specific:** Concerns about confidentiality of shared patient records and ownership of these. Inadequate staff training Good existing relationships between individuals within & across organisations **Service specific :** Difficulties in using IT systems including delays in accessing information, linking between organisations, and lack of a common language between providers. **National**	**Researchers’ Comments:** IC is a way of dealing with problems of specialisation and organisational differentiation. ‘Integration’ is not to be seen as an alternative to ‘specialisation’. Rather, it fosters adaptable models of care combining specialisation and standardisation with collaboration & personalisation.

		and interventions that reflected local needs & priorities. 16 were chosen for participation some of which focused on chronic diseases/ long term conditions. Scale of integration was mostly at meso level i.e integration of practitioners working in different organisations & which was horizontal e.g. between community-based services, such as GP practices, community nursing services & social services – rather than vertical integration – e.g., between primary care & secondary care.	secondary & primary care (n=3), Standardised assessment of disease severity and review of therapy (n=1), Patient-held records (n=1), Action plans for lifestyle behavioural changes (n=1), shared patient registries across providers (n=1), Tele-care (n=1) **Q.4:** Most common features across pilots were risk identification, care planning & shift in specialist care into the community. **Q.5:** Chronic diseases explicitly referred to in 5 pilots were: COPD (n=3), CVD (n=2), CHF (n=1), Diabetes (n=1). Details of ‘long term conditions” in 7 pilot initiatives were NR apart from reference to ‘mainly chronic conditions” in one pilot.	Increased % of patients reported speed of access to GP surgery (S) More patients received timely referrals (S) Care planning Improved (S) Decreased patient involvement in decision making (S) Medication management Decreased prescribing errors **Service outcomes:** (n=2 re CVD & diabetes) Service utilisation NS differences for hospital admissions, ED visits or outpatient attendances. **Resource outcomes:** Cost savings not evident in the short term **Q.8:** Common approaches identified as ensuring integrated care were: (i) Single point of access/referral, (ii) Key worker/case manager approach where staff within and across organisations work together through the coordination of a case manager, (iii) Single	Policies, processes or legislation. E.g. “financial structures of primary care, secondary care & social care in the UK make pooling budgets for joint initiatives a complex, time-consuming and sometimes impossible task” (p.75). **Q.11:** **HCP specific:** Staff Training for new ways of working & new roles Lack of engagement Perceived threats to professional identity **Organization specific:** Clarification of roles & responsibilities Strong senior executive, clinical & team leadership Shared vision & values Building governance & performance management systems Making & developing the local business case for IC Changing attitudes and behaviours toward quality improvement Developing necessary infrastructure (including information technology) **Resource specific:** Establishing supportive financial systems and incentives	

				pathway where a single assessment and plan is shared and used by all care providers incl. a patient-held plan. Overall, key to delivering IC was improved communication within and across organisations incl. virtual teams (e.g. informally through networks and alliances), MDTs, Shared information technology, & Co-location (i.e. professionals from different organisations sit and potentially work together in the same place to offer a common service)		
Apteligen (2011) UK Research Report on London Councils Diabetes Integrated Care Research based on 3 service areas.	"to understand the existing level of integration of diabetes services in London, the policy and operational barriers to integration, and the opportunities during the next stages of health and social care	**Q 1:** NR **Q.2:** Implementation of models of integrated diabetes care in London.	**Q.3:** Diabetes care pathways with triaging to intermediate or secondary care (n=1), clinically-led by GPs, hospital doctors and other care professionals and brings together organisations from both health and social care(n=1) Care delivery supported by aligned financial incentives & and information infrastructure for sharing of information between	**Q.6.or 7:** NR **Q.8:** NR	**Q.9:** Mixed Methods: Wide stakeholder engagement with leaders of diabetes services, representatives of regional and national bodies, and supplemented with detailed review of relevant documentation and a rapid review of recent international literature. **Q.10:** **HCP specific:** Professional boundaries Concerns about confidentiality	**Researchers' Comments:** Key recommendations were to: Develop a robust business case to support investment in integration between health and social care (for people with type 2 diabetes) Promote and share best practice in order to build a more comprehensive and practical evidence

	reform” (p.11)..		HCPs (n=1), Joined up primary & secondary care through joint commissioning and provider networks. **Q.4:** **J**oined up care common to all 3 **Q.5:** Diabetes.		and sharing of data **Organisation specific:** Lack of IC infrastructure e.g. human resources, IT systems, staff training programmes. Lack of common leadership structures across organisations **Resource specific:** Misalignment of financial incentive Unwillingness to invest funding up front **Research specific:** Insufficient evidence base on the benefits of IC or evaluation evidence of what works best **Q.11:** **Service specific:** Shared information systems, including care plans and patient records **Organization specific:** Clear governance & team accountability Strong clinical leadership Changes in organisational structures and behaviours Workforce reconfiguration aligned to the care pathway Common performance management arrangements **Resource specific:** Shared funding systems and financial incentives	base for integration. Provide Clinical Commissioning Groups with the tools necessary to develop provider networks across health and social care, as a means to facilitate greater clinical and service level integration Support Health & Wellbeing Boards to commission services which reflect the wider responsibilities local authorities can play in prevention and promoting healthy lifestyles.

Rosen et al. (2008) & Greene et al. (2009)* UK Report of the 2008 Sir Roger Bannister Annual Health Seminar convened by Nuffield Trust UK. 2 cases studies from UK presented. Peer reviewed paper reporting on an evaluation of one of the pilot cases (Tayside) discussed in this paper. Data from this paper is marked with *.	To summarize discussions at an annual health seminar on integrated care for people with chronic illnesses drawing on UK experiences as well as US experiences.	**Q 1:** Integrated care was not specifically defined. Noted that integration has not been well defined but has been suggested as showing promise to address the problem of fragmentation in health services. A description of integration was provided and is presented for Q 2 below. **Q.2:** Integration: “a single system of needs assessment, commissioning and/or service provision that aims to promote alignment and collaboration between the cure and care sectors. The goals of integration are to enhance quality of care, quality of life, patient outcomes and efficiency in the use of resources. Integration may be ‘horizontal’ between primary, community and/or social care organisations. Or it may be ‘vertical’ between primary, community and	**Q.3:** “Joint goals, a very close-knit and highly connected networks of professionals, Little concern about reciprocation, underpinned by a mutual and diffuse sense of long-term obligation, High degrees of mutual trust, Joint arrangements which are ‘core business’ rather than marginal, Joint arrangements covering operational and strategic issues, Shared or single management arrangements, Joint commissioning at macro- and micro- levels” (sourced from Glendenning et al, 2002)[29]. **Q.4:** NR. **Q.5:** Diabetes (type 1& 2) in one case study: the Tayside Managed Clinical Network Board & diabetes, COPD & renal in the second case study: Working together for Health in Birmingham & Solihull. No further details	**Q.6.or 7:** The Tayside Managed Clinical Network Board: Reported in Green et al. (2009) marked with * **Patient outcomes:** Changes in clinical status* Improved HbA1c (T2D) in greater & of caseload (S) Fewer achieving clinical target for systolic BP (S) Higher % achieving clinical targets for systolic & diastolic BP (S) & cholesterol (S) **Process outcomes:** Health monitoring* Increased screening for bloods & BP, cholesterol, feet & eyes (S). Noted that retinal screening was slow requiring redesign of care pathway. Standardizing care Common standards of clinical practice & integrated care pathways developed by hospital & community clinicians working together. **Organization outcomes:** Integrated governance structures established. *Working together for*	**Q.9:** Seminar discussions on experiences incl. comparisons with US. Observation methods to evaluate pilots and comparable population groups were proposed. Noted that evaluating the impact of integrated care may not be possible with RCTs. Mixed methods evaluation used for *The Tayside Managed Clinical Network* – analysis of data from 7 year period (Greene et al. 2009) **Q.10:** **Service specific:** Challenges in bringing all GPs in a PC trust into an integrated care organization (no further details). Starting with larger groups because of the need to build trust across multiple organizations. **Resource specific:** Inadequate funding for primary care led integration. Reported that: “without a designated (probably risk-adjusted and capitated) budget for a defined population, linked to real transfer of financial risk and	**Researchers’ Comments:** Discussions on the UK experiences centred around the application of integrated care organisations pilot programmes growing on US experiences. These pilot programmes were proposed by the UK Report High Quality Care For All – NHS Next Stage Review Final Report[30]. Greene et al. concluded that “Delivering better care to whole populations across organisational and professional boundaries required sustained work over long periods, and at all levels of the system of care” (p. 456). **UCC Author comments:** The paper by Greene et al. was included here because of its link to Rosen et al. (2009). The paper was retrieved based on a specific search for *The Tayside Managed Clinical*

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[29] Glendenning, C (2002) ‘Breaking down barriers: integrating health and care services for older people in England’,*Health Policy* 65: 139–151.
[30] Department of Health (2008) *High Quality Care For All – NHS Next Stage Review Final Report.* London: TSO (the Stationery Office).

		hospital services, with or without social care. In addition, it may be ‘real’ or ‘formalised’ through organisational mergers or ‘virtual’ in the form of networks between different organisations underpinned by contracts or informal agreement” (p.2).	provided.	*Health in Birmingham & Solihull:* Relationships between clinicians across organizations have deepened. Clarity of roles & responsibility established through the development of 8 ‘commissioning principles’. Noted that while acknowledging the Governments desired outcomes of integrated care relating to efficient processes for sharing and implementing improvements, there is also a need for a single outcome measure of success. Changes in healthcare utilisation are suggested as having a uniform set of data across all organisations. Additional outcomes would be “additional measures of health care utilisation, clinical and functional outcome and patient experience with qualitative data on the processes of integration would all form part of an	real opportunities for profits, there would be not enough ‘grit’ in the system to drive change” (p.7). **Q.11:** **Patient specific:** Self-management support & and shared treatment decisions. **Practice specific** Starting point should be at the level of improving patient experience, clinical outcomes & value for money. This approach will result in greater ‘buy in’ and clinical engagement from clinicians, more so that presenting organisational visions for IC. **HCP specific:** Shared goals & processes across clinical teams. **Service specific:** Pursuing population & health promotion goals which will be maximized if ICO pilots are formed around registered populations of GP practices. Integrated data systems e.g. between hospitals & PC with implications for data protection noted. Serving a population size of at least 50,000 noted as a reasonable position for IC	*Network* aimed to identify evaluations of pilot projects.

				evaluation, alongside the single comparable end points" (p.12). **Q.8:** No single 'best way' available for integrated care but noted that there are common ingredients that contribute to success. **See Q. 11.** In addition: national leadership. **Noted** in Greene et al's paper that "achieving widespread clinical engagement through persuasion and appeal to shared professional values by clinical leaders" was one of the most important strategies needed for change.	programmes (with reference to managing an acceptable level of financial risk on a risk-adjusted capitated budget). Smaller groups more likely to make rapid progress because less time needed to build trusting relationships. Scaling up from successful pilots. Forming close networks in the services **Organization specific:** Creating a receptive & supportive context for a shift to IC e.g. pooling budgets, data transfer between organisations, encouraging individuals to work in more than one organisation, strengthen commissioning for performance management & outcomes. Robust governance & transparent accountability e.g. clinicians & general managers working together with shared goals. Joint strategic discussions between ICO leaders, PC trusts & acute Trusts. Shared goals & processes across organisations. Strategic relationships. **Resource specific:** Financial incentives for GPs & PC colleagues.	

DENMARK						
Frølich et al.(2010) Peer reviewed paper evaluating implementations of integrated healthcare rehabilitation drawing on 4 cases.	“to describe the process and results of a project that led to the development of new management practices and improvement of existing ones to support integrated care between three healthcare organisations” (p.2).	**Q.1:** NR **Q.2:** Integration & implementation of rehabilitation programmes in 4 chronic conditions. The project took place from 2004 to 2007. Chronic care model (CCM) was used as a framework for integration and collaboration in & between organisations supported the development of new management practices & the improvement of existing ones with reference to vertical and horizontal integration. Three organisations collaborated: a University Hospital, the City of Copenhagen, and the GPs in Copenhagen. Programmes conducted in group settings with the path of care from the first visit in a GP’s office or the hospital outpatient clinic through completion of the follow-up programme. Programmes added to	Q.**3:** Health care organisation (new management practices, inter-organisation leadership, joint steering committee overseeing implementation, development of shared guidelines etc.; working groups of clinicians at lower organizational level; networking meetings for sharing knowledge), Decision support (disease specific clinical guidelines developed, stratification), Self -management support (Personal action plans in collaboration with HCPs, Structured patient education programmes for each conditions), Delivery design systems (shared HCPs training on chronic condition, MDT working), Clinical information system (mostly fax transmission, mail or telephone calls, information systems were separate i.e. GP or hospitals which was barrier to sharing), **Q.4:** NR	**Q.6 & 7:** Results in paper are specific to COLPD programme only. **Patient outcomes:** Change in clinical status NS change in BMI Functioning status Improved (S) Health behaviours Positive changes in exercise (86%) & dietary habits (42%) for COPD Quality of Life Improved physical (S), NS change in mental component Satisfaction with care Satisfied for COPD (95%) **Process outcomes** Quality of care Improved practices to support integration e.g. use of clinical guidelines, population stratification, consistent performance measures, and teaching programmes for staff, Collaborations viewed favourably by HCPs Communication Only 39% of GPs satisfied with discharge summaries re patient information	**Q.9:** Mixed methods: Survey of GPs & patients, assessment of clinical data; Interviews with external stakeholders e.g. HCPs, organizational leaders, Observations of knowledge sharing meetings. **CG.** Pre-implementation **FUP** at 12/12 **Q.10:** **Practice specific:** Risk stratification and referral procedures cumbersome for GPs. Use of different Information systems making sharing difficult **Organisation specific:** Governance that is split among three organisations i.e. hospitals, municipalities oversee health promotion & rehabilitation, & GPs Lack of professional leadership at department level (even though organizational leadership was present) **HCP specific:** Attitudes among specialists that GPs were not skilled to provide high quality care **Q.11:** **Organization specific:** Between-organisation	**Researchers’ comments:** CCM supported the implementation of programmes. Concluded that IC between organisations requires improved leadership collaboration & networking between professionals at the provider level. Collaboration is important between leadership and healthcare providers of organisations. Needed are: alignment of financial incentives, interoperable IT with sharing of data between organisations. There is a need to develop methods for routinely assessing the level of integration in healthcare, especially in relation to organisational goals and expectations

		usual care.	**Q.5:** COPD, type 2 diabetes, CHF & falls in elderly people.	**HCP outcomes** Satisfied with collective education, Positive change in attitudes Expertise from hospital specialists valued by health centre staff. **Q.8:** NR	leadership was fundamental to improving integration between the organisations. Involvement of all stakeholders **HCP specific:** Commitment to change & quality improvement **Resource specific:** Alignment of financial incentives	
NEW ZEALAND						
Cumming (2011) Policy paper drawing on publications & policies on New Zealand's healthcare system & changes over time.	"Provides an overview of integrated care in New Zealand" (p.1).	**Q 1:** IC: a " service delivery that provides a 'smooth and continuous' transition between services i.e. 'co-ordinated' care with co-operation and collaboration across services and a 'seamless' journey for service users, as they receive health, support and social welfare services from a range of health and other professionals" (p.2) **Q.2:** Addresses **h**ow recent major reforms to the health system support integrated care for service users & whether these reforms have been successful. The ongoing challenges faced by New Zealand in achieving	**Q.3:** Financing, planning, funding, purchasing, and service delivery **Q.4:** NA **Q.5**: Not specific to chronic diseases but reported on challenges for integrated care being greater for this population.	**Q.6.or 7:** **Key Findings:** Changes in levels of integration from the 1990s through to 2000s in New Zealand, has seen a shift from macro level only to including both macro level and meso- level integration. Macro level includes: Regional alliances for planning & funding for some services, district health boards for public & secondary care. Meso level include: Service budgets e.g. capitation for primary health care organizations as first point of service contact, Amalgamation of primary care organizations, Integrated	**Q.9:** Literature review incl. research & policies in NZ. (See Final column). **Q.10:** **Patient specific:** Multimorbidity **–** people with 2 or more chronic conditions have greater difficulty accessing integrated care compared to those without chronic illness (26% vs 19%). **Organisation specific:** Lack of collaboration between organisations & professionals, Poor communication between services e.g. patient data **Q.11:** **Organisation specific:** Change in cultures and attitudes, Taking time to develop co-operation and collaboration, Developing	**Researchers' Comments:** Financing, planning, funding, purchasing, and service delivery are the key functions to be considered in supporting integrated care. Distract Health Boards are increasingly working towards more integrated care especially for people with chronic illnesses. Noted that although some evidence available, overall there has been little effort to evaluate integrated care initiatives has been made in NZ, therefore little known about what is happening and why.

		better integrated care over the coming few years are considered.		family health centres & clusters. **Q.8:** See success factors in Q. 11.	formal relationship agreements, Enthusiastic leaders & champions, Political commitment to change, Involvement of clinical staff, Close monitoring of progress, Physician & manager partnership. **Resource specific** Realistic timeframes; Adequate initial funding	

Appendix 7: Models of Care Data Extraction Disease Specific

Authors, Date, Country **Type of Evidence (dates if reviews)**	**Aim**	**Q.1: Definition(s) of models/programme(s)** **Q.2: Description of models/programme(s)**	**Q.3: Features/Components of models/programme(s)** **Q4: Shared/Different features if applicable (i.e. more than one models/programme reported** **Q5: Chronic Disease(s) Context**	**Q.6 &7: Outcomes assessed & Effects/Impact on outcomes** (Intervention Group = IG; Control Group = CG; Follow up = FUP). Findings presented as IG vs CG/FUP unless otherwise stated. S = Statistically significant NS = Not statistically significant. **Q. 8: Features/components of models/programme(s) associated with improved results**	**Q.9: Evaluation of models/programme(s)** **Q.10: Implementation Barriers** **Q.11: Implementation Enablers**	**Researcher Comments &/or UCC Authors' comments**
			MULTIPLE MODELS/PROGRAMMES			
Nurmatov et al.(2012) UK Syst. Rev. (n=3 incl. 2 RTCs, & 1 CCT) 1990-2012. Data drawn from 3 countries	"To assess the effectiveness of interventions designed to deliver holistic care for people with severe COPD" (p.1).	**Q.1:** NR **Q.2:** 3 Models: Phoenix-Care (integrated nurse case management with intensive home based care); Respiratory nurse led case management; & Community Care for COPD. All 3 designed to deliver or enhance holistic care (i.e. addressing physical, psychological, social and spiritual needs) compared to usual care in any healthcare system for people with severe COPD. All interventions were led by nurses acting in a coordinating or case-management role.	**Q.3:** Physical care (n=3, e.g. Medical management, emergency, disease & health education), Psychological care (n=3 e.g. Emotional support), Social care (n=3 e.g. mobilising family & community support); spiritual care (n=2, e.g. assessment, advanced care planning). **Q.4: See Q. 3 –**physical, psychological & social care across all 4 models. **Q.5:** COPD (with some Asthma) or CHF. Mostly older adults≥ 65 years. Total sample = 355.	**Q.6 &7:** **Patient Outcome:** Changes in clinical status Improved symptoms (n=1,S at 3/12, not sustained) Functioning status: Improved walking (n=1,S) Quality of life (n=3) Improved (n=1,S), NS difference (n=2) Satisfaction with care Improved (n=1,S) & noted in a qualitative data (n=1) **Services Outcomes:** Service utilisation (n=3) NS differences (n=3) **Q. 8:** NR	**Q.9:** Systematic review (see aim) **CG:** Usual care/inpatient care. **FUP:** 6/52 to 9/12 **Q.10: NR** **Q.11**: Voluntary sector may have relevance for societies in the form of Local patient support groups.	**Researchers' comments** Small trials leave the evidence inconclusive.
Grover & Joshi (2015) India	"To examine various existing chronic disease	**Q.1: NR** - only themes presented.	**Q.3:** Components specific & overlapping across models: Health system & health organisation	**Q.6 &7:** **Note**: S. value not reported in paper.	**Q.9:** Meta-review to provide an overview of chronic disease	**Researchers' comments:** An improvement in chronic disease management

Syst. Rev. (n=23 incl. 12 intervent-ional, 10 cross-sectional & 1 descriptive study) 2003- 2011 Data drawn from 5 countries	models, their elements and their role in the management of Diabetes, Chronic Obstructive Pulmonary Disease (COPD), and Cardiovascular diseases (CVD)”(p.210)	**Q.2:** Five chronic disease models reviewed: Chronic Care Model (CCM, n=20), Innovative Care for Chronic Conditions (ICCC, n=4), Stanford Model of Chronic Disease Self-Management Programme (CDSMP, n=1), Transitional care model (TCM, n=1), Improving Chronic illness Care (ICIC, n=1). **Note**: Some studies included more than one model hence total number exceeds 23 studies reviewed.	(n=12), Clinical Information system (n=12), Decision Support (n=13) , Delivery system design (n=20),Symptom management support (n=20), Community linkages (n=9); **Note** – most studies with above components related to CCM. Other components incl. Building integrated health care (n=1), care centred on patient & family (n=3), self-management or similar (n=16), patient safety (n=1). **Q.4:** See Q. 3 Most common features (>50% of programmes): Self-management support, delivery system design (n=20/23; 87%) Different/Least common features: Community linkages (n=9/23; 39%) & additional components presented. **Q.5:** Diabetes (n=21), CVD (n=10) COPD (n=3).	Results presently broadly & not for specific outcomes. **Patient Outcomes:** Change in clinical status (n=18) Improvement in 13/23 studies on clinical outcomes incl. HbA1C (n=13), lipids (n=11), blood pressure (n=10) Health behaviour Improved adherence to treatment care (n=6) & self-management (n=3). Quality of life, Improved (n=7) **Process Outcomes:** Health monitoring Improved in line with guidelines for diabetes related screening (n=5), neurological testing (n=3), routine lipid test rates (n=7) **Q. 8:** NR	management models. **Q.10:** **HCP specific:** Competing demands on primary care practices, Time pressures, Difficulty defining the different elements of the chronic disease model and their methods of implementation. **Q.11:** **Practice specific:** Team based approach Case managers to bridge primary care & specialist services **Organisation specific:** Team effectiveness with team champions Senior manager support Developmental change with leadership Education of staff & change management. New approaches to educating primary care teams on disease management Centre organisation & co-ordinating structure to bring services together. Greater support for primary care physicians to access services. Electronic Information systems	requires that the delivery system “adopts a primary health care orientation emphasizing comprehensives of care and the overall health of the patient” (p.224). A redesign of the healthcare system is needed.

CHRONIC CARE MODEL						
Adams et al. (2007) USA Syst. Rev. and Meta-analysis (n=32 incl. 20 RCTs, 5 CCT & 7 Before/ After studies. 1966-2005 Data drawn from 11 countries	"To determine the following: (1) which CCM components have been implemented in patients with COPD and (2) what combination of CCM components are associated with improved outcomes" (p.552).	**Q1:** NR or explicit Refers to component of CCM (see Q. 2). **Q2:** Application of CCM components in patients with COPD focusing on prevention or management. The components "involve the community and heare associated wialth system and include self-management support, Delivery system design, decision support, and clinical information systems"(p. 552).	**Q3:** Only 1 CCM component in most studies, mainly self-management (n=28, education, behaviour and motivation), More than 1 CCM component in 8 studies ranging from 2 to 4 but the combination of components (i.e. self-management, delivery system design, decision support, and clinical information systems) if < 4 was NR. **Q4:** See Q3. – Most common components were self-management. All other components were less common as reported in ≤ 25% of papers. **Q5:** Patients with COPD (age groups or total number NR)	**Q6&7:** **Patient Outcomes:** Changes in clinical status (n=7) Improved dyspnoea (n=3,S), NS differences (n=4) Improved FEV1 (n=1), NS differences (n=4) Quality of Life (n=10)_ Improved (n=2,S), NS differences (n=8) Functioning status (n=5) NS improvement (n=5) Mortality (n=3) NS differences (n=3) Psychological health (n=1) Decreased anxiety and depression (n=1,S) Knowledge (n=9) Improved (n=5,S), NS differences (n=4) **Service Outcomes:** Service utilization Reduced ED/unscheduled visits (n=7, S). Reduced hospitalisations (n=4,S) Reduced LOS (S) **Resource outcomes:** Costs Reduced (34% to 70%) due to reduced hospitalisations (n=3, S,NR) **Q.8:** Studies with ≥ 1 CCM component had more significant positive changes than studies with only 1 CCM component. Reported that: "There were no significant differences for those receiving only 1CCM component" (p. 551).	**Q9:** Meta-analysis (see aim). **CG:** Control or comparison groups (no further detail) or before/after. **FUP:** 6/52 to 24/12 (mean=10/12). **Q10:** NR **Q11:** NR	**Researchers' comments:** Limited published data evaluating the CCM components in patients with COPD. Studies with better-defined and more powerful theory-based interventions should be undertaken.

Solomon (2008) U.S.A Syst. Review (n= 28 studies in 32 papers incl. 6 RCTs, 9 case studies, 6 surveys, 4 quasi experimental, 2 pilots, 2 qualitative, 2 mixed method, & 1phenomenological).	“to determine the extent to which IT is applied to enable consumer/ self-management and healthcare provider support of these activities (p.392), particularly how self-management technology supports the chronic care model” (p. 391).	**Q.1:** CCM: The CCM is a system… [where] healthcare organizations, embedded in the larger community system, provide the core care delivery and information systems infrastructure to support multi-disciplinary care teams collaborating with chronically ill patients… in which information is flowing across organizational boundaries to promote the accumulation of knowledge by care teams and patients as they work together to improve health outcomes” (p.394). **Q.2:** Various self-management support provider oriented IT applications. 19% of studies based on CCM.	**Q.3:** Self-management education; internet access to health information (n=8), online forums and discussion boards (n=7), secure online communications (n=5), interactive learning modules (n=3), patient monitoring, electronic diaries, health risk assessments (n=11), patient registry with reminders to providers and/or patients (n=6). Provider-based electronic medical records (n=7); provider alerts (n=5), collaborative care planning with care teams and patients (n=2). Motivational coaching (n=3). **Q.4:** Most common features were tools for patient monitoring (33%). Least common was collaborative care planning- teams & patients. **Q.5:** Diabetes Mellitus (n=17), General chronic disease (n=5), heart failure (n=4), asthma (n=3), cancer (n=2), kidney failure (n=1), multiple sclerosis (n=1). 2 of these studies included multi-morbidity.	**Q.6&7:** The S value was seldom reported in this paper, most studies were cohort design. **Patient Outcomes:** Changes in clinical status (n=4): Reduction in HbA1c (n=1, NS n=3 unclear). Knowledge (n=4): Increased (n=4 S). Satisfaction with care Increased perceived social support (n=2, S). Quality of life (n=1): Improved (S). Depression (n=1): Reduction (n=1). Health behaviours (n=7) Increased compliance (n=3, S) Satisfaction (n=7): Increased (n=7, S, NR) **Process Outcomes:** Health monitoring (n=5) Increased blood glucose testing (n=1,S, NR), eye & foot exam(n=2,S,NR). Increased risk identification by HCPs (n=3, S, NR) & self-assessment (n=4, S, NR). Communication (n=1) Improved between patient & HCP. (n=2, S, NR). **Resource Outcomes:** Costs (n=3): Computer generated reminders cost-effective (n=1) & overcome resource limitations (n=2). **Q.8:** NR	**Q.9:** Syst. Review to assess application of IT to self-management support. Details of CG in studies not reported. **Q.10:** **Practice specific:** Failure to integrate care managers & IT into primary work flow. Lack of integration between IT based self-management tools and providers’ clinical information systems, Inadequate infra-structure Inadequate capabilities & design of IT to support self-management, Patient attrition. **Patient specific:** Concerns about privacy & security if EMRs shared with patients. **Q.11:** **Practice specific:** Integration of care managers & IT into primary work flow. IT infrastructure in place towards health support network to share a common view of care guidelines in the context of a comprehensive personal health record. Reminders, summary reports and self-reporting allows provider to promote self-management activities in the patient, Self-monitoring technologies linking patients & clinicians.	**Researchers’ Comments:** Most studies focused on use of IT by individuals for self-education & monitoring with few exploring its use in collaborative self-management planning & activities. Review suggests that IT health to support CCM are implemented separately to self-management tools. Self-education tools need to be embedded in care processes. Current state of IT health falls short of a comprehensive health record enabling a clinically integrated health system, self-management systems have potential for organised system of co-ordinated chronic care management” (p.400).

de Bruin et al. (2012). The Netherlands. Syst. Rev. (n=33 studies in 42 papers incl. 14 RTCs with 1 pilot, 8 pre-test post-test, 5 CCTs, 3 cluster RCTs, 2 post-test, & 1 case control) 1995-2011. Data drawn from 7 countries.	"To provide insight into the characteristics of comprehensive care programs for patients with multiple chronic conditions and their impact on patients, informal caregivers, and professional caregivers" (p.108).	**Q 1:** Comprehensive care programmes (CCPs) defined but not CCM **Q.2:** Programmes[31] reviewed related to chronic disease management (n=5);[32] care/service initiatives (n=17);[33] Older adult care/services (n= 11).[34]	**Q. 3:** Self –management support (SMS n=25); Delivery System Design e.g. case management, MDT involvement regular follow up (DSD n=26); Decision Support (DS n=17); Clinical Information systems (CIS, n=13); Healthcare system i.e. context of care provision (HS n=4); Community resources & policies (CR n=13) **Note**: components relate only to studies specific to chronic disease management (n=26). See UCC Authors' comments in final column. **Q.4:** See Q3- Most common features (> 50% of programmes): SMS, DSD & DS. Least common was HS. **Q.5:** Most single diseases with some multi-morbidity mostly older adults.	**Q. 6&7:** **Patient Outcomes:** Changes in clinical status (n=1) Decrease in $HbA1_c$ & LDL cholesterol (n = 1 S) Functional status (n=8) Improved (n = 4 S); NS differences (n=4) QOL (n=15) Improved (n=4, S), decreased (n=1, S & n=1,S NR), NS difference (n=9) Satisfaction with care Improved in patients/ caregivers (n=4-S, n =5-S NR) NS difference (n=1). Mental health (n=4) Improved depression scores (n =1,S); NS difference (n=3) Health behaviours (n=4) Increased medication compliance (S NR); Increased Self-Efficacy (n=1, S, n=2 S, NR) Mortality (n=3) Lower (n=1 S); NS difference	**Q.9:** Systematic review (see aim). CG: usual care for most studies, no further detail. **FUP**: 4/12-36/12 **Q.10: Patient -specific** Non-compliance **HCP-specific:** Limited understanding of the care involved Skill deficit **Practice-specific:** Inadequate integration into daily practice. **Resource specific:** Insufficient time to adapt to new care models **Q11:** NR	**UCC Authors' Comments** **Re Q.2:** All included papers in this review were screened. A total of 7 papers were **not** specific to chronic disease management. Instead these related to general problems e.g. falls, incontinence, functional abilities in older adults. These papers are marked with asterisk (*) in footnotes 3&4).

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[31] Due to the volume of individual titles on programmes, we have broadly categorised them in the table and have named these in footnotes as follows.

[32] Disease management (DMP n=1); Care Management Plus, multidisease care management (CMP, n=1); Chronic Disease Self-Management Program (CDSMP, n=2), Disease State Management (DSM) programme n=1).

[33] Enhanced care initiatives (ECI n=1); Transitional care (n=2); Guided Care integrating RN into primary care practice with physician (GC, n=3); Integrated multidisciplinary advocacy program (IMAP, n=1); Nurse Physician Collaborative Partnership (n=1); Telehomecare (n=2); health enhancement (n=1); Rural home care project (RHCP, n=2); nursing health promotion (n=1); Nurse care Management system (n=1); Chronic care clinics; (CCCs, n=1)*; Managed care plus screening, case finding, and referral system for older veterans in primary care (n=1);*

[34] Integrated Services for Frail elderly (SIPA n=1); Geriatric Evaluation & Management clinic (GEM, n=1); Older Hospitalized Patients' Discharge Planning and In-home Follow-up Protocol (OHP-DP, n=1); Frail Elderly Community-Based Case Management (FEC-BCM, n=1), Integrated Community Care for Older People (ICCOP (n=1); After Discharge Care Management of Low-Income Frail Elderly (AD-LIFE) (integrated medical and social care) (n=1); Geriatric Resources for Assessment and Care of Elders (GRACE, n=1); Geriatric Evaluation Management Unit (GEM/GEMU, n=2);* Geriatric Assessment Service (GAS, n=1);* Geriatric Home Hospitalization Service (GHHS) (n=1).*

[5] Van Tulder M, Furlan A, Bombardier C, Bouter L. Updated method guidelines for systematic reviews in the cochrane collaboration back review group. Spine (Phila Pa 1976) 2003;28:1290–9.

Verhagen AP, de Vet HC, de Bie RA, Kessels AG, Boers M, Bouter LM, et al. The Delphi list: a criteria list for quality assessment of randomized clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology 1998;51:1235–41.

				(n=2) **Service Outcomes:** Service Utilisation (n=20): Increased home care/GP visits (n= 1 S; n=4 NS difference); Reduced ED visits (n=5, S; n=7, NS differences; more ED visits in IG n=1 S; n=3 S NR); Lower long term stay care (n=2, S; n = 3 NS differences; n=2 S NR). **Resource Outcomes:** Costs (n=13): Mixed - decreased (n = 3 S; n=5 S NR; n= 5 NS differences). **HCP Outcomes:** Satisfaction with care (n =3) NS difference (n=2); Improved (n =1 S NR) Knowledge Improved re clinical/patient (n=1S) **Q. 8:** Reported that difficulty in determining "to which program components positive effects could be attributed and under which circumstances comprehensive care programs may be most effective" (p.141).		
Mallow et al. (2014) USA Syst. Rev (n=23 all RCTs)	"to present an integrated review of the impact of Mobile Health (m-Health) interventions for community dwelling individuals with type 2 diabetes" (p.43).	**Q.1:** NR **Q.2:** mHealth described as a "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices".	**Q.3:** Health system organisation (HSO, n=5), Delivery system redesign (n=unclear), Clinical information systems (n=unclear), Community Resources & Policies (n= unclear), Self-management (n=10), Decision Support (n=unclear), Types of technology incl. smartphones, mhealth service, Bluetooth transmitted readings to web application, SMS texting.	**Q.6 &7:** **Note**: most results related to enablers or barriers to implementation/use see Q10 & 11. **Patient outcomes:** Change in clinical status (n=11) Improved HbA1c (n=8,S,; n=2, S NR), BP (n=2 S, n=1, S, NR), Cholesterol (n=1,S,NR) Knowledge & Self-management. Improved (n=1 S,NR)	**Q.9:** Insufficient data to extract CG & FUP details. **Q.10:** **Patient specific** Lack of technical support **Practice specific** Lack of face-to-face communication Lack of live technical support **Resource specific** Cost to patient,	

			Q.4: Based on data extracted, SM was most common feature**.** Insufficient reporting to determine least common feature. **Q.5:** Type 2 diabetes. Adults living in rural areas. Insufficient data for some studies to determine sample size reviewed.	Improved self-efficacy (n=1,S,NR) **Process outcomes** Health monitoring Increased tracking of physical activity (n=1, S, NR) **Q. 8:** NR	Technical problems and difficulty of use led to attrition**,** Limited access to care. **Q.11:** **Patient specific** Support to use technology Ease of use **Practice specific** Face-to-face communication & wireless communication **Practice specific** Telephone interventions	
Stellefson et al.(2013) USA Syst. Rev. (n=16 incl. 9 RTCs, 2 cohort, 3 ‘natural’ experiments, 1 qualitative, & 1 cross-sectional) 1999-2011. Data drawn from USA studies	“to determine how CCM has been applied in US primary care settings to provide care for people who have diabetes and also to describe outcomes of CCM implementation” (p.1). Note – aim was to present a qualitative understanding of application.	**Q.1:** CCM: “a systematic approach to restructure medical care , to create partnerships between health systems and communities” (p.1). **Q.2:** Application of CCM in US primary care settings to care for people with diabetes	**Q.3:** Health system- organization of health care e.g. redefining roles with nurses screening instead of PCPs (HSO, n=13), Self-management support (SMS, n=12), Decision support i.e. specialised diabetes support provided to PCPs & nurse practitioners via telephone/email, problem based meetings, telemedicine (DS, n=11), Delivery system design e.g. implementation of guidelines, diabetes days for patients (DSD, n=14), Clinical information systems e.g. disease registries, EMRs (CIS, n=15), Community resources and policies (CSP, n=7). Reported that only 6 of 16 studies implemented all 6 CCM components. **Q.4:** See Q3- Most common features seen in ≥ 50% of programmes were: CIS, DSD, HSO & SMS DS. Least common was CSP. **Q.5:** Diabetes- Adults mostly aged 50 to 70 years.	**Q.6 &7: Note:** No significance values reported. (See UCC authors’ comments in last column) **Patient Outcomes:** Changes in clinical status (n=11) Improved HbA1c (n=11), cholesterol (n=10), BP (n=3), weight (n=3) Knowledge & SM (n=7) Improved (n=7) Health behaviours Improved (n=2) **Process outcomes** Health monitoring (n=15) Improved screening (e.g. eyes/feet) (n=4), Increased tracking of clinical data & care processes/goals (n=12) Improved risk identification (n=1) Improved adherence to clinical guidelines (n=8) Communications (n=9) Improved interpersonal care processes & better patient – professional connection (n=8) but not if patients frustrated by	**Q.9:** Syst. Review to qualitatively assess allocation of CCM. **CG:** NR. **FUP.** NR **Q.10:** **Patient specific** CIS: difficulties in using technology for self-management. Poor diabetes knowledge, Low awareness of educational service Lack of support **Q.11:** **Practice specific** Training programmes for patients **Organization specific** Leadership. Changing staff roles e.g. nurses taking on screening 8 monitoring from PCPs. Training PCPs in evidence-based care	**Researchers’ comments:** Concluded that evidence suggests that CCM is effective for improving outcomes in diabetes related outcomes managed in primary care settings. Noted little emphasis on measuring process outcomes. **UCC Authors’ comments:** While acknowledging that this review sought “a qualitative understanding” on CCM application, papers were generally reported favourably in terms of positive outcomes but without reference to levels of significance. Having sourced the original papers, we noted that some studies in the review were baseline results, yet reported as positive outcomes in the review.

				technology (n=1) **Q.8:** Reported that **"**no single component of the CCM was imperative for improved outcomes" (p.5). Multiple components recommended.		For these reasons, we were prompted to include the original papers as full papers in our review.
Kadu & Stolee (2015) Canada Syst. Rev. (n=22 qualitative studies) 2003-2012 Data drawn from 5 countries, mostly USA.	"to identify facilitators and barriers encountered during implementation of CCM in primary care.	**Q.1:** NR **Q.2:** Barriers and facilitators were interpreted using the Consolidated Framework for Implementation Research (CFIR).	**Q.3:** Self-management support, Redesigning Delivery Systems, Decision support that is system wide, Clinical information technology, linkages to community resources & Health care system **Q.4:** NR **Q.5:** Varied – diabetes mostly where reported. Disease context not explicit in most paper. Samples were mostly health care professionals and some managers.	**Q.6 &7:** NA **Q. 8:** NA	**Q.9: NA** **Q.10:** **HCP specific:** Inadequate expertise in team management Lack of interest senior physicians **Practice specific:** Time pressures to implement Sustainability of the intervention **Organisation specific:** Lack of support & accountability from senior leadership Lack of resources for implementation Poor organisation of primary care. **Resource specific:** Staff turnover, union issues, inadequate role expansion, Inadequate finances & hidden costs. **Q.11:** **Organisation specific** Culture of multi-disciplinary or patient-centred care Willingness to advance and manage change	Reported that the findings highlighted the importance of assessing organizational capacity and needs prior to and during the implementation of the CCM, as well as gaining a better understanding of health care providers' and organizational perspective. Author reported that the uptake of CCM elements in the studies required a primary care culture supporting willingness to change and quality improvement at the individual clinician, team and organizational levels. **Researchers' comments:** Implementation is most successful when there is a shared vision and a recognized need across the organization for new care change approaches to promote effective execution of the CCM. Requires require time and flexibility to Implement and manage change processes in the primary care. Tailoring

					Leadership in the form of supportive administration and supervisors, with clear goals Shared vision Stable work force & relationships **Practice specific:** Changing policies and development of care teams to meet implementation needs Networks & communication between healthcare providers & organizations **HCP specific:** Facilitated by health care providers, particularly specialists and non-physician staff e.g. nurse practitioners. Education & training	interventions to the local context, as well as altering the context, for the process to be successful.
Piatt et al. (2006) , Piatt et al. (2010), Piatt et al. (2011) USA RCT (n=105)	“To determine whether using the chronic care model (CCM) in an underserved community leads to improved clinical and behavioural outcomes for people with diabetes” (p.811). To determine if improvements observed in outcomes were sustained at 3-year follow-up.	**Q.1:** “The chronic care model (CCM) is a multifaceted framework for enhancing health care delivery… based on a paradigm shift from the current model of dealing with acute care issues to a system that is prevention based” (p.811). **Q.2:** Two intervention types: CCM intervention and provider only education (PROV). CCM involved 6 self-management training sessions for	**Q.3:** Community (resources and policies), Self-management support, Delivery system design, Decision support, Clinical information systems, Organisational support. **Q.4:** NA **Q.5:** Diabetes in adults (mean age = 67.56 years)	**Q.6 &7:** **Patient Outcomes: (12 months FUP)** Change in clinical status: Improved HbA1C (S) in CCM; NS in PROV Improved non-HDL cholesterol (S only after adjustment for confounders) No changes in BP (NS) Quality of wellbeing: Improved quality of wellbeing in PROV (S) WHO-QWB10 scores decreased Diabetes knowledge & self-management: Improved knowledge in CCM (NS) Increased self-monitoring of blood glucose in CCM (S) Increased self-efficacy scores in	**Q.9:** RCT to assess the impact of the CCM on clinical and behavioural outcomes of diabetes patients. **CG** received usual care - providers were mailed their practice’s chart audit report and decision support items i.e. provider only information. Diabetes educator was not based in practice for visits etc but available by telephone for consultations. **FUP** at 12/12 & 36/12 **Q.10:** NR **Q.11:** CDEs delivering DSMT at point of service in several primary care practices and	**Researchers’ comments:** Differs from other interventions as the entire CCM was implemented as a multifaceted intervention can improve diabetes outcomes. Further post-hoc analysis (Piatt et al. 2011) found that psychosocial and socio-demographic factors accounted for greater variability and improvement in HbA1C, BP, and non-HDL cholesterol than treatment intensification. **UCC Authors’ comments:** RCT underpowered to

		patients facilitated by a certified diabetes educator (CDE remained in practice for 6/12) held weekly & monthly support groups for 12/12. CCM also involved one problem based learning session for health providers to encourage them to redesign current patient visit processes (a CDE was made available to providers). PROV consisted of one problem based learning session and access to CDE for consultation only (not placed in the practices). Intervention lasted 12/12.		CCM (S) **Patient Outcomes (3 yrs FUP)** Changes in clinical status: Improved HbA1C (NS) in CCM; no improvements in PROV and UC Improved non-HDL cholesterol in CCM (NS), PROV (S), and UC (NS). Improved systolic BP (NS) and diastolic BP (NS except for CCM) in all groups Quality of wellbeing: Improved quality of wellbeing in all groups (NS) Diabetes knowledge & self-management: Continued self-monitoring of blood glucose in all groups (NS except for UC group) **Q. 8**: NR (reported that no attempt was made to "dissect out the efficacy of individual components of [the] intervention…rather [they] implemented the entire CCM as [a] multifaceted intervention" (p.816).	using an empowerment approach. Flexible, patient centred approach to DSMT. .	detect significant differences in the primary and secondary outcomes due to the small sample size. The authors allude to the possibility of a type II error i.e. there may have been improvements in other outcomes that were unable to be detected.
Schillinger et al. (2009) USA RCT (n=339)	"To examine the effects of two self-management support strategies (automated telephone self-management support [ATSM] and group medical visits [GMV]) across outcomes	**Q1: C**CM: "an ecological model describing factors including self-management support that can improve functional and clinical outcomes" (p. 560) **Q2:** The ATSM model employs technology to provide surveillance, education and care	**Q3 :** Patient-oriented self-management support (both arms), Collaborative goal-setting with behavioural "action plans' (both arms), Automated calls triggering health messages &/or nurse follow up call (ATMS), face to face sessions with HCP (GMV). **Q4:** Both models consistent with self-efficacy theory and share objective characteristics of successful self-	**Q6 & 7:** **Patient Outcomes:** Changes in clinical status NS differences in HbA1c Reduced systolic BP and diastolic BP in ATSM & GMV (NS) NS differences in BMI Self-Management Improved diabetes self-efficacy & self-management behaviours in ATSM & GMV (S) Improved self-monitoring of	**Q9:** RCT to test effects of two self-support strategies **CG:** Usual Care **FUP: at** 12/12 Post-hoc analyses conducted to examine the relative superiority of ATSM over GMV. Greater participant engagement did not alter the effect size. Interpersonal processes of care reduced the effect size between ATSM and	**Researchers' comments:** "Traditional self-management support approaches often do not reach significant segments of the population with chronic disease, such as individuals who are uninsured or publicly insured or those with communication barriers, such as limited literacy or

	corresponding to the Chronic Care Model" (CCM) (p.559)	management while the GMV model employs a more interpersonal and collective approach with roots in adult educational theory and practice. ATSM arm received weekly, automated (pre-recorded) telephone calls. Each call takes between 6 and 12 minutes to complete. Call times are selected by patients and these can be altered or the patient can call the system toll-free. Patient responses triggered either immediate, automated health education messages and/or subsequent nurse phone follow-up. This follow-up involves a problem-solving approach with collaborative goal-setting and action plans. All interactions are documented on a standardised ATSM record. This record also serves to communicate with the patient's physician. The GMV arm involved 90-min monthly sessions co-facilitated by a primary care	management support. Both are system-level interventions that promote collaborative goal setting in the form of behavioural "action plans" in which patients set short-term goals to improve their self-management. **Q5:** Adults with poorly controlled Type 2 diabetes with a most recent HBA1C ≥ 8%. Aged 44-69 yrs.	blood glucose in ATSM & GMV (S) Improved foot care in ATSM (S) Increased physical activity in ATSM (S) <u>Functional capacity</u> Decreased days restricted to bed in ATSM (S) ATSM participants less likely to report that diabetes prevented them from carrying out ADLs <u>Mental health</u> Improved in ATSM vs GMV (S) & usual care (NS) **Process Outcomes:** <u>Engagement with interventions</u> 94% completed ≥ 1 ATSM call 69% attend ≥1 GMV Majority of action plans pertained to exercise and/or diet <u>Communication</u> Improved explanations of care processes & of self-care, and elicitation of patient problems and decision-making (S) in ATSM only. **Service Outcomes:** <u>Service utilization</u> Fewer bed days in ATSM (S) **Q. 8:** Improved CCM alignment of care in ATSM & CCM (S) (i.e. improved delivery system/practice design, goal setting, problem-solving, and follow-up coordination).	GMV on the behaviour and functional status domains **Q10:**NR **Q11:**NR	limited English proficiency" (p565). "The ATSM model is a more effective communication vehicle than GMV to deliver population-based self-management support and improve health-promoting behaviour and quality of life" (p. 565).

		physician and health educator. Role of co-facilitators focuses on goal-setting and action plans. All interactions are documented. GMV participants received bus tokens and healthy snacks.				
Turner et al. (2012) USA RCT (n=280)	"To evaluate a peer and practice team intervention on the reduction of coronary heart disease risk (CHD) and systolic blood pressure in African – Americans using the D'Agostino's 4-year CHD risk model". (p.1258)	**Q.1:** NR **Q.2:** 4 year programme of peer & practice intervention to reduce CHD risk and hypertension. Based on aspects of CCM over 6/12 of counselling and behavioural support through monthly phone calls from trained peer-patients whose hypertension was well-controlled and office visits with trained practice staff.	**Q.3:** Peer support, Counselling with entertaining, Educational slideshows and an interactive computer-based CHD tool, team based care **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Poorly controlled hypertension in adults aged 53-71years. African Americans. Diabetes in IG (54%) & CG (52%). 20% had prior CHD event.	**Q.6 &7:** **Patient Outcomes:** <u>Changes in clinical status</u> Reduced CHD-risk (NS) Decreased systolic BP (S) **Q. 8:** NR	**Q.9**: RCT to assess intervention on patients with CHD. **CG:** No programme **FUP** 6/12. **Q.10:** **Patient Specific:** Clinically complex patients with multi-morbidity incl. depressive symptoms Non-adherence to medications **Q.11:** (reported from previous literature). **Practice specific:** Registry-based information systems, Team-based care, Increasing providers' expertise and skill, Educating and supporting patients	.
Smidth et al. (2013a,2013b)Denmark Cluster RCT(n=16 GP practices as unit of randomizatio	"to determine the effect on healthcare-utilization of an active implementation model for a disease-management-	**Q.1:** NR **Q.2:** An active, structured implementation of a disease management programme (DSM) for COPD based on the main areas of the CCM.	**Q.3:** Policies and resources (smoking cessation programmes, joint home visits post discharge by GP & community nurse), Self-Management Support (e.g. education sessions, action card, website about COPD & related support groups), Delivery System Design (faxing information to GP following discharge, joint home	**Q.6 &7:** **Patient Outcomes:** Adherence to the disease-management-programme **Process Outcomes:** <u>Health Monitoring</u> Increased spirometry testing (S) <u>Health Promotion</u> Increased planned preventative	**Q.9:** RCT to assess effects **CG;** Practices without programme. **FUP**: 12/12. **Q.10:** NR **Q.11:** NR	**Researchers' comments:** Noted a need to explore the activities & implementation strategies that could easily be adopted in GP practices, comprising of multiple components of the CCM with a view of preventing

n. Included 38 GPs & 1,372 patients.	programme for patients with COPD” (p.1)	Targeted GPs & 3 hospitals with GP practice unit of observation.	visits, scheduled annual review of patients or more often if needed), Organisation of Healthcare (delegation of health monitoring to practice staff other than GPs), Decision support (podcasts for GP training, summarizing initiatives for information management, access to specialist for advice & practice consultation) & Clinical Information System (data base of patients). **Q.4**: NA- will be included in Final Report with reference to all papers reviewed **Q.5:** COPD in adults aged 36-65 years.	visits (S) **Service outcomes:** Fewer out of hours visits (S) Reduced hospital-admissions (S) No changes for LOS (S, NR) No differences for ED visits (S, NR) **Q.8:** Reported that unable to assess the effectiveness of the individual components of the intervention. GPs varied by selecting different elements of intervention.		complications and improving outcomes for patients with COPD.
Dickinson et al. (2014) USA Cluster RCT (n=40 primary care practices)	“to investigate…3 approaches for implementing the Chronic Care Model to improve diabetes care”.(p.8)	**Q.1:** NR **Q.2**: 3 approaches included: (i) practice facilitation over 6/12 using a reflective adaptive process (RAP) approach; (ii) practice facilitation for up to 18/12 using a continuous quality improvement (CQI) approach; and (iii) providing self-directed (SD) practices with model information and resources, without facilitation. Practice facilitation noted as a key method for assisting practices in implementing organizational changes.	**Q.3:** RAP: Change management & facilitation (with facilitators trained) with multi-method practice assessment & feedback on change & culture, & development of improvement teams. CQI: as above but with a structured Model for Improvement (e.g. self-management support -use of incremental plan-do-study-act cycles), supervisory team support facilitators. SD: no facilitators with limited feedback on culture etc. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Diabetes mainly: patients with a mean of 2 co-morbidities. Diseases NR other than mainly diabetes. Chart reviews (n=386 at 9/12 & 822 at 18/12)	**Q.6 &7:** **Patient outcomes:** <u>Changes in clinical status</u> NS changes in HbA1c or differences in BP or cholesterol **Process outcomes:** <u>Health monitoring</u> Improved health testing & screening in all 3 groups S & ≥ for CQI, S) **Organization outcomes:** Improved change culture @ 9/12 (S, ≥ for RAP vs SD) but decreased @ 18/12 (S) Decreased work culture from 9/12-18/12 (RAP, S); Both scores stable over time in SD and CQI practices.(NS) **Q. 8:** NR	**Q.9:** RCT to assess effect **CG:** 3 groups compared (see Q. 2**)** **FUP** 9/12 & 18/12. Assessed practice diabetes quality measures from chart audits and Practice Culture Assessment scores **Q.10:** NR **Q.11:** **Organization specific:** Culture- shown to be associated with successful innovation and quality of care in medical practices.	**Researchers comments.** Noted at the outset that implementing CCM in primary care settings has yielded disappointing results. All 3 strategies yielded significant improvements in process of care, CQI had greater improvements but may not result in improvements in practice change & work culture. Diabetes care remained suboptimal. Transforming practices will require major investment.

Frei et al. (2014) Switzerland. RCT (n=326 with 40 primary care practices enrolled.	“to test whether the implement-ation of elements of the Chronic Care Model (CCM) via a specially trained practice nurse leads to an improved cardiovascular risk profile among type 2 diabetes patients”(p.1039).	**Q.1:** CCM: “an evidence-based approach for the care of chronically ill patients. A central element of the CCM is the team-centred care approach which facilitates and produces effective interactions between proactive primary care practice teams, and empowers patients with the aim to improve processes and outcomes in patients with chronic illnesses” (p.1040 cited from [35].[36].) **Q.2:** A team based programme according to the CCM, which included the involvement of a practice nurse in the care for type 2 diabetes patients.	**Q.3:** Organisation of health and delivery systems (with involvement of practice nurse), clinical information systems (monitoring tool), decision support (monitoring tool) and self- management support, delivery design (team care; delegation of clinical activities to practice nurse) **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Diabetes with at least one glycosylated haemoglobin [HbA1c] 53mmol/mol in preceding year Adults aged 55y & over. Noted that many patients had multimorbidity.	**Q.6 &7:** **Patient Outcomes:** Changes in clinical status: HbA1c levels- NS differences Improved blood pressure (BP), LDL & Cholesterol (S for each) Quality of life NS differences Patients’ views on Chronic illness Care Improved (S). **Q.8**: NR	**Q.9:** RCT to assess effect CG = Usual PCP and the PCP-patient relationship with marginal involvement of practice nurses with 12/12 **FUP.** **Q.10:** NR **Q.11:** NR	**Researchers’ comments** Noted that the CCM can be implemented in small primary care practices despite being inexperienced, a context similar to many European health care systems.

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[35] Epping-Jordan JE, Pruitt SD, Bengoa R, Wagner EH. Improving the quality of health care for chronic conditions. Qual Saf Health Care 2004;13:299–305

[36] Wagner EH, Austin BT, Davis C, HindmarshM, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. Health Aff (Millwood) 2001;20: 64–78

DISEASE MANAGEMENT PROGRAMMES						
Hisashige (2012) Japan Meta-analysis & Syst. Rev. (n= 28 incl. of RCTs, CTs & quasi-experimental. 1995 - 2010	“To evaluate the evidence on effectiveness and efficiency of Disease Management (DM) (p.27)	**Q.1:**DM refers to a “systematic population-based approach emphasizing coordinated and comprehensive care along the continuum of disease and across the health care delivery system” (p.27) Sourced from previous literature.[37,38,39] **Noted that “**there was no consensus about the definition of disease management”(p.28) **Q.2:** A range of DMPs reviewed including a primary focus on MDT care, discharge and follow-up care including home visits, patient education case management, nurse led/managed clinics.	**Q.3:** Multi-disciplinary team care; Home visits; hospital discharge planning; Counselling; Clinical follow-up by specialists; Patient education and a combination of provider use of practice guidelines, appropriate education, and supplies of drugs and ancillary services; nurse led/managed care. . **Q.4:** MDT approach, patient education & self-management, discharge and follow-up, home visits. **Q.5:** Multiple diseases which included : Diabetes (n=2); COPD (n=9); Coronary Heart Diseases (CHD) (n=10); Rheumatoid Arthritis (n=1);Depression(n=2), Multi-morbidity (i.e addressed in papers (n=4). Other details on sample not available.	**Q.6&7:** **Patient Outcomes:** Clinical health status (n=16/20) Improved results for Physiological, functional status & disability (4/16;S) Mortality Significant only in the (CHD). Reduced (n=3/15;S) Quality of life Improved (n=12/21 ;S) Satisfaction with care (n=6/28) Improved (n=3/6;S) Knowledge Improved Knowledge or change in life style: (5/16;S) **Service Outcomes:** Service Utilisation Improved (14/22, S) – noted that 68% of SR & MA showed positive results. Specific outcomes NR other than ‘hospitalisations’ etc. **Process Outcomes**: Improved adherence to guidelines & Screening frequency **Resource Outcomes:** Costs (n=16/28) Improved (6/16;S) **Q.8:** NR	**Q.9:** Meta-analysis to assess effectiveness & most effective components of intervention. **Q.10:** NR **Q.11:**NR	**Researchers’ Comments:** Reported that Observed improvement with a reasonable amount of evidence was the highest at process (69%), followed by health services (63%), QOL (57%), health outcomes (51%), satisfaction (50%), costs (38%).

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[37] Hunter, D. J., & Fairfield, G. (1997). Managed care: disease management *BMJ, 315*, 50-53. http://dx.doi.org/10.1136/bmj.315.7099.50

[38] Ellrodt, G., Cook, D. J., Lee, J., Cho, M., Hunt, D., & Weingarten, S. (1997). Evidence-based disease management. *JAMA, 278*, 1687-92. http://dx.doi.org/10.1001/jama.278.20.1687

[39] Epstein, R. S., & McGlynn, M. G. (1997). Disease management, what is it? *Dis Manage Health Outcomes, 1*, 3-10. http://dx.doi.org/10.2165/00115677-199701010-00002

Pimouguet et al. (2011) Canada Meta-analysis incl. 41 RCTs 1960 -2009 Drawn from 4 countries, mostly US	“to assess the effectiveness of disease management programs (DMP) for improving glycaemic control in adults with diabetes mellitus and to study which components of programs are associated with their effectiveness” (p.115)	**Q.1:** DMP is “an ongoing and proactive follow-up of patients with at least two of the following five components: patient education, care coordination, monitoring, treatment adjustment & coaching” (p.E116)**.** **Noted:** No consensual definition of disease management exists. **Q.2:** Programmes with the goal of improving overall health by supporting the physician/ practitioner or patient relationship and plan of care, emphasizing prevention of exacerbations and complications, utilisation of evidence-based practice guidelines, patient empowerment strategies, and evaluation of clinical, humanistic, and economic outcomes on an on-going basis. Length of interventions ranged from 1.5 to 48 months.	**Q.3:** Patient education (dietary & exercise counselling, self- monitoring, disease & medication knowledge) Coaching (overcoming psychological/social barriers impeding medication compliance), treatment adjustment (starting or commencing treatments by disease manager without approval from PC physician) Monitoring (getting medical data from patient), Care- coordination by disease manager (reminders to patient re appointments, advises on self-care, & informs the PC physician about complications, treatment adjustment etc). Reference to risk status of patients. **Q.4:** Treatment adjustment & patient education by case manager. . **Q.5:** Type 1 diabetes (n=3) or Type 2 diabetes (n=29), Both Type 1 & Type 2 Diabetes (n=9) Adults≥18 years. Mean age 57.6 years (SD 7.3)	**Q.6 &7:** **Patient Outcomes:** Change in clinical status Reduced HBA1C by 0.51% (S) and greatest for those with baseline > 8.0% (S) **Q.8:** Two components based on meta-regression & subgroup analysis to greater improvements in glycaemic control: **(i)** Treatment adjustment by disease manager (with or without approval from PC physician) and greater effect without approval (S) & (ii) frequency of patient contact (moderate to high) & greatest for high frequency (S) were the two components of the DMP that led to greater improvements in glycaemic control.	**Q.9:** Meta-analysis to assess effectiveness & most effective components of intervention. **CGs:** Usual care (no further details) **FUP:** Unclear. Noted that only 5 studies were ≥ 12/12 **Q.10:** NR **Q.11:** NR	**Researchers’ comments:** Reported that DMP were more effective for patients with poor glycaemic control (mean HB A1C ≥ 8.0% at baseline) compared to those with better glycaemic control. **UCC authors’ comments:** Unclear who disease managers were but it was noted that treatment adjustments without PC approval are appropriate roles for nurses and pharmacists.

Fuchs et al. (2014) Germany Syst. Rev. (n= 16 papers incl. 9 controlled observational studies 1999 -2008	“to bring together the available controlled studies evaluating the effectiveness of Disease Management Programmes (DMPs) in Germany” (p.453)	**Q.1:** NR **Q.2:** DMP implemented in Germany, no further details given.	**Q.3:** NR **Q.4:** NR **Q.5:** -Type 2 diabetes mellitus. Mean age between 62 & and 70.7 years. Sample sizes in studies ranged from 85 to 84,410 in IG (DMP) groups, and from 64 to 79 137 patients in control groups.	**Q.6 &7:** **Patient Outcomes:** Changes in clinical status Reduced cholesterol (n=1, S). Otherwise, data on morbidity reported to be unclear & limited for other indicators e.g. BMI, HBA1c. Quality of Life (n=5) Improved in some domains (n=4, S) NS difference for other domains (n=4, S) or (n=1, S, NR). Mortality (n=3) & Survival rate (n=1) Lower (n=3, S) & Higher (n=1,S) Satisfaction with care (n=3) Greater (n=2,S) & NS difference (n=1) Health behaviours/attitudes (n=3) Improved (n=2,S, n=1, NS) Self-Management (n=1) Improved weekly BP check (S) but NS effect for blood glucose, foot or weight checks or keeping a diary. **Process outcomes:** Health monitoring (n=5) Increased screening for BP (n=2, S. n=1, NS), annual eyes (n=3, S, n=1, S, NR) & feet (n=4, S., n=1, S, NR). Medication treatment (n=5) Some S positive effects reported but unclear what is being measured e.g. appropriate prescribing, increased medication etc. Patient-HCP relations (n=4) Improved (n=2, S, n=2 NS). Patient education (n=5) Increased participation (n=5, S) although NS for BP education in 2 studies. **Q. 8:** NR	**Q.9:** Syst. Rev. of cohort studies to assess effectiveness. **CG:** Routine care **FUP:** NR **Q.10:** NR **Q.11:** NR	**Researchers’ comments:** The evidence base is insufficient and varied to allow conclusions be drawn about the effectiveness of DMPs.

Gaikwad & Warren (2009) New Zealand Syst. Rev. (n=27 incl 14 RCTs, 1 CCT, 1 Cross section, 2 Qualitative, 2 Syst. & Lit Rev, 1 Quasi Exp. & 6 Other 2002 – 2007 Drawn from 10 countries	“To evaluate the feasibility and benefits of home-based information and communications technology enabled Interventions for chronic disease management, with emphasis on their impact on health outcomes and costs”(p.122).	**Q.1:** NR **Q.2:** The programme involved the assessment of studies with the implementation of home-based healthcare applications and approaches or their implementation in the patient’s home environment as well as clinical interventions. The impact of different components such home tele-health implementation and nurse case management for patients with multi-morbidity was also assessed. 5 studies investigated tele-homecare (THC),2 studies videoconferencing,	**Q.3:** Multidisciplinary home-based interventions (n=3) Tele-homecare (THC, n=5), Tele-monitoring (TM n=8), , Nurse-led community/home-based interventions incl. telephone support & virtual meetings (NL-HBIs, n=4), Home-based physiotherapy interventions (n=2), MDT home based interventions (MDT-HBI)(n=6). Telephonic support by nurses offered in some interventions reviewed. **Q.4:** Most common features Tele-monitoring and Tele-health **Q.5:** Chronic Heart Failure COPD and/or diabetes ,hypertension, pulmonary conditions. Types of diseases extracted for some studies. Age groups reported for some studies < 50 yrs with some as ‘frail elderly. Sample size reported for some studies only ranging from 36-13,271.	**Q.6 &7:** **Note**: level of significance reported for some outcomes only. **Patient Outcomes:** Clinical health status Improvements in physical health (TM) Reduction in HBA1c Quality of life (n-3) –QOL (n=3/3 S) Self-management Improved (THC, NL-HBIs) Health Behaviour Increased adherence (THC) Satisfaction with care Improved **Process outcomes:** Communication/information sharing Improved (TM) Health monitoring Improved (TM) e.g, automated vital signs **Service Outcomes** Reduction in hospitals admissions (THC, TM, MDT-HBI, S; NL-HBIs,) & LOS (THC, MDT-HBI S;) & ED visits (THC) **Resources Outcomes:** Costs: Reduced costs for chronic care management when used long term (THC, MDT-HBI (n=1 S) Reduced utilization of healthcare resources(n=1,S) **Q. 8:** NR but see final column on specialist patient care).	**Q.9:** Systematic Review **Q.10:** **HCP-specific:** Limited understanding of the care involved **Resource specific:** Set up implementation costs **Q.11:** **Practice specific** Specialist patient care (see final column) Video conferencing for conducting follow-up clinics of stable patients, to enable patients save travel and time and also avoid missing appointments.	**Researchers’ comments:** Reported from one study that THC beneficial to organisations with new specialised patient care services incl. “a specialized model (emergent with involvement of nurses in care) and a planned polyvalent model (involving activities like developing clinical practice guidelines and health resource planning)
Mitchell et al.(2008) Australia	“to assess the impact of co-ordinated multi-	**Q.1:** NR **Q.2:** 4 models of care	**Q.3:** Communication, Care plan, decisions making & Community hospital based team outreach.	**Q.6&7:Patient Outcomes:** **Patient Outcomes:** Functioning	**Q.9:** Syst. Rev. to assess effectiveness. **CG** NR**.**	**Researchers’ Comments:** Reported that process benefits such as improved

Syst. Rev (n= 18, incl. 5 RCTs; 7 Qual. studies; non RCTs & Observational studies 1990 –2006	disciplinary care planning involving primary care professionals, either wholly within primary care or by primary-secondary care teams, on outcomes in stroke, relative to usual care”. (p.2)	identified: (i) Early supported discharge community rehabilitation; (ii) post discharge community rehab. with/without discharge planning, (iii) late community rehab. (iv) GP orientated post stroke rehab. From the above secondary outreach was most common approach**.** Care planning took part in the context of multidisciplinary team care based in hospitals with outreach to community patients. Patients were followed after discharge by care coordinators (usually nurses) based in specialist units and working in the community with allied health personnel based in the same unit, or with local primary care providers.	**Q.4:** NR **Q.5:** Patient population: Adults following a stoke Age groups NR.& Sample size (n=681)	Improved (n=1, S; n=2 NS) Mortality NS differences (n=2) Quality of Life improved (n-1, S; n=2 NS) **Service Outcomes:** Service utilisation (n=1) Reduced bed day numbers (n=1 S) **Q.8:** NR	**FUP:** 6 & 12/12 Noted that the relative effectiveness of different types of models could not be assessed. **Q.10:**NR **Q.11:** **HSP specific** Case-based education relating to problems experienced by current patients is effective in improving knowledge and practice. **Organisational specific** Engaging primary care providers including GPs in multidisciplinary discharge planning	task allocation between providers may improve the care of patients with completed stroke.
Mattke et al. (2007) USA Syst. Rev (n= 29)	“to assess the evidence for the effect of disease management on quality of care, disease control, and	**Q.1: DM:** “a system of coordinated health care interventions and communications for populations with conditions in which	**Q.3:** Typically multicomponent interventions with individualized patient education, care planning, and follow-up delivered by a nurse/case manager by telephone or in person.	**Q.6&7:** **Note**- outcomes mostly reported in general terms – level of significance not explicitly reported. Results related to evidence as a whole & so unable to extract the number of	**Q.9:** Syst. Rev. to assess effectiveness. **FUP:** Most short term up to 12/12. **Q.10:** NR	**Researchers’ Comments:** Evidence lacking on large scale population based DMPs. Reported that the evidence on the role of disease

covering 317 studies in 10 Meta-analyses; 16 Syst. Rev & 3 Evaluat-ions of Population-based Programs 1990 – 2005	cost, with a focus on population based programs". (p.670)	patient self-care efforts are significant" (p.671 sourced from Disease Management Association of America Web site.[40] The researchers added DM has having defining characteristic: (i) illness severity in target population involving health risk appraisal (ii) intervention intensity varying from low to high; (iii) the nature of the condition which can be more or less complex to manage **Q.2**: Focus on population based DMPs characterised by 2 dimensions: severity of illness among the target population with consideration to including all risk categories & intensity of the intervention with consideration to including DMPs from low to high intensity.	**Q.4:** NR **Q.5:** CHF:(n=18) ;CAD(n= 7);Diabetes: (n=9);Asthma: (n=4);COPD: (n=5) ; Depression: (n=4) Age group NR	studies reported for each outcome **Patient Outcomes:** Clinical Health Status Lower HbA1c in diabetes Inconclusive clinical outcomes in CHF & depression Evidence for no effect in CAD & Asthma Insufficient evidence in Diabetes & COPD Quality of care Improved in CHF & depression Health Behaviours Inconclusive evidence with no effect in all studies for Changes in behaviour **Processes Outcomes:** Improved Adherence to evidence based guidelines in CHF,CAD, Diabetes & depression but inconclusive in Asthma while Insufficient in COPD Disease Control Improved results in CHF CAD, diabetes & depression but inconclusive in Asthma & COPD **Service Outcomes:** Service utilisation Higher utilization of outpatient care and prescription drugs among patients with depression (n=2) **Resource outcomes:** Improved net cost savings (n=2) **Q.8:** NR	**Q.11:** NR	management in reducing utilization of health services was inconclusive with the exception of reducing hospitalization rates among patients with CHF and the higher utilization of outpatient care and prescription drugs among patients with depression (p.674)
Knight et al.(2005) USA	"To systematically evaluate and synthesize published evidence	**Q.1:** Disease management was defined according to a previously	**Q.3:** Guidelines, protocols, algorithms, care plans, or systematic patient or provider education programs, counselling and medication	**Q.6 &7:** **Patient outcomes:** Change in clinical status Improved GHb level (n=9/24 S) –	**Q.9:** Syst. Rev. to assess effectiveness. **CG**: Reported as matched control for some studies	**Researchers' Comments:** Methodology for implementing DMPs is in its infancy.

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[40] Disease Management Association of America Web site . Population health: DMAA definition of disease management. http://www.dmaa. org/dm definition.asp.

Syst. Rev & Meta-analysis (n= 24 incl. 19 RCTs 5 non-RCTs 1987 - 2001 Data drawn from 6 countries	regarding the effect of disease management programs for patients with diabetes mellitus on processes and outcomes of care" (242).	published definition (Ellrodt et al)[41] Definition not reported in paper. **Q.2:** Programme involved different interventions ranging from patient education sessions to centrally administered provider reminders to integrated multidisciplinary team approaches. Interventions ranged from several days to 30 months.	adjustment **Q.4:** NR **Q.5:** Diabetes (n=20) Aggregate sample size (n= 6421) patients Age groups not reported.	pooled effects showed 0.5% reduction (S) Decreased BP (n=1/5 S Improved HDL cholesterol levels (n=1/8 S) & LDL (1/3 S). QOL Positive trend (S NR) **Process Outcomes** Health monitoring: Increased frequency of HbA1C testing (n =2/34 S, retinal screening (n=2/3, S) & foot care (n=3/3 S) **Service outcomes** Positive trend for hospital admissions ED visits – S,NR **Q.8:** Reported that "programs that incorporated provider education, provider feedback, provider reminders, patient education, patient reminders, and patient financial incentives were associated with improvements in provider adherence to guidelines and patient disease control".(p.249)	**FUP**: 3 -30/12 **Q.10:** **Patient specific** Unwillingness to make needed lifestyle changes in diabetes patients. Perception that type 2 diabetes mellitus is not serious. Guidelines flexibility to be useful ipatient care. **Q.11:** **Patient specific** Patients' motivation to participate in DMPs	
Yu et al.(2006) Hong Kong Syst. Rev (n=25 papers incl. 21 RCTs 1995-2004 Data drawn from 8 countries	"To identify the characteristics of Disease management programmes (DMPs) which are crucial to reducing hospital readmission and/or mortality of older people with heart failure". (p.596)	**Q.1:** DMP: "a programme that used multiple interventions in a systematic manner to manage heart failure across different health-care delivery systems"(p.597). **Q.2:** Drew on guidelines from the European Society of Cardiology (ESC) to describe DMPs with reference to their	**Q.3:** Care by teams (n=21, multi-disciplinary or case management or individual team members), In-hospital phase of care (n=13 e.g. education, discharge planning), Patient education (n=21, most focusing of disease content & self- care, fewer on exercise & counselling), Guideline based/flexible medication therapy (n=7), Attention to clinical deterioration (n=15), Vigilant follow-up (n=21 e.g. home visit &/or HF clinic visit, and/or telephone contact; 15 also provided telephone hotline to	**Q.6 &7:** **Patient Outcomes:** Mortality (n=18) Reduced mortality rate (n=5,S, n=13, NS) Reduced combined event rate (n=8,S) Quality of Life (n=10) Improved (n=6,S, n=4 NS) Improved functional status(S) **Service outcomes:** Service utilisation (n=21) Reduced hospital readmission (n=6,S, n= 15,NS)	**Q.9:** Syst. review to assess effects. **Q.10:** Lack of understanding of heart failure, Inadequate medical prescription, Poor treatment**,** compliance, Inadequate follow-up care, Inadequate communication between health-care providers.	**Researchers' comments:** The evidence from the review supports extending the roles of cardiologists to specialist nurses e.g. responding to health needs, handling clinical deterioration, monitoring treatment effectiveness. A PC physican is also needed in the MDT. In-hospital care should be built into DMPs. DMPs need to be designed to shift

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[41] Ellrodt G, Cook DJ, Lee J, et al. Evidence-based disease management. *JAMA.* 1997;278:1687-1692.

		key characteristics as: “(1) using a team approach, (2) providing in-hospital and out-hospital care, (3) including discharge planning, (4) using education and counselling strategies, which focus on promoting self-care and teaching behavioural strategies, (5) optimizing medical therapy, (6) prescribing flexible diuretic regimen, (7) directing close attentions to clinical deterioration, (8) providing vigilant follow-up, and (9) enhancing access to health care” (p.596)[42].	patients). **Q.4:** Patient education and vigilant follow up were the most common component (in 100%). Exercise and psychosocial counselling were least adopted within patient education. **Q.5** Heart Failure (HF) Average age: 60 years; Mean age 73.3 (SD 4.8). Sample size varied from 84 to 462.	**Resource Outcomes:** Costs (n=11) Decreased (n= 9, S,NR, n=2 NS) **Q. 8:** 91.7% of effective DMP interventions (vs non-effective interventions) had multiple components including clinic/home visits, telephone follow-up, and/or telephone call support. Combining telephone support with face to face patient care “appears crucial to enhance the success of DMPs” (p. 605).	**Q.11:** Use of a team approach**,** Providing in-hospital and out-hospital care Including discharge planning**,** Using education and counselling strategies, which focus on promoting self-care and teaching behavioural strategies**,** Optimizing medical therapy**,** Prescribing flexible diuretic regimen**,** Directing close attentions to clinical deterioration**,** Providing vigilant follow-up**,** Enhancing access to health care.	the emphasis for chronic disease management from being hospital centric to primary care centric with home/clinic visits & telephone support.
Khunti et al. (2007) UK Cluster RCT (n=1163 from 20 primary care practices	“To evaluate the effect of a disease management programme for patients with coronary heart disease (CHD) and chronic heart failure (CHF) in primary care” (p.1398)	**Q.1:** NR **Q.2:** Two peripatetic nurse specialists trained in management of CH. The role of nurses in D & CHF held weekly clinics in IG practices. Nurses able to refer patients for echocardiography and	**Q.3:** Nurse-led DMP in primary care. Clinics included patient assessment, confirmation of diagnosis, medication management and titration, home visits for house bound with CHF, and liaison between primary and secondary care. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed.	**Q.6 & 7:** **Patient Outcomes:** Changes in clinical status: Improved BP control (S) Improved cholesterol (NS) Decreased in BMI and weight check (S) Health Behaviours Increase uptake of smoking cessation programme (S) Quality of Life:	**Q.9:** RCT to assess effect of DMP on patients with CHD & CHF. **CG** received usual care from members of the primary healthcare team, but control practices were provided with the same open access echocardiography and access to secondary care	**Researchers’ comments:** Larger trials required to assess the effect of specialist nurses in primary care on the management of patients with LVSD. Nurse-led DMP in primary care can lead to improvements in quality of care and improvements in referral for ECGs resulting

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[42] Task Force for the Diagnosis and Treatment of CHF of the European Society of Cardiology. Guidelines for the diagnosis and treatment of chronic heart failure: full text (Updated 2005). http://www.excardio.org/ knowledge/guidelines/Chronic_Heart_failure.htm.

		assessment in secondary care cardiology clinic. Intervention lasted 12/12.	**Q.5:** Coronary heart disease (angina or past medical history of myocardial infarction) or chronic heart failure Median age: 70.5.	Improved (S) but not for patients with confirmed LVSD diagnosis. Improved quality of life and treatment satisfaction (S). **Process outcomes** Health monitoring Increased BP monitoring (S) Increased % having ECGs (S) incl. patients with unconfirmed CHF (S) and left ventricular systolic dysfunction (S) NS differences in risk factor management. Medication prescribing More patients with a history of MI were prescribed beta blockers (S) Risk management More patients had adequate management of BP and cholesterol. (S) **Q. 8:** Reported that "it is difficult to determine… which facet or facets of a complex, multifactorial intervention led to improvements in care" (p.1403) but noted that the components of a successful intervention seem to be education and optimisation of treatment and regular contact with patients delivered by specialist nurses.	cardiology clinic as IG. **FUP** at 12/12. **Q.10:** NR **Q.11:** NR	in more complete clarification of the presence or absence of LVSD in patients with presumed CHF. Noted that specialist nurses coordinated care between primary & secondary sectors after hospital discharge. They did not provide clinical care. Trial was pragmatic and could easily be implemented widely in the primary care setting.
Galbreath et al. (2008) South Texas RCT(n=902)	"to compare the effectiveness of 2 previously successful Disease Management (DM) programs with that of traditional care". (p.599)	**Q.1:** DM was defined as "a system of coordinated health care interventions and communications for populations with conditions in which patient self -care efforts are significant"(p.599).	**Q.3:** Telephonic DM interventions & Scheduled calls, Action Plan, Self-management advice, Training, and Education. Asthma guidelines. Home visits (in ADM group) **Q.4:** NA- will be included in Final Report with reference to all papers reviewed	**Q.6&7:** **Patient Outcomes** Quality Of Life Improved for ADM group. (S) & Changes in clinical status Decreased symptom scores which was larger for ADM group (S) **Process outcomes:** Medication management High adjusted rate of control	**Q.9:** RCT to assess effect of DM. CG=Usual care / routine care from primary care providers (PCP) **FUP** 6/12 & 12/12. **Q.10:NR**	**Researchers' Comments** Reported that DM did not result in significant differences in clinical outcomes or utilisation such as health care utilisation which meant that further prospective RCTs are required to

		Q.2: The South Texas Asthma Management Project (STAMP) compared 2 national guideline-based asthma management strategies against traditional care by evaluating the effectiveness of interventions in children and adults with persistent asthma. Participants received services from the two IGs which included: (I) DM group received 'The National Jewish Medical and Research Centre's telephonic program' based on asthma guidelines,. Delivered by nurses specialised in respiratory care – total of 6 calls. Involves self-management assessment and advice. Participants had 24 hr. access to nurse by telephone for advice. Nurses provided reports and recommendations to PC GP. (2) Augmented DM group (ADM): as above augmented with respiratory therapist in-home visits. Conducted over 12 months.	**Q.5:** Persistent Asthma in 473 Children & 429 Adults. Age 5 -64 year Adult data only extracted.	medication in CG although (NS) vs IGs NS differences between in the number of cortisone 'bursts' received. **Service Outcomes** Service Utilisation NS differences between groups for Office visits (PC), ED visits or hospital admissions. **Q.8:NR**	**Q.11:NR**	evaluate the effectiveness of DM as an approach to cost savings and reduced health care utilisation in asthma

Hogg et al. (2009) Canada RCT (n=241)	“To examine whether quality of care (QOC) for chronic disease management (CDM) for multi morbidity improves when nurse practitioners (NPs) and pharmacists work with family physicians in community practice (p.76).	**Q.1 :** NR **Q.2:** Multidisciplinary team care provision in a family practice with addition of 1 pharmacist & 3 practice nurses. Care delivered almost exclusively by telephone & in the home. Patients were randomly assigned to receive usual care from their family physicians or Anticipatory and Preventive Team Care (APT-Care) from a collaborative team composed of their physicians, 1 of 3 nurse practitioners, and a pharmacist.	**Q.3:** Telephone contacts, Home visits, Action /Care plan and Self-management support, MDT medication management. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Single multiple conditions including Diabetes, Coronary Artery Disease, Congestive Heart Failure, and COPD. Patients aged >50 years Mean age 72.1 years	**Q.6&7 :** **Patient Outcomes** Changes in clinical status Improved HBA1c (NS) Improved blood pressure (NS) Quality of life NS changes **Process outcomes** Health monitoring Increased HbA1c testing, foot and eye screening (NS) Quality of care Improved (S) likely due to increased guideline adherence especially diabetes care Improved preventive care (S) **Service Outcomes** Service utilisation NS changes hospital admission or ED visits. **Q.8:** Reported that additional care in the form of multidisciplinary teams for complex community-dwelling patients can increase adherence to evidence-based guidelines. However, these additional resources are provided at a substantial additional cost and appropriateness of the intervention will ultimately depend on its associated costs and the value that society places on its effect	**Q.9:** RCT to assess effects. **CG:** Usual care with physician **FUP** **Q.10:** NR **Q.11:** NR	**Researchers’ comments** There are costs associated with additional resources which have implications for the appropriateness of the intervention.
Sönnich-sen et al. (2010) Austria RCT (n=1344)	“To evaluate the effectiveness of the Austrian DMP [Therapie aktiv] for diabetes mellitus	**Q.1:** NR **Q.2:** The DMP consisted of physician and patient education, standardised	**Q.3:** Training course for physicians, Patient education – modular approach (by physicians), Standardised documentation, Structured interdisciplinary care, Decision-making	**Q.6 &7:** **Patient Outcomes:** Change in clinical status: Improved HbA1c (NS) Improved systolic or diastolic blood	**Q.9:** RCT to assess effects of DMP on patients with type 2 diabetes. **CG** Usual care. **FUP** 12/12.	**Researchers’ comments:** Mot possible to predict the influence of disease management on clinical outcomes based on the

	type 2 on HbA1c and quality of care for adult patients in primary care” (p.1).	documentation and agreement on therapeutic goals. Training was conducted by physicians in their surgeries or in out-patient clinics (10 hours) and patient modules (9 hours) were offered throughout the province prior to the implementation of the DMP. Physicians that performed usual care in the control group were not permitted to participate in the 10-hour DMP training course. Intervention lasted 12/12. Nationwide implementation of this DMP for diabetes underway by statutory public health insurance.	for therapeutic goals. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Type 2 Diabetes for adult patients Average age: (65.5 years).	pressure (S) Reduction in cholesterol (S) & BMI (S) **Process Outcomes:** Health monitoring Increased HbA1c testing (S), Increased foot and eye screening (S) Guideline adherence Increased (S) Patient education More patients received education (S) **Service outcomes:** Service utilization Fewer hospitalised days (NS) **Q.8:** Reported that DMP-effects and diabetes care were dependent on the participating physician’s motivation and effort rather than on the DMP.	**Q.10: Process specific:** Lack of utilisation of three pillars of the CCM which would further increase the DMP effectiveness, delivery system design, decision support, & clinical information systems. **Q.11:** NR	observation period of only 12 months. Longer term evaluation needed.
Konstam et al. (2011) & Weintraub et al.(2010) USA RCT(n=188)	To assess “the incremental effect of AHM technology over and above that of a previously described nurse directed HF disease management program[43]” (Weintraub et al. (2010 p. 285) & “to compare the SPAN-	**Q.1**: NR **Q.2:** A DMP called the SPAN-CHF was delivered in conjunction with an Automated Home Monitoring (AHM) system. Randomised patients received the intervention for 90 days, either with AHM or without (NAHM;	**Q.3:** SPAN-CF: Specialised heart failure (HF) nurse managers, Pharmacologic guidelines, Compliance education, Home visits with regular telephone follow up/accessible via telephone 24/7, Weekly teleconference Nurse-manager & specialist, Nurse-manager communication to PC physician advising on changes & recommendations from specialist. AHM extra = Telephonic weight and symptom monitoring prompts (with	**Q.6 &7:** **Patient Outcomes:** Quality of life Improved in both groups (S) but differences were NS Mortality Lower trend in IG (NS) **Process outcomes:** IG received more calls from nurse-managers increasing likelihood of problems identified early (noted in discussion).	**Q.9:** RCT to assess effects **CG:** standard-care without AHM control i.e. (NAHM) **FUP**: 45/s & 3/12 **Q.10:** **Patient specific:** Preference for traditional communication rather than technology.	**Researchers’ comments:** A DMP that partly relies on limited technical expertise is feasible for elderly patients with HF. AHM has potential to increase the productivity of nurse managers in HF DMP by increasing the numbers of HF patients a nurse manager can monitor & so can detect need for earlier

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[43] Kimmelstiel C, Levine D, Perry K, Patel AR, Sadaniantz A, Gorham N, et al. Randomized, controlled evaluation of short- and long-term benefits of heart failure disease management within a diverse provider network: the SPAN-CHF Trial. Circulation 2004; 110:119.

	CHF intervention, with and without Automated Home Monitoring (AHM), to assess the potential added value of AHM on Health-Related Quality of Life (HRQL)". (Konstam et al. 2011 p.152)	control group). The AHM consisted of a text message component and a data component with integrated home monitoring devices that transfer results to a central database. The SPAN-HF involved home visit by nurse-management in HF focusing on diet, monitoring, detecting changes etc. Patient received educational booklet. SPAN-CHF = Specialized Primary and Networked Care in Heart Failure (SPAN-CHF)	data transfer to central database) **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Heart Failure (HF) (average age: 68.5 years).	 **Q. 8:** AHM technology on primary endpoint was significant. RE: QOL - Reported that the combined interaction effects of the various components are difficult to capture because the processes by which patients assess their HRQL to be improved are unknown. However, noted that key elements associated with optimal outcomes included: A specialized nurse managers, use of pharmacologic guidelines, a teaching visit, & compliance education.	**Q.11:** **Service specific:** Experienced HF- MDT approach to care. Tele-monitoring can support the tele of nurse-managers in DMPs for HF.	attention. No added value to including AHM in the SPAN-CHF DMP for QOL outcomes. Noted that subjects receiving AHM were older, had higher ejection fractions, and were more likely to be taking beta-blockers than control group.
Due et al. (2014) Denmark RCT (n=183 GP practices)	"To examine the effectiveness of a semi-tailored facilitator-based intervention… to support the implementation in general practice of Disease Management Programmes (DMPs) for chronic obstructive pulmonary disease (COPD) and Type 2 diabetes (DM2)" (p.3)	**Q.1:** DMP: a systematic, proactive approach to chronic care including a division of tasks between general practitioners, hospitals and municipalities. The programmes stress the need for population-based patient registration; annual chronic disease check-ups; and stratification of patients into three levels according to risk of complications, complexity, and state of the disease" (p. 3,	**Q.3:** Facilitator education programme for 14 GPs, with (40 hours of meetings & 11 selected practices), Coaching, Communication skills, Meeting management and development processes, Outreach visits to GP practices (by facilitator) providing information & support. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed**.** **Q.5:** COPD & Type 2 Diabetes (DM2). No details on patient caseloads in GP practices provided.	**Q.6 &7:** **Process Outcomes:** Health monitoring More annual check-ups (NS) NS differences in self-reported use of annual check-ups for DM2 or COPD Reduction in the number of GP practices with fewer annual check-ups (S), or in the use of spirometry (S), Increased self-reported ICPC[45] diagnosis coding (S). Increased use of stratification (S) for COPD, NS for DM2, Faster sign-up rate to Sentinel Data Capture (NS).	**Q.9:** RCT to assess effects. **CG** Delayed intervention group **FUP** 12/12. **Q.10:** NR **Q.11:** **Service specific:** Sentinel Data Capture essential in ensuring effective DMP.	**Researchers' Comments** Concluded that a "semi-tailored facilitator-based intervention of relatively low intensity is unlikely to add substantially to the implementation of disease management programmes for DM2 and COPD in a context marked by important concurrent initiatives (including financial incentives and mandatory registry participation) aimed at moving all practices towards changes in chronic care" (p.1).

		sourced from Fuller et al. 1984).[44] **Q.2:** The DMP focused on "GP's role as coordinator of care, patient stratification, a proactive approach, and a systematic organisation of workflow and division of task in general practice concerning chronic disease check-ups" (p.4). the intervention had 2 phases: facilitator education & development of a toolbox, and facilitator visits (to GP practices). The Intervention lasted 9/12. Noted that DMPs based on CCM have been developed throughout Denmark.		**Q.8:** Reported that intervention was characterised by a high degree of flexibility which may have contributed to the positive impact of the intervention on secondary outcomes (i.e outcomes other than annual check- up).		
Harno et al. (2006) Finland RCT (n=175)	To evaluate the effectiveness of the using an integrated e-health approach system in managing diabetes care.	**Q.1:**NR **Q.2:** An e-health application with a diabetes management system and a home care link was used in the study group but not involved in the usual care. Patients downloaded their measurements from the	**Q.3:** Self-management with system to transport short message services(SMS) Text messaging, education session for set up and Telephone calls, **Q.4:** NA – will be included in Final Report with reference to all papers reviewed **Q.5:** Type 1 & 2 Diabetes Total of 175 patients	**Q.6&7:** **Patients Outcomes:** <u>Change in Clinical Status</u> Improved and lowered HbA1c (S) Lower diastolic BP, fasting plasma glucose, serum total cholesterol, serum LDL-cholesterol and serum triglycerides (S) **Q.8:** NR	**Q.9:** RCT to assess effect with e-heath application system. FUP 12 months CG=usual care (n=74) **Q.10:**NR **Q.11:**NR	**Researchers' Comments:** Reported that "use of e-health in diabetes care for 12 months was able to provide equivalent diabetic control to usual care and improved cardio-vascular risk factors". Further noted that since home blood glucose monitoring may not be required in Type 2 diabetes

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[45] The International Classification of Primary Care

[44] Fullard E, Fowler G, Gray M: **Facilitating prevention in primary care.** *Br Med J (Clin Res Ed)* 1984, **289:**1585–1587.

		blood glucose meter into the regional database using a modem. A Self-management system allowed the diabetes team to transmit short messages services text messages to patients with mobile phones and internet access. These in the study group also had one educational visit only to set the home care link while the comparison (usual care) group with standard care had regular GP visits.				results are not of a major concern although frequent testing has a positive effect.
PATIENT- CENTRED MEDICAL HOME CARE MODEL						
Jackson et al. (2013) Syst. Rev. (n=19 comparative studies incl. 9 RCTs and 10 observational studies. 12 non-comparative studies also sourced) Date of database inception – 2012 Data drawn	"To describe approaches for patient-centred medical home (PCMH) implementation and summarise evidence for effects on patient staff experiences, process of care, and clinical and economic outcomes".	**Q1:** The PCMH is "a model of primary care transformation that seeks to meet the healthcare needs of patients and to improve patient and staff experiences, outcomes, safety and system efficiency. To be considered a PCMH intervention required the following: 1) team-based care, 2) having at least 2 of 4 elements focused on how to improve the entire organisation of care (enhanced access, coordinated care, comprehensiveness, systems-based approach to improving quality and safety), 3) a sustained	**Q3:** All 7 major components included (n=24). **Q4:** "approaches to implementing the various components of PCMH varied widely" (p175). **Q5:** Adult or child primary care patients with multiple conditions (excluded single-disease care management studies)	**Q.6&7: Patient Outcomes:** Clinical status and experiences Improved patient satisfaction and patient-perceived level of care coordination No change to health status Decreased rate of functional decline Decreased mortality (NS) Metabolic factors Improved HBA1C and low-density lipoprotein cholesterol **HCP Outcomes:** Increased staff satisfaction **Service Outcomes:** Service utilisation Insufficient evidence to evaluate the effects on care processes for patients with chronic illness.	**Q9:** "Evidence is not yet sufficient to comment on evidence related to (i) chronic illness care processes, (ii) clinical outcomes, (iii) effect on hospital admission, and (iv) effect on costs of care" (p176). **Q10:** NR **Q11:** Significant restructuring of primary care practices required. Funding PCMH implementation – methods used include external study funding, capitation payments,	**Researchers' comments:** "Most studies were conducted in integrated delivery systems, such as staff- or group-model HMOs, led by payer organisations, or conducted outside the United States" (p 172). "PCMH is a promising model for organising primary care. However, there are open questions about its effect on patients and health care organisation" (p176).

from 2 countries		partnership, and 4) having an intervention that involves structural changes to the traditional practice” (p169). **Q2:** The core principles of the PCMH are the following: wide-ranging, team-based care; patient-centred orientation toward the whole person; care that is coordinated across all elements of the healthcare system and the patient’s community; enhanced access to care that uses alternative methods of communication; and a systems-based approach to quality and safety.		No change on inpatient utilisation (for all age groups) Reduced emergency department utilisation among older adults only **Resource Outcomes:** Cost Savings may occur with lengthy exposure to the PCMH system of greater than 1 year **Q8.** NR	enhanced fee-for-service, or a hybrid approach.	
MODELS FOR MANAGING MORBIDITY (See also House of Care & Bodenheimer and Berry-Millett (2009) Appendix 8)						
CARE MANAGEMENT PROGRAMMES						
Egginton et al. (2012) U.S.A Syst. Rev. and Meta-analysis (n=52 Incl. 42 Parallel RCTs and 9 physician panels & practices) 2000-2011 Data drawn	“to assess the composition and performance of care management models evaluated in the last decade and their impact on patient important outcomes”. (p.1).	**Q.1:** NR **Q.2:** Programme involved assigning each study group to a primary delivery type which included the following : “**Office**” if the intervention involved primarily interaction or chart review in the medical outpatient setting; “**Web**” if most interaction took place on the computer or internet; “**Telephone**” if the intervention took place	**Q.3:** Office interventions i.e. primary care (67%) with telephone ,education, web- interventions (15%).self-monitoring and Lifestyle modification such as diet or nutrition **Q.4:** Office interventions were the most common, being used in 67% of studies. **Q.5:** Patients with Type 2 diabetes. No specific reference to multimorbidity reported.	**Q.6&7:** **Patient Outcomes** Change in Clinical status Reduced HbA1c & LDL-cholesterol (n=30, S) especially in patients with high blood pressure. Quality of Life (QoL) (n=17) Improved QoL (n=12, S) Lifestyle modification (n=7) (S ,NR) Self –efficacy (n=19) Improved self-care (n=10,S) **Service Outcomes** Service Utilisation Clinic visits (70%, S) **Process Outcomes** (n-14) Process measures (n=11/14, S)	**Q.9:** Systematic review. **FUP** a few weeks to 5 years. **Q.10:**NR **Q.11:**NR	**Researchers’ Comments:** Reported that in some cases the significance reported was limited to a specific subgroup, the high-risk group although based on the limited evidence, care management improves process measures and also improves surrogate outcomes to a trivial extent. Most programmes found to be ‘carved out’ i.e. not provided by existing healthcare team. These were found to have limited effects on patient

from 1 country		over the phone or a pager system; and “**Education**” if the patient received educational information in another setting such as a community-based facilitated diabetes group. Physician-led interventions were delivered in the office setting where the 2 interventions had a telephone component and another two an education component.		although with mixed results on whether those same studies also achieved desirable surrogate outcomes. **Resource Utilisation** (n=8) Health care costs (n=2, S) **HCP Outcomes** Risky prescribing events (n=2, S) **Q.8:** Reported that the data synthesized in the report was insufficient to recommend for or against either approach. (p.6)		outcomes.
Coburn et al. (2012) USA RCT (n=1,736)	“To evaluate the survival impact of the community-based nursing intervention program developed by the Health Quality Partners (HQP) versus usual care up to five years post enrolment”. (p.1)	**Q.1:** HQP is a program that was developed in multiple care delivery settings and incorporated a broad portfolio of evidence-based preventive and care management interventions delivered longitudinally by nurse care managers in collaboration with local health care and social service providers. **Q.2:** The majority of the care coordination programmes use care coordinators, which are usually registered nurses and most programmes educate patients in order to improve medication adherence, diet, exercise, and self-care.	**Q.3:** Health service utilization, Community resources, Treatment action plans, series of assessment including geriatric assessment and ongoing screening assessments for depression, domestic abuse, neglect etc. Series of care bundles including nutritional education, physical activity education, advance care planning etc. **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Multi-morbidity; COPD**,** Cardiovascular -Coronary Heart Disease (CHD), Asthma, Diabetes and Hypertension. Average age (75 years).	**Q.6 &7:** **Patient Outcomes:** Mortality Reduced all-cause mortality in chronically ill older adults(S) Quality of life(QOL) Improved functional status & Quality of life (S) **Service Outcomes:** Service Utilisation Fewer hospitalizations in IG(39%;S) Fewer emergency room visits (37% S) **Resource Outcomes:** Decrease total Medicare expenditures and a net savings to Medicare (36% ;S) **Q. 8:** NR	**Q.9:** RCT to assess effects with **FUP**. Mean **FUP** for both control and intervention groups=4.2 years. **Q.10:** Few low-income and non-white individuals were enrolled. Implementation was in a single geographic region of the US. Sample size for the study overall and for most subgroups was smaller than optimal for the purpose **Q.11:** NR	**Researchers’ Comments** Reported that there was a 100% match between deaths known to nurse care managers in the intervention group and deaths identified in the Social Security Death Master File (SSDMF). Also noted that health service utilization and expenditures among higher risk participants and reduced overall mortality, suggest that the model of community-based nurse care management works by reducing avoidable complications that increase both the use of acute health care services and the risk of death.

McMahon et al. (2012) USA RCT (n=151)	"to investigate whether telephone or online care management improves diabetes-related outcomes over time compared with usual care supplemented with Internet access and training". (p.1060)	**Q.1:** NR **Q.2:** Telephone-based care management group where care managers used integrated case management software to log and track results. Schedule follow-up telephone calls biweekly in which home glucose and blood pressure readings were reviewed with participants i. Online care management group in which participants were asked to log-in to the patient portal of an Internet-based care management application at least biweekly Care managers were diabetes educators (nurses or pharmacists) i. Usual care supplemented with Internet access and online self-management resources (''Web training''). Where participants were provided with a laptop computer and Internet access with training in the use of the device as necessary.	**Q.3:** Telephone calls ,web care & training, self-management, Education on lifestyle modifications; case management. **Q.4:** NA – will be included in Final Report with reference to all papers reviewed. **Q.5:** Patients with Type 2 Diabetes Age (years) mean (SD) -60 (10.8)	**Q.6&7:** **Patient Outcomes:** Change in clinical status: Decline in HbA1c-in all groups (S) Decreased Systolic and diastolic BP in telephone group (S) Decreased HDL Cholesterol in telephone group (S) Decreased Diabetes distress in telephone group (S) Decrease in triglycerides in online group (S) On multilevel model analysis, none of the outcomes differed between groups **Q.8:** Noted that the engagement of participants with care managers was not associated with any outcomes assessed.	**Q.9:** RCT to assess effects **CG**: Usual care supplemented with internet access & training. **FUP =** 3, 6, 9 & 12 months **Q.10:**NR **Q.11:**NR	**Researchers' Comments:** Reported that providing access to online resources for patients with poorly controlled diabetes improves outcomes to the same degree as active care management but is likely to be much more cost-effective than active care management.

COCHRANE REVIEW						
Smith et al. (2012a,b) Cochrane Syst. Rev (n= 10 RCT's) (1990-2011) Data drawn from 3 countries	"to determine the effectiveness of interventions designed to improve physical, psychosocial, and health service utilisation outcomes in patients with multi-morbidity in primary care and community settings" (p.2).	**Q.1:** NR **Q.2:** Types of interventions broadly describing terms of main focus as: Organisational (n=8), professional (n=3), patient oriented (n=6).	**Q.3:** Professional: education/training of co-ordinators (n=3); Patient: self-management support & patient education (n=6); peer support (n=1); Organisational: care co-ordination/management (n=4), multidisciplinary team working (n=4), individual care planning (n=7), MDT community care (n=2),; structured visits (n=7), structured telephone contact (n=5). **Q.4** Most common features in 50% or > studies– self-management education/patient education; individual care planning; structured visits, and structured telephone contacts; MDTs Least common features were: Care co-ordination/management; peer support. **Q.5:** Multi-morbidity: combination of physical conditions (n=9, e.g. hypertension, diabetes, heart Disease) or depression and hypertension (n=1), or diabetes &/or heart disease and depression (n=1). Depression. 2 studies focused on comorbidity rather than multimorbidity in general.	**Q.6 & 7: Patient Outcomes:** Change in clinical status: Improved BP (n=1; S; 1 NS Improved glycated haemoglobin (n=1, S; 1 NS) Low density lipoprotein cholesterol levels(n=1/1; S); Symptom scores – (1 NS) Medication Compliance /usage: Drug use and adherence improved(n=1;S) Health related behaviours 2 NS differences. Mental health: Lower depression score.(n=2,S; 1NS) QOL/Wellbeing: Improved (1 S; 2 NS) Mortality: Reduced mortality after a focused occupational therapy and physiotherapy led intervention (S) Functional health: Improved (S) **Process outcomes:** Prescribing by practitioners or the management of medicines, both of which indicated significant benefits for intervention patients (n=2;S) Improved patient assessment **Service Outcomes:** Services Utilisation: Hospital admissions decreased	**Q.9:** Systematic review to determine the effectiveness of interventions designed to improve outcomes in patients with multi-morbidity in primary and community care settings. CG: usual medical care. **Q.10:** NR **Q.11:** NR	Suggests that interventions should target patients across the age spectrum. Most of the studies in the review focused on older patients; however, advised that it is also important to deal with the needs of younger patients with multi-morbidity, which are likely to be different and to include problems related to employment and absenteeism Recommends Planning research in collaboration with policy makers to ensure applicability and successful integration of Interventions into current delivery systems.

				(n=1,S); n = 4 NS differences) Changes in health service visits(n=3; NS) **Q.8: O**rganisational interventions that targeted the management of specific risk factors or focused on areas where patients have difficulties, such as with functional ability or the management of medicines, seem more likely to be effective. Patient oriented interventions linked to healthcare delivery seem more effective.		
STANFORD CHRONIC DISEASE SELF-MANAGEMENT PROGRAMME (CDSMP)						
Brady et al. (2013) USA Meta-analysis (n= 23 RCTs & longitudinal studies). 1999-2009 Data drawn from 5 countries	“To quantitatively synthesize the results of CDSMP studies conducted in English - speaking countries to determine the program’s effects on health behaviours, physical and psychological health status, and health care utilization at 4 to 6 months and 9 to 12 months after baseline” (p.1).	**Q.1:** NR **Q.2: “**The Chronic Disease Self-Management Program (CDSMP) is a 6-week community-based self-management education program designed to help participants gain confidence (self-efficacy) and skills to better manage their chronic conditions” (p.1).	**Q.3:** NR **Q.4:** NR **Q.5:** Chronic disease (no details reported) Aged ≤65 (n=10) to ≥65 (n=5). Total sample size = 8,688.	**Q.6 &7:** **Patient Outcomes:** Changes in clinical status Improvement on fatigue, energy & self-rated health at 4-6/12 but not sustained at 9-12/12 (S), Improved symptoms (pain and dyspnoea) by 9-12/12. Self- efficacy Improved for disease management and symptom management at 12/12 (S) Health Behaviours Increased exercise sustained at 12/12 (S), NS differences in stretching exercises. Increased communication with physician (S) Mental health Improved for depression & health distress at 4-6/12 (S) & 9-12/12 (S). **Process outcomes** Increased communication with	**Q.9:** Meta-analysis **to** assess effects**.** **CG:** Analysed study arms only **FUP** 4/12 -12/12. **Q.10:** NR **Q.11:** NR	**Researchers’ comments:** Concluded that the benefits seen for CDSMP in this meta-analysis “have meaningful, wide-ranging, and complementary implications for chronic disease self-management and for primary and tertiary prevention of chronic disease” (p.5)

				physician (S, small to moderate effect size. **Service Outcomes:** <u>Service Utilisation</u> Small decrease in LOS at 4-6/13 (S) & 9-12/12 (NS), NS differences for hospital admissions or ED visits. **Q. 8** NR		
Fosters et al. (2007) UK Syst. Rev (n= 18 papers on 15 RCTs & 2 Pilot studies 1986- 2006 Data drawn from USA, UK, China, Canada, Australia, Netherlands.	"To assess systematically the effectiveness of lay-led self-management programmes for people with chronic conditions" (p.1)	**Q.1:** Self-management education programmes: programmes that "allow people with chronic conditions to take an active part in the management of their own condition usually based on theoretical models of behaviour" with the CDSM programme based on self-efficacy theory (p.3). Lay led self-management programmes are "structured programmes for people with chronic conditions primarily educational, primarily addressing self-management of disease, and where the majority of the course content was delivered by lay people" (p.4). **Q.2:** Structured lay-led (or peer-led) self-management programmes which differ from professionally- led programmes by involving	**Q.3:** ASMP/ EPP/CDSMP: Educational resources, Goal setting & problem solving; Lifestyle changes around diet, exercise & sleep, resource identification, Symptom management, dealing with emotions, Communicating with HCPs. **Q.4:** Reported that most interventions shared similar content & structure. **Q.5:** Arthritis (n=5) , Osteoarthritis (n=1), Multiple (single) conditions e.g. Diabetes (n=2),HIV (n=1),CHF (n=1),Back Pain (n=1) Patients of all age groups, mostly adults. Mean age ranged from 44 -79 years. Sample size: (n= 7442 ranging from 71-1140 across studies.	**Q.6&7:** Note: Results are for pooled effects in meta-analysis. **Patient Outcomes:** <u>Change in clinical status</u> (n=2) NS differences for HbA1c (n=2) <u>Self-efficacy</u> Improved self-efficacy re symptom management (n=10,S) Improved cognitive symptom management e.g. relaxation, visualisation (n=4,S) <u>Knowledge</u> (n=2) NS differences (n=2) <u>Symptoms</u> Reduced pain (n=11,S) Reduced fatigue (n=1,S, n=6 NS) NS differences for shortness of breath (n=3) <u>Functional status</u> Reduced disability (n=8,S) <u>Mental health</u> Improved depression (n=6,S) & anxiety (n=3, S) Improved psychological wellbeing (n=5, NS). Improvement in health distress (n=4, S). <u>Self-rated general health</u> (n=6) Improved (n=6, S) <u>Quality of life</u> (n=3) NS differences	**Q.9:** Syst. review to assess effects. CG: Usual care (n=17 plus comparison with professional led programmes (n=3). **FUP:** 3/12-6/12 with 2 studies at 12/12. **Q.10:** NR **Q.11:** NR	**Researchers' comments:** The programmes may lead to small but clinically unimportant improvements for some outcomes. No evidence of an effect on healthcare use. Evidence on clinical measures is very sparse.

		lay leaders (with chronic illnesses) and being less formal. Comprised of: Arthritis Self-Management Programme (ASMP): (n=5), CDSMP or its anglicised variation .The Expert Patient Programme (EPP): (n=7 sampling a range of conditions) and other disease-specific lay-led educational interventions (n=5). Short duration over 6 weeks (ASMP, EPP, CDSMP); Others varied 4-7/52. Conducted in community (n=13), primary care (n=3) or hospital (n=1).		Health behaviours Improved frequency aerobic exercise (n=7,S) **Process outcomes:** Communication with HCPs (n=7) Improved (n=7, S). **Service Outcomes:** Service Utilisation NS changes in physician or GP attendance (n=9) NS differences in hospital LOS (n=6) **Q.8: NR**		
Nolte & Osborne (2013) Germany Syst. Rev (N=18 RCTs) 1982- 2006	"To investigate and summarize the effectiveness of group-based chronic disease self-management courses specific for arthritis".(p.1)	**Q.1:** NR **Q.2:** Disease-specific or generic self-management interventions comparable with the Stanford curricula. Most programmes were arthritis-specific i.e. the Stanford Arthritis Self-Management Course for osteoarthritis or other musculoskeletal disorders (n=7)**,** rheumatoid arthritis (n=2), & Generic CDSMP (n=4). Note: Only included studies that were reasonably similar to the	**Q.3:** Action planning, goal setting, Education. As for standard programme **Q.4:** NR **Q.5:** Osteoarthritis (n=8) , other musculoskeletal disorders (n=4) or Rheumatoid arthritis (n=2), back pain (n=1), chronic pain (n=1), fibromyalgia (n=1), unclear other than application of generic CDSM (n=2) Aged ≥18 years. Sample sizes NR.	**Q.6 &7:** **Note**: Reported as effect size (ES) index. Results below are for between-groups. **Patient Outcomes:** Change in clinical status General health (n=7): Varied from small negative to medium positive ES. Symptoms (n=17) Pain: (n=17) with small-medium ES (n= 9) or negligible ES (n= 8) Fatigue (n=6): negligible to small ES (n=5) & medium ES (n= 1) Mental health Depression (n=10) negligible to small ES (n=9) & medium ES (n= 1)	**Q.9:** Syst. review to assess effects. **CGs:** NR **FUPs**: ranged post treatment to 6/12. **Q.10:** Lack of objective biological measures of disease severity in musculoskeletal diseases which means that evaluators rely on participant self-report when looking at program effectiveness. **Q.11:** NR	**Researchers' Comments:** Noted that results were disappointing & are in contrast to other reviews that have showed at least one third of participants benefiting from such courses. On the other hand, the review confirms other reviews indicating that the Stanford CDSMP or similar programmes gave negligible to small effects. Evaluations of medium & longer term effects are needed.

		Stanford curricula. Programmes had to have the following 4 criteria: delivered in a group setting; based on a formal syllabus; ran between four and ten sessions within a period of 3 months; did not include any additional components such as exercise lessons, reinforcement techniques, individual consultations, and/or home visits.		Anxiety (n=4): negligible to small ES. Functioning status (=9) Disability (n=9): negligible to small ES (n=5) & small-medium ES (n= 4) Physical functioning: negligible (n=2) to small effects (n=2) Self –efficacy Self-efficacy/Confidence (n= 10): very small (n=2), small to medium (n=5), medium (n=2) to above medium (n=1) ES. Knowledge (n=5) Medium or large ES (n=5)) **Process outcomes** Communication with physician (n=5): Negligible to small (n=4) & large (n=1) ES. **Service Outcomes:** Service utilisation Visits to physician (n= 8) varied from small decreases to small increases in ES. **Q. 8:** Reported that current approaches to program evaluation may not be sufficient to assess the true impact of chronic disease self-management education as evaluations heavily rely on participant self-report.		
Elzen et al. (2007, 2008) The Netherlands RCT (n=129)	To evaluate " the effect of the CDSMP [Chronic Disease Self-Management Program] on health care utilization among chronically ill	**Q.1:** NR **Q.2:** Chronic disease self-management programme in chronically ill older people. Intervention period (NR).	**Q.3:** Chronic disease self-management programme. Outcomes measured through self-report at baseline and **FUP**. **Q.4:** NA – will be included in Final Report with reference to all papers reviewed. **Q.5:** Diabetes, Lung disease, Arthritis	**Q.6 &7:** **Service Outcomes:** Service Utilisation: NS differences in visits to GP Medical specialist, doctor, or physical therapist, NS differences in hospital admission/duration of admission. S difference between IG & CG in relation to the use of home care,	**Q.9:** RCT to assess the effect on the CDSMP on health care utilisation among chronically ill older patients. **CG**: Usual care. **FUP** at 6/12 **Q.10:** NR	**Recommendation:** Future research should include a **FUP** period of at least 12/12. Utilisation of a monthly questionnaire may be more beneficial than the administration of a 6/12 self-report.

	older people" (p.159)		& Heart disease in patients aged between 59-87 years.	but due to decrease in IG & increase in CG. **Q.8:** Reported that there was "no convincing evidence for a decrease in health care utilization as a result of the CDSMP" (p.160).	**Q.11:** NR	
Kennedy et al. 2007; & Reeves et al. (2007) UK RCT (n=629) Post hoc subgroup analysis reported in Reeves et al. paper. .	To examine the clinical & cost effectiveness of selfcare support through the 'Expert Patients' programme (Kennedy et al. 2007) and "To determine whether baseline characteristics predict clinical outcomes from attendance at a chronic disease self-management course; and to assess whether identification of such characteristics assists in targeting the course to individuals most likely to benefit" (Reeves et al. 2007 p.198)	**Q.1:** "Expert Patient Programme: "a group intervention which is led by trained lay people with experience of long-term conditions... it is designed to help participants to develop appropriate self-care skills" (p.199) **Q.2:** Expert Patient Programme in the UK is an adapted model of the Stanford Chronic Disease Self-Management Programme. Led by trained lay people with experience of long-term conditions. Designed to help participants to develop appropriate self-care skills. Consists of 6 x 2.5 hour group sessions held weekly in a non-NHS premise. Sessions include relaxation, diet, exercise, fatigue, breaking the 'symptom cycle', managing pain and medication, and communication. Intervention lasted 6/52.	**Q.3:** Stanford programme e.g. goal setting, action planning, Topics/focus related to lifestyle behaviours, symptom management, Communication (see Q. 2). **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Musculoskeletal, circulatory, respiratory. 15.7% under 40 years, 41.3% between 40-59 years, 43% over 60 years).	Q.6 & 7: **Patient Outcomes:** Self-Efficacy: Improved & greater impact on those with lower self-efficacy at baseline (S) Symptoms Energy levels greater impact on younger participants i.e. ≤ 40y (S) Other Health Outcomes: Improvements e.g. psychological wellbeing, social limitations, pain. Quality of Life: Individuals with low QOL at baseline likely to benefit more from programme (S, effect size small to moderate). **Service Outcomes** NS differences. **Q.8:** NR but noted that patient characteristics may influence effects e.g. those with lower baseline self-efficacy & HRQOL gain most from the Expert Patients Programme. Also, younger people vs older people may benefit more.	**Q.9:** RCT to effects. **FUP** at 6/12 in both IG & CG. CG did not avail of any intervention. Multiple regressions utilised to determine individuals most likely to benefit from ICP. **Q.10:** Patient experience study indicated that younger individuals found the course setup and group discussions unappealing (course orientated towards older patients). **Q.11: NR**	**Researchers' comments:** Need to make the course more appropriate to the needs of younger participants (e.g. increasing the focus on employment related issues). "The programme may be a useful addition to current provision for long-term conditions" i.e. in Expert Patient Programme (Kennedy et al. 2007 p. 261).
Smeulders et al. (2010)	"To report on of the effects of the Chronic	**Q.1:** CDSMP is "a generic cognitive-behavioural group programme and a	**Q.3:** Self-management (goal-setting and action-planning) Self-efficacy, Education and Health information.	**Q.6 &7:** **Patient outcomes:** Improved physical activity among	**Q.9:** RCT to assess effects with **CG:** **FUP** at 6/12 & 12/12	**Researchers' Comments** A significant short-term effect of the CDSMP was

Netherlands RCT(n=256)	Disease Self-Management Programme on psychosocial attributes, self-care behaviour and quality of life among congestive heart failure patients who experienced slight to marked limitation of physical activity” (p.1487).	structured self-management programme where patients with different chronic diseases can learn from each other as they face similar adaptive tasks”.(p.2) **Q.2:** Programme consisted of six weekly group sessions of two and a half hours each and incorporated four strategies to enhance self-efficacy expectancies: skills mastery, reinterpretation of symptoms, modelling and social persuasion. All CDSMP classes were led by a trained cardiac nurse specialist (‘professional leader’) and a patient with CHF (‘peer leader’).	**Q.4:**NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Congestive Heart Failure (CHF) Adults with mean age 67 years	patients with CHF (S) Improved Self-care behaviour (S) Self-efficacy No effects were observed(NS) Anxiety & Depression Not affected (NS) Quality of Life (QOL) Improved QOL.(S) Cognitive symptom management (s) No significant effects found at 6 & 12/12 follow up. **Q.8:** NR	**Q.10:** NR **Q.11:** NR	found for self-care behaviour, but did not extend to 6 and 12 months of follow-up.
Adepoju et al. (2014) USA RCT (n=376)	“To compare time-to-hospitalization among type 2 diabetes patients enrolled in different diabetes self-management programs (DSMP)”.(p.111)	**Q.1: “**CDSMP is an educational model developed by Stanford University and focuses on equipping patients to be proactive in managing their chronic diseases”.(p.112) **Q.2:** The study compared time-to-hospitalization among Type 2 diabetes (T2DM) patients randomized to one of four study arms: personal digital assistant hand held	**Q.3:** Self-management (decision making, action planning), self-efficacy, information technology, ,and effective communication **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Multi-morbidity**:** Chronic heart failure, Ischemic heart disease, Renal failure, cardiac conditions, although mainly addressed type 2 diabetes mellitus Average age: (57.5 years).	**Q.6 &7:** **Services outcomes:** Significantly prolonged time-to-hospitalization **in** CDSMP-only arm (S) No improvements in Subjects in the PDA-only and combined PDA and CDSMP arms (NS) CDSMP –interventions able to delay the occurrence of any acute event necessitating hospitalization, ER visits and observations among patients with T2DM (S) **Q. 8:** NR	**Q.9:** RCT to assess effects with 24/12 **FUP**. **Q.10:** i. Subjects in the study may have visited emergency departments and hospitals out of their HMO network, for which information was not available i. Less healthy persons in the combined group than persons in the CDSMP group	**Researchers’ Comments** Reported that healthcare utilization outcomes varied between the CDSMP-only and combined groups that received the CDSMP intervention possibly because persons in the combined group were generally less healthy: 2% with normal weight and 80% obese versus 9% normal weight and 65% obese in the CDSMP only

		device (PDA n = 81), Chronic Disease Self-Management Program (CDSMP n = 101) combined PDA and CDSMP (COM), and usual care (UC), (n = 99) to determine whether DSMP enhanced the probability of healthier outcomes and prolonged the time to first hospitalization within any of the treatment groups, after controlling for relevant demographic and clinical variables.			**Q.11:** Reducing unnecessary healthcare utilization, particularly inpatient hospitalization is a key strategy to improving the quality of health care and lowering associated health care costs.	group. Also reported that the CDSMP is likely to be effective within a short time span (2 years) in prolonging time-to-hospitalization among patients with T2DM patients.
Cameron-Tucker et al. (2014) Australia RCT(n=69)	"To evaluate the Chronic Disease Self-Management Program (CDSMP) in the pulmonary rehabilitation of people with (COPD) or Chronic Obstructive Pulmonary Disease".(p.513)	**Q.1:** NR **Q.2:** 6 week programme comprising of chronic disease self-management combined with supervised 6 minute walk distance exercise (6MWD). Delivers in medical centre of community led by trained leaders. .	**Q.3:** Walking exercise, Self-management (e.g. problem solving, action plan), Educational and health information (on COPD. & physical activity), **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** COPD in adults Average age: (65 years).	**Q.6 &7:** **Patient outcomes:** Quality of life (QOL) No statistically significant Increase in (6MWD) in both IG & CG. (S) Self Efficacy NS differences Increase in self-reported exercise, exercise stage of change, exercise, breathlessness and self-management behaviours although with no significance (NS) **Q. 8:** Using an additional community-based mentoring component.	**Q.9:** RCT to assess effects with **FUP** (NR). CG n= 31 **Q.10:** **Process specific:** Would have been informative to have a group in a twice-weekly or three-times-weekly supervised exercise schedule to determine whether this more exacting approach to exercise would add to the effects of the CDSMP. Does not include a structured home exercise programme. **Q.11:** More intensive conventional exercise program as advocated in guidelines for	**Researchers' comments:** Reported that the measure of self-reported exercised used, was more comprehensive than the Stanford measure[46] which contrasted the findings with other studies, that had reported significant increase in self-reported exercise immediately following the CDSMP alone for people with chronic conditions, including COPD

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[46] Lorig K, Stewart A, Ritter P, Gonzalez V, Laurent D, Lynch J. *Outcome Measures for Health Education and Other Interventions*. Thousand Oaks, CA: Sage Publications, Inc.; 1996.

					successfully fostering adequate amounts of home or community-based exercise which meet current recommendations for optimizing health benefits.	
Forjuoh et al.2014 USA RCT(n=196)	"To assess the effectiveness of the Chronic Disease Self-Management Program (CDSMP) on glycated haemoglobin A1c (HbA1c) and selected self-reported measures".(p.407)	**Q.1:** NR **Q.2:** 6-week, classroom-based program for diabetes self-management with the goal of increasing self-efficacy to ultimately decrease chronic disease related symptoms and avoidable healthcare utilization. Program was a comparison of one intervention arm, the CDSMP, and the control arm, designed to evaluate the effectiveness of two different type 2 diabetes mellitus (T2DM) self-care interventions (implemented singly and in combination) on glycaemic control. Involved lay leaders.	**Q.3:** Self-management, self-efficacy, decision making, action planning, and effective communication **Q.4:** NA- will be included in Final Report with reference to all papers reviewed **Q.5:** Two different type 2 diabetes mellitus (T2DM) for adults ≥ 65	**Q.6 &7: Patient Outcomes:** Change in clinical status Reduction in HbA1c in CG with usual care suggests good routine in integrated care can lead to better glycaemic control (S) Differences between the CDSMP intervention (IG) and usual care CG (NS). Symptoms NS Health Behaviours: Self-care activities few S differences Quality of Life NS differences **Q. 8:** Reported that there is a debate in the self-management field regarding whether generic *vs* disease-specific self-management is more beneficial.[47][48]	**Q.9:** RCT to assess effects with **FUP** at 12/12. CG = usual clinical diabetes care along with some publicly available education materials. **Q.10:** Differences between the intervention and control groups, with the control group appearing to be healthier at baseline **Q.11: NR**	**Researchers' Comments** Reported that a behavioural intervention such as the CDSMP can result in some modest improvements in glycaemic control, although the same improvements may also be found among participants that receive usual care. Also noted that for post-hoc analysis, future analyses should focus on randomizing a larger number of participants in the treatment arm being investigated in order to prevent under-powered results.

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[47] Brady TJ, Murphy L. Sorting through the evidence for the arthritis self-management program and the chronic disease self-management program: Executive summary of ASMP/ CDSMP meta-analysis [Internet]. 2011 (Accessed on 2nd December 2013). Available from: URL: http: //www.cdc. gov/arthritis/docs/ASMP-executive-summary.pdf

[48] Sevick MA, Trauth JM, Ling BS, Anderson RT, Piatt GA, Kilbourne AM, Goodman RM. Patients with Complex Chronic Diseases: perspectives on supporting self-management. *J Gen Intern Med* 2007; 22 Suppl 3: 438-444 [PMID: 18026814 DOI: 10.1007/s11606-007-0316-z]

Appendix 8: Models of Care Data Extraction Country-Specific or Origin

Authors, Date, Country **Type of evidence (dates of evidence if synthesis papers & countries represented if reported)**	**Aim**	**Q.1. Definition(s) of IC** **Q.2. Description of IC**	**Q.3.Features/Components of IC** **Q4. Shared/Different features/components if applicable (i.e. more than one IC reported** **Q5. Chronic Disease(s) Context**	**Q.6 & 7 Outcomes assessed & Effects/Impact on outcomes** NS = Not statistically significant. **Q. 8 Features/components of ICP associated with improved results**	**Q.9. Evaluation of ICP** CG: usual care (not details provided) FUP: **Q.10 Implementation Barriers** **Q.11 Implementation Enablers**	**Additional Comments / key recommendations/. Reported quality stated by authors.**
All papers in this Appendix are Case Studies, Commissioned Reports, or Peer reviewed papers on Evaluations of Implementing Models of Care						
UNITED KINGDOM						
Singh and Ham (2006) Evidence review commissioned as part of the NHS Institute's work plan and a survey of strategic health authorities in England. Focus on improving care for people with long-term conditions.	To compile up-to-date information about generic care models and the impact of these models and to better understand current international, national and local thinking about the different approaches to the NHS and Social Care Model.	**Q1**. NR **Q2.** Several models are described within the report including the NHS and Social Care model, CCM, the Continuity of Care Model and the Program of All-Inclusive Care for the Elderly (PACE) model.	**Q3.** A wide variety of approaches have been adopted to support implementation of the NHS and Social Care Model with an emphasis expanding the *Expert Patient Programme* on promoting self-management including the support of specialists nurses (community matrons), and on how teams will work together. The CCM and the related Innovative Care for Chronic Conditions Model are the most common frameworks for conceptualising effective components of care for people with long-term conditions. **Q4. CCM:** Community resources; the healthcare system; patient self-management; decision	**Q6. & 7.** There is limited high quality evidence about the impact of any model. There is evidence that improvement programmes which aim to implement the CCM can have a sustainable impact on quality of care and some clinical and resource outcomes. No evidence of implementing other models reviewed – The Public health model; The Continuity of Care Model. **Q8.** The relative merits of each component of the model and the extent to which these are implemented effectively by healthcare organisations, is still under review. "While there is evidence that single or	**Q9**. Review of international frameworks in the literature, feedback from experts, surveying strategic health authorities **Q10.** NR **Q11.** NR	**UCC Authors comments:** Service delivery models were also reviewed in this report but we excluded them because they do not represent generic models of care for chronic disease management or prevention.

			support; delivery system redesign; and clinical information systems. **Q5**. Complex & long term conditions.	multiple components of the Chronic Care Model can improve quality of care, clinical outcomes, and healthcare resource use, it remains unclear whether all components of the model, and the conceptualisation of the model itself, is essential for improving chronic care" (p8).		
UK - House of Care						
Diabetes UK* (2011) United Kingdom Pilot project (3 pilot sites, 53 practices) **Grey literature*	RE: the House of Care - 'to summarize the key learning from the project so that it is available for others to consider and use... to act as the formal report of the activities and findings of the pilot programme' (p.11)	**Q.1:** 'care planning is a process which offers people active involvement in deciding, agreeing and owning how their diabetes will be managed. It is underpinned by the principals of patient-centeredness and partnership working… it is an ongoing process of two-way communication, negotiation and joint decision making in which both the person with diabetes and the healthcare professionals make an equal contribution to the consultation' (p.31,Department of Health & Diabetes, UK, 2006). **Q.2:** Routine consultations between	**Q.3:** Care planning, community support services, & IT. **Q.4: NA – will be included in final report with reference to all papers reviewed.** **Q.5:** Type 1 & Type 2 Diabetes	**Q6&7: Patient Outcomes:** <u>Perceived quality of care:</u> Improved experience of care. <u>Self-Efficacy:</u> Improved self-care behaviour. **Service Outcomes:** Care planning adopted as norm in majority of practices (83% or practice). 76% of individuals with type 2 diabetes on practice registers received at least 1 care planning consultation. 1,000 HCP's trained, and 40+ local trainers' quality assured. Productivity improved (care planning cost neutral at practice level); some report savings. **HCP Outcomes:** <u>Knowledge:</u> Improved knowledge and skills, greater job satisfaction. Practices report better organisation and team work. **Q.8:** Reported that routine diabetes care can be best delivered by 'a service designed around structured education and care planning'	**Q.9:** To report and assess the impact of the Year of Care pilot programme. Intervention lasted 24/24. **Q.10:** NR **Q.11:** NR	

		clinicians and people with long term conditions to ensure collaborative care planning; ensuring that local services required for support are recorded and available, through commissioning. Intervention lasted 24/24.		(p.111).		
CALIFORNIA, USA – Care Management						
Bodenheimer and Berry-Millett (2009) Research synthesis report No.19 for policymakers. Centre for Excellence in Primary Care, Department of Family and Community Medicine, University of California, San Francisco.	To explore the potential for care management to improve quality of care and reduce costs for people with complex health care needs.	**Q1**. "Care management is a set of activities designed to assist patients and their support systems in managing medical conditions and related psychosocial problems more effectively, with the aim of improving patients' health status and reducing the need for medical services" (p4) **Q2.** "The goals of care management are to improve patients' functional health status, enhance coordination of care, eliminate duplication of services, and reduce the need for expensive medical service Care management is different from case management. Case management often refers to a limited set of episodic services assisting patients and families in navigating the health care and social service systems with cost reduction	**Q3.** Identify patients most likely to benefit from care management; assess the risks and needs of each patient; develop a care plan together with the patient/family; teach the patient/family about the diseases and their management, including medication management; coach the patient/family how to respond to worsening symptoms in order to avoid the need for hospital admissions; track how the patient is doing over time; revise the care plan as needed. **Q4.** All care management models address problems such as falls, lack of mobility, chronic pain and incontinence, hearing loss, depression, visual impairment and dementia. Other components may include patient education;	**Q6. & Q7.** Evidence for improved quality of care and cost reduction for primary care, integrated multi-speciality groups, and hospital-to-home but inconclusive evidence for vendor supported management and home-based programmes. Care management within the hospital-to-home care transition, and possibly within primary care, can significantly reduce hospitalisation and health care costs for complex patients **Q.8** Patient selection; person-to-person encounters; home visits; specially trained care managers with low caseloads; multidisciplinary teams including physicians; presence of informal caregivers; use of coaching.	**Q9.** Research studies not entirely reflective of the non-research environment. It is important to examine experiments of care management that are implemented by health care organisations – these are real world examples of care management but have a less rigorous evaluation of their impact than research-based programmes. **Q10.** **Organisation specific** Care management provided independent of primary care by disease management companies or through the use of telephone encounters alone is generally not effective. **Q11**. **Practice specific** "Care management provided by RNs, who are in close communication with physicians and are supported by an interdisciplinary team, can improve the quality of life and other clinical	**Researchers' comments:** "A promising development is the high-risk clinic, which concentrates complex patients in one setting with a specialised interdisciplinary team intensively caring for a small panel of patients…These clinics can address the problem of traditional primary care practices lacking resources to support care management for their relatively small numbers of patients with complex health care needs" (p16).

		as its primary goal…care management is a broad set of longer-term services that includes medical management and assistance in navigating the system, with both quality enhancement and cost reduction as goals. Care management requires the involvement of professionals with clinical training, usually registered nurses (RNs)” (p4).	assistance with coping; crisis management; surveillance to determine if a disease process is worsening and to intervene prior to the need for acute care; navigating the health system; creation of a specific care plan; support for family caregivers; clinical care (e.g. medication intensification, wound care, physical therapy); and coordination of care among primary care, speciality care and ancillary services. **Q5.** Care management focuses on individuals who have multiple chronic conditions i.e co-morbidities.		outcomes for complex patients in primary care, home, and hospital-to-home settings.. …..care management should be accurately targeted to patients with complex health care needs whose problems can be alleviated through medical-psychosocial intervention. Multidisciplinary teams involving both physicians and RNs with specialised training enhance the success of care management…finally, adopting a coaching paradigm to teach self-management skills to patients and families appears to enhance the value of care management” (p16).	
CANADA AND FINLAND – Chronic Care Model as main focus						
Health Council of Canada (2009) Government Report (Case studies from four Canadian areas and one international case study from Finland).	To identify how applied primary health care research can be translated into pragmatic action. Specific goals were to identify: critical success factors for effective team-based disease management; challenges inherent in implementing the team approach; steps required to address and overcome obstacles; and delivery mode and performance of the teams in the case examples.	**Q1.** NR **Q2.** All 5 case studies embraced some components of CCM The case studies were: 1. Calgary Zone’s CDM - health promotion and disease prevention; 2. Group Health Centre partnership approach, Ontario with an emphasis on interdisciplinary care and self-management, 3. Disease management for COPD in Nova Scotia with an emphasis on self- management & multidisciplinary community primary health care, 5. Health care in Finland The health centre is the primary point of	**Q3.** **Case Study 1** Nurse support in primary care (community-based nurses partnered with family physicians); Living well with a chronic condition program (community-based exercise, education and self-management program); Programs for diverse populations; Complex chronic care (high-intensity, high frequency users of the acute care system are referred to an interdisciplinary clinic for patients with multiple chronic conditions); Access to specialist expertise in primary	**Q6. & 7** **Note:** Significance results NR. **Case Study 1** **Patient outcomes** Changes in clinical status HbA1C control increased by 17% Triglyceride control increased by 13% **Service outcomes** Service utilisation COPD-related exacerbation in-patient hospitalisations decreased by 19% In-patient hospitalisations decreased by 41% overall ED visits for all patients decreased by 34% **Case Study 3**	**Q.9.** Evaluations underway for some models – the need for real-time evaluation that is integrated into electronic systems is necessary. **Q10.** **Practice specific** **Case study 1:** duplication of existing regional/community programs; short-term nature of the exercise program; expanding to other diseases. **Organisation specific** **Case Study 2:** human resources (value of nurse-managed clinics crucial in monitoring patients with chronic disease and improving the educational components of CDM);	**Researcher’s Comments** **Case Study 1** “Establish clear eligibility criteria for the program and the roles and responsibilities of each provider; create a structured process for partnering with other programs to ensure established cross-referral mechanisms; support patients in the self-management of their condition and health behaviour change” (p13). **Case Study 2** “The development of interdisciplinary teams,

		health service for most people with chronic conditions, or conditions which may later be diagnosed as chronic disease. **Note**: Case 4 excluded because of focus on mental health.	care (speciality clinic expertise provided to family physicians to help develop care and role algorithms); Academic detailing (pharmacy education for physicians and nurses) Information systems (electronic records) Evaluation (performance measurement and quality improvement integrated into CDM). **Note**: Features of other cases not explicitly reported although all noted to emphasise self-management education, multidisciplinary teams **Q4.** Collaboration and/or partnerships; quality improvement; education and training; information systems; community access and responsiveness; program promotion and changing perspectives; client self-management; team effectiveness. **Q5.** Referred to chronic diseases in general across these cases with the exception of COPD in Case 3.	**Patient outcomes** Changes in clinical status Improved dyspnoea scores Health behaviours Increased smoking cessation rate Improved medication use Improved health status/disease condition (50% of participants) Increased participation in exercise and breathing exercises **Q.8** The following components are essential for program implementation and sustainability: leadership; an interdisciplinary team approach; an electronic database; patient self-management tools and support; and the monitoring of health outcomes. Also see researcher comments.	information systems (funding). **Case Study 3** Physician recruitment (the need for physician champions and getting buy-in) Infrastructure resources and support (maximum use of what is available and seek funding from every conceivable source) **Case Study 5 (Finland)** Changing perspectives (to achieve planned, managed care of chronic conditions while still providing acute care – practitioners have recognised that the model helps in care provision and does not create an additional burden) **Q11**. Final conclusion from five case studies: effective communication, patient-centred programs, clinician engagement, community involvement and empowerment, community outreach, and strong support from senior leadership.	with a focus on maximising scope of practice, and the use of medical directives; continuous assessment and evaluation using an electronic medical record system; strong leadership at governance and clinical levels” (p17). **Case Study 3** “Promote the program – involve and obtain referrals from general practice, emergency room, and specialist physicians; maximise team potential – set the enabling conditions for change by showing team members how they can best use their skills; obtain support from senior leadership - keep them informed and involved in the program; start small and demonstrate the success of what you have implemented to get buy-in and to sustain the program” (p20). **Case Study 5 (Finland)** “Patients’ long-term disease management and complex medication management will not be successful without a structured treatment model and supporting tools; implementation needs the engagement of management and enough

						resources at the grassroots level to take care of all tasks i.e. acute and chronic care; changes is not easy and needs continuous reinforcement – a good training program for current staff and an orientation for newcomers is necessary" (p28).
GERMANY – Disease Management Programme						
Hamar et al. (2010) Germany Retrospective comparison with IG & comparison group – Evaluation of national programme (n=22,987 patients)	"to evaluate the impact of a proactive chronic care management program for members of a German insurance society who suffer from chronic disease" and specifically "we tested the impact of nurse-delivered care calls on hospital admission rates" (p.339).	**Q.1:** Chronic care management is a "program designed to provide holistic support and care to members with chronic disease to improve the quality of medical care and thereby decrease medical expenses and increase member satisfaction" (p.340). **Q.2:** The programme involved educating and empowering members to effectively care for their health with respect to their chronic disease(s) with the goal of preventing acute events and related hospitalisations. Programme delivered by CCM nurses who used proprietary electronic management software to document all member medical information and care call interactions.	**Q.3:** Tailored patient education including self-management using Telephonic care calls, mailed educational materials, and access to online support. Risk stratification (as a basis for determining individual needs including frequency of calls). Stratified as 3 least severe to 1 most severe. **Q.4:** NA **Q.5:** Coronary artery disease (48%), heart failure ((14.3%),, diabetes (59.3%), or chronic obstructive pulmonary disease (12.3%). Intervention (n=17,319) and Comparison (n=5668); Mean age 71.2-71.5 years.	**Q.6&7: Patient Outcomes:** **Patient outcomes:** Quality of life Improved (S) **Service Outcomes:** Service Utilisation Reduced admission rates by 6.2% IG vs increase in CG by 14.9% (S). The overall decrease in admissions for IG was driven by risk stratification levels 2 and 1, for which admissions decreased by 8.2% and 14.2% compared to Comparison group increases of 12.1% and 7.9%, respectively. **Q.8**: Risk stratification	**Q.9:**Retrospective comparative analysis on participants participating in the programme based on records on telephonic interactions. **CG:** participants not participating in the programme but who had signed up to participate. **Follow-up:** Evaluation completed 12 months following initial implementation. **Q.10:** NR **Q.11:** NR	**Researchers' Comments:** Concluded that participation in care calls reduces the likelihood of inpatient admission in a population that is diverse with respect to disease diagnosis and severity.(p.343) A proactive chronic care management care calls can help reduce hospital admissions among German health insurance members with chronic disease.

AUSTRALIA –Disease Management Programme						
Hamar et al (2015) Australia Retrospective comparison with IG & comparison group – Evaluation of national programme. (n=4,948 IG; 28,520 CG).	“To evaluate the longitudinal value of a chronic disease management program, My Health Guardian (MHG), in reducing hospital utilization and costs over 4 years”(p.1).	**Q.1:**NR **Q.2:** My Health Guardian (MHG) is a population health and well-being program available free of charge to individuals enrolled in an HCF plan that provides hospital coverage, and who have a qualifying chronic condition”.(p.3) The program provides knowledge, individualized support via telephonic nurse outreach and online tools for behaviour change well-being and self-management of health conditions. All members have access to an online program with health assessments, health actions plans, personalized health support, education, and health behaviour tracking.	**Q.3:** Individualised telephonic support by nurses - Self-management, Actions plans, Education and health behaviour tracking. **Q.4: NA** **Q.5:** Heart disease or CAD, Diabetes in HCF members aged 20-89 years with continuous insurance coverage in the base period and four-year intervention period.	**Q.6&7:** **Service Outcomes:** Service Utilisation Reductions in hospital admissions (S) Reduced readmissions (S) Reduced bed days (S) **Resource Outcomes:** Reduced costs (S) **Q.8:** NR	**Q.9:** Matched control retrospective analysis **CG**: matched control **FUP:** Evaluated over 4 years. **.10:** NR **Q.11:**NR .	**Researchers’ comments** Reported that “program participation is associated with significant reductions in utilization and cost in the first year and that the magnitude of these outcomes increase with time”(p.8). 4 years follow up.
MULTIPLE COUNTRIES: EUROPE (all papers related to DISMEVAL study: Disease Management Programme						
Nolte & Knai (2015)* *Report on Chronic Disease Management in European Health Systems prepared	To report on approaches to chronic disease management & evaluation strategies in a range of European countries as part of the DISMEVAL project (Developing and validating DISease Management EVALuation methods	**Q 1**. Noted that definitions vary in the literature. DM defined “as comprising the following components: (a) an integrated approach to care or coordination of care among providers, including physicians, hospitals, laboratories and pharmacies; (b) patient education; and (c) monitoring or collection of patient outcomes data for	**Q.3** Components of CCM used as a basis for evaluation, namely, self-management support (in most countries), service delivery design, decision support & clinical information systems (least developed) **Q.4** Most common -self management support. Least common -clinical information	**Q.6.or 7** **Evaluation findings** Noted wide variation in the nature and scope of approaches across countries incl. the extent to which nonmedical staff is involved in care delivery. The GP/family physician tended most commonly acted as principal provider or ‘care coordinator’.	**Q.9** Mixed methods: Survey guided by CCM & in addition evaluating barriers & facilitators. Interviews with key stakeholders and reviews of work in progress such as pilot projects, green or white papers, consultation documents, committee reports, parliamentary hearings and proposals. **Q.10** **Service specific** Limiting implementation to select	**Researchers’ Comments:** All of the countries reviewed in this book have a similar commitment to providing universal and reasonably equitable access to health care for their populations, but do so in different ways. **UCC Authors’ Comments:** The individual chapters in this Report are written by

for the European Observatory Series in Health Systems & Policies. Covers 12 countries: Austria (AUS), Denmark (DN), England (UK), Estonia (EST), France (FR), Germany (GER), Hungary (HG), Italy (IT), Latvia (LAT) Lithuania (LUT), the Netherlands (ND) and Switzerland (SW) (the only non-EU country). *Grey Literature	for European health care systems), a 3 year European collaborative Project (2009-2011) which aimed to provide evidence to inform decision-making in chronic DM evaluation.	the early detection of potential complications” (sourced from Krumholz et al., 2006). **Q.2 S**tructured disease management programmes to improve coordination, implemented nationally level, or, regionally in decentralized systems. A number of countries were characterized by a wide Programmes in a number of countries were small scale pilots at local/ regional level intended for subsequent implementation in larger geographical areas (e.g. Aus. DN, IT & SW)	systems. **Q.5. T**ype 2 diabetes, asthma/COPD,CVD, CHF, ischaemic heart disease, stroke), cancer, and mental health problems.	Overall description of programmes indicated that: Most approaches focused on populations with defined conditions; A trend towards strengthening the role of nurses in care delivery and coordination in some countries (e.g. (UK, IT, ND) e.g. nurse-led clinics and nurse led case management, self-management support & extended roles. Noted wide variation in the nature and scope of approaches across countries incl. the extent to which nonmedical staff is involved in care delivery. The GP/family physician tended most commonly acted as principal provider or ‘care coordinator’. Overall description of programmes indicated that: Most approaches focused on populations with defined conditions; A trend towards strengthening the role of nurses in care delivery and coordination in some countries (e.g. (UK, IT, ND) e.g. nurse-led clinics and nurse led case management, self-management support & extended roles. (see also Q10 & Q11. **Q.8**	geographical regions may limit access to defined population groups **Organization specific** Few approaches to reduce barriers between sectors Continuing structural or sectoral boundaries **Q.11**. **Practice specific** Structured referral pathways (provided no sectoral boundaries exist) **Organisation specific** Breaking down sectoral boundaries in primary-secondary care such as: Provider networks (e.g. FR) A range of integrated care contracts (GER) **Resource specific** Financial incentives such as Start up funding to support infrastructural development targeting payers e,g, municipalities (DN), IC pilots (UK), IC contracts (GER), or support Providers as in the case of provider networks (FR).	various authors. In our report however, we are reporting on the Report Findings overall and therefore citing Nolte & Knai rather than authors individual chapters. .

Nolte et al. (2012a) & Elissen et al. (2014) & Knai et al. (2013) Peer reviewed papers & Evaluation Report on the DISMEVAL project focusing on Netherlands (ND), Germany (GER) & Austria (AUS) (Nolte et al. 2012a) with these 3 as well as Spain (SP), Italy (IT) & Denmark (DN) reported by Elissen et al. 2014). AUS was RCT, all other countries	To “examine the role of the regulatory, funding and organisational context for the development and implementation of approaches to chronic care, using examples from Austria, Germany and the Netherlands” (p. 125, Nolte et al. 2012) & to “to describe the interventions, research methods and main findings of the international DISMEVAL project, in which the ‘‘real-world’’ impact of exemplary European disease manage-ment approaches was investigated in six countries using advanced analytic techniques” (p.25 , Elissen et al. 2014). The aim of Knai et al. (2013) paper was to better understand the barriers to evaluation in chronic care.	**Q 1**. DM: ‘the coordinated treatment and care of patients during the entire duration of a (chronic) disease across boundaries between providers and on the basis of scientific and up-to-date evidence” (p. 131, Nolte et al. 2012, sourced from Bundesversicherungsamt, 2011)[49]. & DM: ‘‘a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant’’ (p.26, Ellissen et al. 2014) **Q.2** DMPs is the overarching approach adopted in the countries to improve integrated care delivery. Although most DMPs are single disease oriented, generalist approaches are being adopted to address co-morbidities but as yet tend to be geographically localised and/or restricted to pilot programme. Content & scope of DMPs varies across. ND: MDT approach in care	**Q.3 (FUP= follow up)** **AUS:** Patient management with coordinating physician following care pathways; Patient education (group) with goal setting, timelines, joint targets & regular FUP, standardized documentation. **DN:** MDT supports rehab. delivery, regular patient FUP; regular inter-organizational meetings; Patient education & regular documentation of self-management needs and activities with individualised treatment plans & goal setting; Access to physical exercise intervention, Monitoring of practice team performance; Systematic clinical data collection. **FR:** MDT care, Individualized care planning by core team; Discussion forum and quality circles; Regular FUP; Patient involvement with joint treatment plans; Shared information system. GER: Coordination of 3 levels of care by GP with evidence based guidelines, Patient education (groups) with joint treatment goals; Regular FUP with patient reminders if missed sessions; Standard-ized electronic document-ation of treatments, tests etc,	**Q.6.or 7** **Note**: General brief statements drawing on studies. S values NR for some outcomes. Most outcome data extracted from Elissen et al. 2014). **Patient outcomes** Changes in clinical status Improved HbA1c (n=3, S, AUS, FR, ND with increase n=1, DN) & BMI (n=4, S, AUS, DN, FR, SP),diastolic BP (S) in DN & SP, cholesterol (DN), NS differences in vascular complications for CVD (GER) Reduced CV risk (S) in SP. Quality of Life Improved (S) for COPD (DN) Mortality Reduced (S) in ND & GER **Process outcomes** Health Monitoring Increased HCP adherence to guidelines concerning e.g. regular foot-, eye-, and HbA1c-measurements (AUS, S, GER) Increased participation in patient education (AUS) **Service outcomes** Service utilizations Reduced for LOS, ED visits for COPD (S,NR in DN), NS differences (GER)	**Q.9** Noted that little systematic evaluation of DMPs to date to determine their effectiveness (re GER). Noted – phased evaluation as part of phased implementation – noted as favourable approach. **CG:** Usual care/no programme **FUP** at 10/12 -36/12 **Q.10** **HCP specific** Additional workload associated with documentation. Professional resistance to change. **Organizational specific** Lack of structured framework (ND) Limited federal oversight of projects resulting in duplication of efforts & a lack of scale-efficiency in some regions with only 16% of funding put to use (AUS). **Resource specific** Lack of funding threatened the viability of shared care introduced in the ND in the 1990s. Lack of financial incentives for physicians has led to slow uptake of DMPs (AUS) **Q.11**. **National initiatives** Strengthened by legislation which removed legal & financial obstacles with parallel introduction of structured DMPs with the intention of providing providers and insurers with incentives to encourage	**Researchers’ Comments** Results point to significant positive ‘‘realworld’’ effects of DM for chronic conditions on process quality, but only moderate improvements in (intermediate) health outcomes. Likely to take at least 3-5 years for DMP to be fully implemented and for any effects at individual level to be seen. From Knai et al. (2013) Responsibility for driving the infrastructure and culture for evaluation must lie with decision-makers and funders of chronic care initiatives.

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[49] Bundesversicherungsamt (2011), ‘Zulassung der Disease Management Programme (DMP) durch das Bundesversicherungsamt (BVA)’, http://www.bundesversicherungsamt.de/cln_108/nn_1046154/DE/DMP/dmp__inhalt.html

involved before/after with comparisons (except ND – no comparison). Knai et al. (2013) reported on 2 case studies for additional insights on barriers (FR & ND).		groups with overall co-ordination across groups led by a physician & patient management largely delegated to nurses; GER & AUS: still a traditional approach to care provided by doctors within the ambulatory care sector, using strict protocols for DM between levels of care, and in which allied professionals play a minor role. FR : diabetes provider networks SP: nurse led clinics (CVD) DN: IC rehabilitation programme	central data analysis to produce quality reports, & provider feedback on performance & for benchmarking. **ND**: Patient stratification re disease severity; Referrals to secondary care overseen by GP who ensures FUP according based on national diabetes MDT protocols, Self-management patient education by practice nurses/ specialized diabetes nurses, Based on need, Disease-specific electronic patient record with check-up & referrals data within care programme with information sharing and automatisation of care protocols **SP**: Structured FUP telephone interviews from initial medical check-up by nurse to assess knowledge about CVD risk; Adherence to recommendations (e.g. smoking cessation); Awareness of clinical symptoms **Q.4** Common features were: Patient education/self-management (all countries). **Q.5**. DMPs mostly targeted single diseases especially diabetes. Other diseases incl. CVD & chronic respiratory disease/COPD (GER). Sample size ranged from 200 (DN) to ≥ 3.4 million in GER for type 2 diabetes.	**Findings on Barriers to Evaluation** (Knai et al. 2013) A lack of evaluation culture and related shortage of capacity; Reluctance of payers or providers to engage in evaluation & Practical challenges around data and the heterogeity of IT infrastructure. **Q.8** Improving access to ambulatory care services, Financial incentives & bundled payment contracts (noted to contribute to higher participation in ND).	evidence based chronic care. Other initiatives included GP centred care, policlinics, & strengthening ambulatory sector. (GER since 2000s). Introduction of health insurance reform (GER) facilitated new forms of delivery & payment for more IC e.g. GP formed care groups who contract with insurers based on ‘bundled payment’. Creating a financial pool at national level forming the basis for DMPs. (AUS since 2006) with a focus on coordinating healthcare delivery across sectors, especially between ambulatory and hospital care.. Also ambulatory care developed to strengthen IC. Development of group practices through agreements with medical professions & health insurance funds.	

Appendix 9: Cochrane's Tool for Risk of Bias

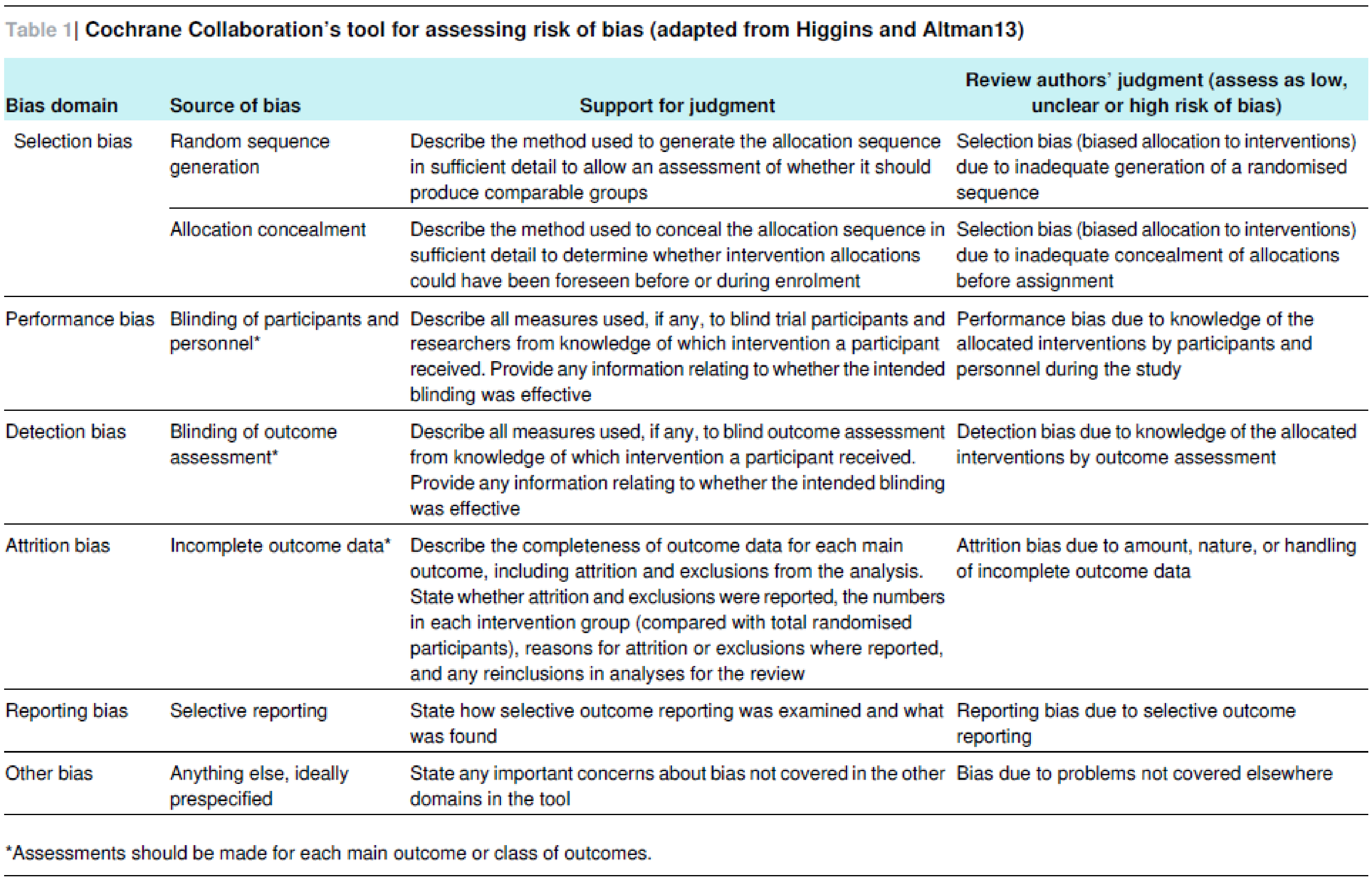

Table 1| **Cochrane Collaboration's tool for assessing risk of bias (adapted from Higgins and Altman13)**

Bias domain	Source of bias	Support for judgment	Review authors' judgment (assess as low, unclear or high risk of bias)
Selection bias	Random sequence generation	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups	Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence
	Allocation concealment	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen before or during enrolment	Selection bias (biased allocation to interventions) due to inadequate concealment of allocations before assignment
Performance bias	Blinding of participants and personnel*	Describe all measures used, if any, to blind trial participants and researchers from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study
Detection bias	Blinding of outcome assessment*	Describe all measures used, if any, to blind outcome assessment from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective	Detection bias due to knowledge of the allocated interventions by outcome assessment
Attrition bias	Incomplete outcome data*	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomised participants), reasons for attrition or exclusions where reported, and any reinclusions in analyses for the review	Attrition bias due to amount, nature, or handling of incomplete outcome data
Reporting bias	Selective reporting	State how selective outcome reporting was examined and what was found	Reporting bias due to selective outcome reporting
Other bias	Anything else, ideally prespecified	State any important concerns about bias not covered in the other domains in the tool	Bias due to problems not covered elsewhere

*Assessments should be made for each main outcome or class of outcomes.

Appendix 10: AMSTAR Tool for Quality Appraisal

1. Was an 'a priori' design provided?

The research question and inclusion criteria should be established before the conduct of the review.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

2. Was there duplicate study selection and data extraction?

There should be at least two independent data extractors and a consensus procedure for disagreements should be in place.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

3. Was a comprehensive literature search performed?

At least two electronic sources should be searched. The report must include years and databases used (e.g. Central, EMBASE, and MEDLINE). Key words and/or MESH terms must be stated and where feasible the search strategy should be provided. All searches should be supplemented by consulting current contents, reviews, textbooks, specialized registers, or experts in the particular field of study, and by reviewing the references in the studies found.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?

The authors should state that they searched for reports regardless of their publication type. The authors should state whether or not they excluded any reports (from the systematic review), based on their publication status, language etc.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

5. Was a list of studies (included and excluded) provided?

A list of included and excluded studies should be provided.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

6. Were the characteristics of the included studies provided?

In an aggregated form such as a table, data from the original studies should be provided on the participants, interventions and outcomes. The ranges of characteristics in all the studies analyzed e.g. age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases should be reported.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

7. Was the scientific quality of the included studies assessed and documented?

'A priori' methods of assessment should be provided (e.g., for effectiveness studies if the author(s) chose to include only randomized, double-blind, placebo controlled studies, or allocation concealment as inclusion criteria); for other types of studies alternative items will be relevant.

☐ Yes
☐ No
☐ Can't answer
☐ Not applicable

8. Was the scientific quality of the included studies used appropriately in formulating conclusions? The results of the methodological rigor and scientific quality should be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations.	☐ Yes ☐ No ☐ Can't answer ☐ Not applicable
9. Were the methods used to combine the findings of studies appropriate? For the pooled results, a test should be done to ensure the studies were combinable, to assess their homogeneity (i.e. Chi-squared test for homogeneity, I^2). If heterogeneity exists a random effects model should be used and/or the clinical appropriateness of combining should be taken into consideration (i.e. is it sensible to combine?).	☐ Yes ☐ No ☐ Can't answer ☐ Not applicable
10. Was the likelihood of publication bias assessed? An assessment of publication bias should include a combination of graphical aids (e.g., funnel plot, other available tests) and/or statistical tests (e.g., Egger regression test).	☐ Yes ☐ No ☐ Can't answer ☐ Not applicable
11. Was the conflict of interest stated? Potential sources of support should be clearly acknowledged in both the systematic review and the included studies.	☐ Yes ☐ No ☐ Can't answer ☐ Not applicable

Source: Shea et al (2007) This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Appendix 11: Components of Models of Care and Associated References

Other Models of Care referred to in Included Papers.		
Model of Care	**Key Elements**	**Associated Citations in this Review**
Improving Chronic Illness Care (ICIC)	This was a national program in the United States, adapted from Wagner's Chronic Care Model, which aimed to improve chronic illness management. Available at: http://www.improvingchroniccare.org/	
Innovative Care for Chronic Conditions (ICCC) Framework	The WHO ICCC Framework is based upon a set of guiding principles. Each of the principles is fundamental to the Micro-, Meso-, and Macro-levels of the health care system. *Integration*: Integration is the core of the ICCC Framework and health care for chronic problems requires integration from multiple perspectives. Each level of the health care system, Micro-, Meso-, and Macro-, must work together and share in the unmistakable goal of better care for chronic conditions. Other principles include: *Evidence-based decision making*; *Population focus*; *Prevention focus* and *Quality focus*; Available at: http://www.who.int/chp/knowledge/publications/icccreport/en/	
Evercare*	Evercare Health and Home Connection is a program for people aged 65 and older who need assistance to remain at home. The main objective is to improve the ability of life by supporting an enrollee's ability to live independently and to reinforce the physician-patient relationship, so the primary care physician (PCP) can spend his or her time practicing medicine and delivering high quality care to each enrollee. It's success depends on strong relationships with physicians, providers and facilities. The PCP is responsible for coordinating the enrollee's health services, and ensuring continuity of care. Available at: http://www.uhccommunityplan.com/content/dam/communityplan/healthcareprofessionals/providerinformation/EHHC-Provider-Administrative-Manual-Nov-2010.pd	
The Flinders Program™ for Chronic Condition Management (formerly the South Australia HealthPlus)*	The Flinders Program™ was formerly known as the Flinders Model. There are a number of reasons for the name change. The Flinders Program™ is no longer a model. Ten years of research and clinical use in a variety of settings and countries has led to more robust reinforcement of the components of the Program, the education and training options and adaptations for special populations. Based on its inception in the SA HealthPlus coordinated care trial (1997-99), and subsequent research and development, Flinders care planning process has five functions: i. *Generic and holistic chronic condition management*; *ii. Case management;* *iii. Self-management support;* iv. *Systemic and organisational change;* v. *Clinician change.* Available at;	

	http://www.flinders.edu.au/medicine/fms/sites/FHBHRU/documents/Flinders%20Program%20Information%20Paper_M.pdf	
The Gesundes Kinzigtal Integrated Care Initiative	Gesundes Kinzigtal Integrated Care Initiative was initiated by Gesundes Kinzigtal a health care management company in the German which operates a regional integrated care system. The initiative works with two statutory health insurers covering all age groups and care settings. The first programs initiated in 2006 with a smoking prevention scheme, a program for patients with osteoporosis, and one for elderly people. There are health promotion programs in schools and workplaces, and 'patient university' classes to offer health advice to support prevention and self-management. Program also offers gym vouchers, dance classes, glee clubs and aqua-aerobics courses to encourage people to stay active. Process and performance characteristics of Gesundes Kinzigtal Integrated Care Initiative include: i. Individual treatment plans and goal-setting agreements between doctor and patient ii. Patient self-management and shared decision-making iii. Follow-up care and case management iv. Right care at the right time v. System-wide electronic patient record Available at: http://www.ijic.org/index.php/ijic/article/view/539/1050	
Phoenix Care*	Defined as a community based program that focuses on teaching independent living skills to individuals thus aiding in successful community living. The model emphasizes patient/family self-empowerment and prevention. The Phoenix Care program was designed to deliver a defined set of home-based services addressing disease and symptom management, education to the patient and family/caregiver, and social, psychological, and spiritual support services for seriously chronically ill individuals at risk of death from their advanced disease state.(Lockhart, Volk-Craft, Hamilton, Aiken, & Williams, 2003) Phoenix Care System Services Provided: • Case Management and Counselling, • Crisis Intervention, • Symptom Monitoring and Supportive Psychotherapy (to include Trauma Informed Care), • Medication Management and Administration, • Financial Management, • Housing Assistance, • Group Treatment, • Community Living Skills, • Psychiatric Consultation, • Social/Relationship Building Skills, • Vocations/Educational Planning, Counselling and Services, • Social Recreation, • Home Visitation Available at: http://www.phoenixcaresystems.com/	

House of Care	The ‘House of Care’ is a co-ordinated service delivery model derived from the CCM (Wagner) and the Diabetes UK Year of Care project. NHS England and partners are using the House of Care model as a checklist/metaphor for the building blocks of high quality person-centred coordinated care. The House of Care metaphor is used to illustrate the whole-system approach, emphasising the interdependency of each part and the various components that need to be in place to hold it together. “Care planning is at the centre of the house; the left wall represents the engaged and informed patient, the right wall represents the health care professional committed to partnership working, the roof represents organisational systems and processes, and the base represents the local commissioning plan” (Coulter et al. 2013, p1). The House of Care model has four key interdependent components, all of which must be present for the goal, person-centred coordinated care, to be realised: 1. Commissioning - which is not simply procurement but a system improvement process, the outcomes of each cycle informing the next one. 2. Engaged, informed individuals and carers – enabling individuals to self-manage and know how to access the services they need when and where they need them. 3. Organisational and clinical processes – structured around the needs of patients and carers using the best evidence available, co-designed with service users where possible. 4. Health and care professionals working in partnership – listening, supporting, and collaborating for continuity of care. The house of care model differs from other models in two important ways: • It encompasses all people with long-term conditions, not just those with a singles disease or in high-risk groups • It assumes an active role for patients, with collaborative personalised care planning at its heart. Implementing the model requires health care professionals to abandon traditional ways of thinking and behaving, moving towards a partnership model of care in which patients play an active part in determining their own care and support needs (Coulter et al. 2013). To implement the model successfully, there are complex changes required. This includes changing patient attitudes, workforce cultures, and organisational and commissioning system changes. These changes need to occur system-wide, vertically as well as horizontally. This entails the House framework being used in ‘front-line’ clinical practice, and being supported by local and national policy and strategy. Available at: http://www.england.nhs.uk/resources/resources-for-ccgs/out-frwrk/dom-2/house-of-care/house-care-mod/	

Appendix 12: CINAHL Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A.	CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - CINAHL
B.	INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL STRATEGY - CINAHL
C.	ECONOMIC EVALUATION SEARCH STRING

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - CINAHL
GROUP B: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - CINAHL
GROUP C: ECONOMIC EVALUATION SEARCH STRING

S15 – S48 Clinical Search - GROUP A AND GROUP B
49 (MH “Economics”) (n = 9,935)
50 (MH “Health Impact Assessment”) (n = 263)
51 (MH “Cost and Cost Analysis”) (n = 13,036)
52 (MH “Cost Benefit Analysis”) (n = 20,818)
53 (MH “Cost Control”) (n = 5,738)
54 (MH “Economic Aspect of Illness”) (n = 5,922)
55 (MH “Health Care Costs”) (n = 31,469)
56 (MH “Health Resource Allocation”) (n = 6,940)
57 (MH “Health Resource Utilization”) (n = 11,741)
58 (MH “Quality –Adjusted Life Years”) (n = 2,223)
59 (MH “Economic Value of Life”) (n = 492)
60 ti/ab "cost effectiveness" or "cost impact" or resources (n = 55,147)
61 ti/ab "economic evaluation" or "cost benefit analysis" or "cost analysis" or "cost impact analysis" or "cost effectiveness analysis" or "cost utility analysis" or "cost minimisation analysis" or “cost minimization analysis" or "cost consequence analysis" or "cost offset study"(n = 3,105)
62 ti/ab "cost allocation" or "implementation cost*" or "cost variables" or "cost estimat*" or "economic benefit*" or "economic impact" or "avoided cost*" or “cost control” or “cost efficiency”(n = 2,794)
63 ti/ab “resource allocation” or “health resource allocation” or “health resource utilisation” or “health resource utilization” or “patient admission” (n = 1,509)
64 ti/ab "quality adjusted life year*" or "quality-adjusted life-year*" or "quality-adjusted life year*" or "incremental cost effectiveness ratio" or "incremental cost per quality adjusted life year*" (n =1,944)
65 Combined S49 – S64 with Boolean Operator OR (n = 138,181)
66 S48 (Group A: Chronic Disease Search String and Group B: Integrated Care Programme Search String) AND S65 (n = 298)

Appendix 13: MEDLINE Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
B. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
C. ECONOMIC EVALUATION SEARCH STRING

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP B: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: ECONOMIC EVALUATION SEARCH STRING

S15 – S48	Clinical Search - GROUP A AND GROUP B
49	(MH “Economics”) (n = 26,558)
50	(MH “Health Impact Assessment”) (n = 159)
51	(MH “Cost and Cost Analysis”) (n = 42, 147)
52	(MH “Cost Benefit Analysis”) (n = 61,491)
53	(MH “Cost Allocation”) (n = 1,951)
54	(MH “Cost of Illness”) (n = 18, 610)
55	(MH “Health Expenditures”) (n = 14, 058)
56	(MH “Health Care Costs”) (n = 28, 296)
57	(MH “Resource Allocation”) (n = 7,200)
58	(MH “Health Resources”) (n = 9,098)
59	(MH “Quality –Adjusted Life Years”) (n = 7,337)
60	(MH “Value of Life”) (n = 5, 425)
61	ti/ab "cost effectiveness" or "cost impact" or resources (n = 163, 912)
62	ti/ab "economic evaluation" or "cost benefit analysis" or "cost analysis" or "cost impact analysis" or "cost effectiveness analysis" or "cost utility analysis" or "cost minimisation analysis" or cost minimization analysis" or "cost consequence analysis" or "cost offset study"(n = 18,551)
63	ti/ab "cost allocation" or "implementation cost*" or "cost variables" or "cost estimat*" or "economic benefit*" or "economic impact" or "avoided cost*" or “cost control” or “cost efficiency”(n = 13,028)
64	ti/ab “resource allocation” or “health resource allocation” or “health resource utilisation” or “health resource utilization” or “patient admission” (n = 5,731)
65	ti/ab "quality adjusted life year*" or "quality-adjusted life-year*" or "quality-adjusted life year*" or "incremental cost effectiveness ratio" or "incremental cost per quality adjusted life year*" (n =8,095)
66	Combined S49 – S65 with Boolean Operator OR (n = 335,962)
67	S48 Group A: Chronic Disease Search String and Group B: Integrated Care Programme Search String) AND S66 (n = 701)

Appendix 14: Business Source Complete Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management
for the Irish Health System.

A. ECONOMIC EVALUATION SEARCH STRING
B. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL SEARCH TERMS - MEDLINE
C. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL SEARCH TERMES - MEDLINE

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: ECONOMIC EVALUATION SEARCH STRING
GROUP B: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE

1 ti/ab “Economic*” (n = 364,660)
2 ti/ab "Medical Economic*" or "cost" or "cost analysis" or "cost effectiveness" or "cost allocation" or "resource allocation" or "medical resources" or "health facilities utilization" (n=427,080)
3 ti/ab "cost effectiveness" or "cost impact" or resources (n = 288,748)
4 ti/ab "economic evaluation" or "cost benefit analysis" or "cost analysis" or "cost impact analysis" or "cost effectiveness analysis" or "cost utility analysis" or "cost minimisation analysis" or “cost minimization analysis" or "cost consequence analysis" or "cost offset study"(n= 6,574)
5 ti/ab "cost allocation" or "implementation cost*" or "cost variables" or "cost estimat*" or "economic benefit*" or "economic impact" or "avoided cost*" or “cost control” or “cost efficiency”(n = 24,795)
6 ti/ab “health facilities allocation” or “health facilities utilization” or “patient admission” (n = 38)
7 ti/ab "quality adjusted life year*" or "quality-adjusted life-year*" or "quality-adjusted life year*" or "incremental cost effectiveness ratio" or "incremental cost per quality adjusted life year*" (n= 399)
8 Combined S1 – S7 with Boolean Operator OR (n = 1,024,402)
9 Group B: Chronic Diseases Search String AND Group C: Integrated Care Programme Search String AND S 8 (n = 172)

Appendix 15: EconLit Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A. ECONOMIC EVALUATION SEARCH STRING
B. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL SEARCH TERMS - MEDLINE
C. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL SEARCH TERMES - MEDLINE

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: ECONOMIC EVALUATION SEARCH STRING
GROUP B: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE
GROUP A - ECONOMIC EVALUATION SEARCH STRING

1	ti/ab “Economic*” (n = 268,302)
2	ti/ab “Health Impact Assessment” or "Cost*" or "Cost Analysis" or “Cost Benefit Analysis” or “Cost Allocation” or “Cost of Illness” or “Health Expenditures” or “Health Care Costs” or “Resource Allocation” or “Health Resources” or "Health Resource Allocation" or "Health Resource Utilization" or “Quality –Adjusted Life Years” or "Economic Value of Life" or “Cost Control” (n=117,866)
3	ti/ab "cost effectiveness" or "cost impact" or resources (n = 49,267)
4	ti/ab "economic evaluation" or "cost benefit analysis" or "cost analysis" or "cost impact analysis" or "cost effectiveness analysis" or "cost utility analysis" or "cost minimisation analysis" or “cost minimization analysis" or "cost consequence analysis" or "cost offset study"(n= 4,244)
5	ti/ab "cost allocation" or "implementation cost*" or "cost variables" or "cost estimat*" or "economic benefit*" or "economic impact" or "avoided cost*" or “cost control” or “cost efficiency”(n = 5,726)
6	ti/ab “resource allocation” or “health resource allocation” or “health resource utilisation” or “health resource utilization” or “patient admission” (n = 2,441)
7	ti/ab "quality adjusted life year*" or "quality-adjusted life-year*" or "quality-adjusted life year*" or "incremental cost effectiveness ratio" or "incremental cost per quality adjusted life year*" (n= 303)
8	Combined S1 – S7 with Boolean Operator OR (n = 384,968)
9	Group B: Chronic Diseases Search String AND Group C: Integrated Care Programme Search String AND S 8 (n = 21)

Appendix 16: EMBASE Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A. ECONOMIC EVALUATION SEARCH STRING
B. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL SEARCH TERMS - MEDLINE
C. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL SEARCH TERMES - MEDLINE

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: ECONOMIC EVALUATION SEARCH STRING
GROUP B: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE

ECONOMIC EVALUATION SEARCH STRING

1 'resource allocation' OR 'health resource allocation' OR 'health resource utilisation' OR 'health resource utilisation' OR 'patient admission'
2 'economics'/exp OR OR 'economics'
3 ‘health impact assessment' OR 'cost' OR 'cost analysis' OR 'cost benefit analysis' OR 'cost allocation' OR 'cost of illness' OR 'health expenditures' OR 'health care costs' OR 'resource allocation' OR 'health resources' OR 'health resource allocation' OR 'health resource utilization' OR 'quality – adjusted life years' OR 'economic value of life' OR 'cost control':ab,ti
4 'cost effectiveness' OR 'cost impact' OR resources:ab,ti
5 'economic evaluation' OR 'cost benefit analysis' OR 'cost analysis' OR 'cost impact analysis' OR 'cost effectiveness analysis' OR 'cost utility analysis' OR 'cost minimisation analysis' OR 'cost minimization analysis' OR 'cost consequence analysis' OR 'cost offset study':ab,ti
6 'cost allocation' OR 'implementation cost' OR 'cost variables' OR 'cost estimate' OR 'economic benefit' OR 'economic impact' OR 'avoided cost' OR 'cost control' OR 'cost efficiency':ab,ti
7 ‘quality adjusted life year' OR 'quality-adjusted life-year' OR 'quality-adjusted life year' OR 'incremental cost effectiveness ratio' OR 'incremental cost per quality adjusted life year':ab,ti
8 #2 OR #3 OR #4 OR #5 OR #6 OR #7
9 Group B: Chronic Diseases Search String AND Group C: Integrated Care Programme Search String AND S 8 (n = 919)

Appendix 17: CRD, DARE, NHS EED & HTA Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A. ECONOMIC EVALUATION SEARCH STRING
B. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL SEARCH TERMS - MEDLINE
C. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL SEARCH TERMES - MEDLINE

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: ECONOMIC EVALUATION SEARCH STRING
GROUP B: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE

ECONOMIC EVALUATION SEARCH STRING

1	MeSH DESCRIPTOR Cost-Benefit Analysis EXPLODE ALL TREES	13056
2	MeSH DESCRIPTOR Cost of Illness EXPLODE ALL TREES	634
3	MeSH DESCRIPTOR Economics, Medical EXPLODE ALL TREES	45
4	MeSH DESCRIPTOR Economics, Hospital EXPLODE ALL TREES	1165
5	MeSH DESCRIPTOR Economics, Nursing EXPLODE ALL TREES	9
6	MeSH DESCRIPTOR Health Care Economics and Organizations EXPLODE ALL TREES	18650
7	MeSH DESCRIPTOR Value of Life EXPLODE ALL TREES	117
8	(Economic* or Health Impact Assessment or Cost or Cost Analysis or Cost Benefit Analysis or Cost Allocation):TI FROM 2005 TO 2015	9507
9	(Cost of Illness or Health Expenditures or Health Care Costs or Resource Allocation or Health Resources or Health Resource Allocation or Health Resource Utilization or Cost Control or Economic Value of Life):TI FROM 2005 TO 2015	34
10	MeSH DESCRIPTOR Quality-Adjusted Life Years EXPLODE ALL TREES	3370
11	MeSH DESCRIPTOR Health Impact Assessment EXPLODE ALL TREES	2
12	MeSH DESCRIPTOR Cost Allocation EXPLODE ALL TREES	14
13	MeSH DESCRIPTOR Cost Control EXPLODE ALL TREES	783
14	MeSH DESCRIPTOR Cost Savings EXPLODE ALL TREES	652
15	MeSH DESCRIPTOR Costs and Cost Analysis EXPLODE ALL TREES	17039
16	MeSH DESCRIPTOR Health Care Costs EXPLODE ALL TREES	4563
17	(cost effectiveness or cost impact or resources):TI FROM 2005 TO 2015	5856
18	(economic evaluation or cost benefit analysis or cost analysis or cost impact analysis or cost effectiveness analysis or cost utility analysis or cost minimisation analysis or cost minimization analysis or cost consequence analysis or cost offset study):TI FROM 2005 TO 2015	2914
19	(cost allocation or implementation cost* or cost variables or cost estimat* or economic benefit* or economic impact or avoided cost* or cost control or cost efficiency):TI FROM 2005 TO 2015	194
20	(resource allocation or health resource allocation or health resource utilisation or health resource utilization or patient admission):TI FROM 2005 TO 2015	4
21	(quality adjusted life year* or quality-adjusted life-year* or quality-adjusted life year* or incremental cost effectiveness ratio or incremental cost per quality adjusted life year):TI FROM 2005 TO 2015	17
22	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21	19823
23	Group B: Chronic Diseases Search String AND Group C: Integrated Care Programme Search String AND S 22 (n = 39)	39

Appendix 18: Cochrane Search Strategy Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

A. ECONOMIC EVALUATION SEARCH STRING
B. CHRONIC DISEASES SEARCH STRING AS PER CLINICAL SEARCH TERMS - MEDLINE
C. INTEGRATED CARE PROGRAMMES SEARCH STRING AS PER CLINICAL SEARCH TERMES - MEDLINE

The search combinations will be as follows:
A AND B AND C

NOTE - Limits Applied = Jan 2005 – Mar 31 2015 & English Language
GROUP A: ECONOMIC EVALUATION SEARCH STRING
GROUP B: CHRONIC DISEASES SEARCH STRING AS PER CLINICAL STRATEGY - MEDLINE
GROUP C: INTEGRATED CARE PROGRAMME AS PER CLINICAL STRATEGY - MEDLINE

ECONOMIC EVALUATION SEARCH STRING
1 "Economic":ti,ab,kw
2 "Health Impact Assessment" or "Cost*" or "Cost Analysis" or "Cost Benefit Analysis" or "Cost Allocation" or "Cost of Illness" or "Health Expenditures" or "Health Care Costs" or "Resource Allocation" or "Health Resources" or "Health Resource Allocation" or "Health Resource Utilization" or "Quality – Adjusted Life Years" or "Economic Value of Life" or "Cost Control":ti,ab,kw
3 "cost effectiveness" or "cost impact" or resources:ti,ab,kw
4 "economic evaluation" or "cost benefit analysis" or "cost analysis" or "cost impact analysis" or "cost effectiveness analysis" or "cost utility analysis" or "cost minimisation analysis" or "cost minimization analysis" or "cost consequence analysis" or "cost offset study":ti,ab,kw
5 "cost allocation" or "implementation cost*" or "cost variables" or "cost estimat*" or "economic benefit*" or "economic impact" or "avoided cost*" or "cost control" or "cost efficiency":ti,ab,kw
6 "resource allocation" or "health resource allocation" or "health resource utilisation" or "health resource utilization" or "patient admission":ti,ab,kw
7 "quality adjusted life year*" or "quality-adjusted life-year*" or "quality-adjusted life year*" or "incremental cost effectiveness ratio" or "incremental cost per quality adjusted life year*":ti,ab,kw
8 #1 or #2 or #3 or #4 or #5 or #6 or #7
9 Group B: Chronic Diseases Search String AND Group C: Integrated Care Programme Search String AND S 8 (n = 53)

Appendix 19: Grey Literature Search Economic Arm

Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System.

Open Grey

Search terms:
Economic evaluation of integrated care for chronic disease. Results – nil
Cost of integrated care for chronic disease/illness. Results – nil
Cost of integrated services for chronic disease/illness. Results – nil
Cost effectiveness of integrated care. Results 5, relevant – nil
Cost effectiveness of integrated services. Results 4, relevant – nil
Cost impact of integrated care. Results 1, relevant – nil
Cost impact of integrated services. Results - 10, relevant – nil
Implementation cost of integrated care mode/servicesl for chronic disease/illness. Results – nil
Implementation cost of integrated care services for chronic disease/illness. Results – nil
New York Academy of Medicine
Economic evaluation of integrated care for chronic disease. Results – nil
Cost of integrated care/services for chronic disease/illness Results – 11 relevant – 7 (TBC)
Cost effectiveness of integrated care/services for chronic disease/illness. Results 8 – 3 relevant, included above
Cost impact of integrated care/services for chronic disease/ illness. Results – 1, relevant – nil (no access, but read TI/AB and does not seem relevant)
Open Doar
i)cost effectiveness of integrated care for chronic disease
ii)cost impact and resources involved with integrated models of care for chronic disease
iv)implementation cost of an integrated model of care for chronic disease
Economic evaluation of integrated care for chronic disease. Results – nil
Total papers yielded pgs 1-3, n=7

NIH

Economic evaluation of integrated care for chronic disease. Results – nil
Cost effectiveness of integrated care for chronic disease . Results – 2 + 3 already included in review
Implementation cost for an integrated model of care for chronic disease. Results - 1

HSE

Cost of integrated models of care chronic disease. Results - nil
Health Information and Quality Authority (HIQA)
Integrated care AND cost or chronic or disease. Results - nil
Health Research Board (HRB)
Cost of integrated care. Results - nil
Lenus
Economic evaluation of integrated care for chronic disease. Results nil searching first 100 references
World Health Organisation (WHO)
economic evaluation of integrated models of care for chronic disease. Resullts – nil (1 paper already included in grey literature review from clinical search
National Institute for Health and Care Excellence (NICE)
Economic evaluation of integrated models of care for chronic disease. Results – nil (1 paper included in systematic review)
Centre for Health Economics and Policy Analysis (CHEPA)
Integrated models/services of care. Results – nil
Institute of Health Economics (Alberta Canada)
Integrated models/services of care. Results - nil
Department of Health UK
Economic evaluation of integrated care for chronic disease. Results-nil

NHS

Economic evaluation of integrated care for chronic disease. Results - nil
Health Canada/ Public Health Agency
Economic evaluation of integrated care for chronic disease. Results -

Appendix 20: BMJ Quality Checklist

Extract Study design.

1. The research question is stated.
2. The economic importance of the research question is stated.
3. The viewpoint(s) of the analysis are clearly stated and justified.
4. The rationale for choosing alternative programmes or interventions compared is stated.
5. The alternatives being compared are clearly described.
6. The form of economic evaluation used is stated.
7. The choice of form of economic evaluation is justified in relation to the questions addressed.

Data collection.

8. The source(s) of effectiveness estimates used are stated.
9. Details of the design and results of effectiveness study are given (if based on a single study).
10. Details of the methods of synthesis or meta-analysis of estimates are given (if based on a synthesis of a number of effectiveness studies).
11. The primary outcome measure(s) for the economic evaluation are clearly stated.
12. Methods to value benefits are stated.
13. Details of the subjects from whom valuations were obtained were given.
14. Productivity changes (if included) are reported separately.
15. The relevance of productivity changes to the study question is discussed.
16. Quantities of resource use are reported separately from their unit costs.
17. Methods for the estimation of quantities and unit costs are described.
18. Currency and price data are recorded.
19. Details of currency of price adjustments for inflation or currency conversion are given.
20. Details of any model used are given.
21. The choice of model used and the key parameters on which it is based are justified.

Analysis and interpretation of results

22. Time horizon of costs and benefits is stated.
23. The discount rate(s) is stated.
24. The choice of discount rate(s) is justified.
25. An explanation is given if costs and benefits are not discounted.
26. Details of statistical tests and confidence intervals are given for stochastic data.
27. The approach to sensitivity analysis is given.
28. The choice of variables for sensitivity analysis is justified.
29. The ranges over which the variables are varied are justified.
30. Relevant alternatives are compared.
31. Incremental analysis is reported.
32. Major outcomes are presented in a disaggregated as well as aggregated form.
33. The answer to the study question is given.
34. Conclusions follow from the data reported.
35. Conclusions are accompanied by the appropriate caveats

Source: Drummond et al. (1996)

Appendix 21: Philips Checklist for Decision Analytical Models

Dimension of Quality	Questions for critical appraisal
Structure	
S1 Statement of decision problem/objective	Is there a clear statement of the decision problem? Is the objective of the evaluation and model specified and consistent with the stated decision problem? Is the primary decision-maker specified
S2 Statement of scope/perspective	Is the perspective of the model stated clearly? Are the model inputs consistent with the stated perspective? Has the scope of the model been stated and justified? Are the outcomes of the model consistent with the perspective, scope and overall objective of the model?
S3 Rationale for Structure	Is the structure of the model consistent with a coherent theory of the health condition under evaluation? Are the sources of data used to develop the structure of the model specified?
S4 Structural Assumptions	Are the causal relationships described by the model structure justified appropriately? Are the structural assumptions reasonable given the overall objective, perspective and scope of the model?
S5 Strategies/ comparators	Is there a clear definition of the options under evaluation? Have all feasible and practical options been evaluated? Is there justification for the exclusion of feasible options?
S6 Model type	Is the chosen model type appropriate given the decision problem and specified causal relationships within the model?
S7 Time horizon	Is the time horizon of the model sufficient to reflect all important differences between options? Are the time horizon of the model, the duration of treatment and the duration of treatment effect described and justified?
S8 Disease states/Pathways	Do the disease states (state transition model) or the pathways (decision tree model) reflect the underlying biological process of the disease in question and the impact of interventions?
S9 Cycle Length	Is the cycle length defined and justified in terms of the natural history of disease?
Data	
D1 Data identification	Are the data identification methods transparent and appropriate given the objectives of the model?
	Where choices have been made between data sources, are these justified appropriately? Has particular attention been paid to identifying data for the important parameters in the model? Has the quality of the data been assessed appropriately? Where expert opinion has been used, are the methods described and justified?
D2 Data modelling	Is the data modelling methodology based on justifiable statistical and epidemiological techniques?
D2a Baseline data	Is the choice of baseline data described and justified? Are transition probabilities calculated appropriately? Has a half-cycle correction been applied to both cost and outcome? If not, has this omission been justified?

Dimension of Quality	**Questions for critical appraisal**
D2b Treatment effects	If relative treatment effects have been derived from trial data, have they been synthesised using appropriate techniques? Have the methods and assumptions used to extrapolate short-term results to final outcomes been documented and justified? Have alternative assumptions been explored through sensitivity analysis? Have assumptions regarding the continuing effect of treatment once treatment is complete been documented and justified? Have alternative assumptions been explored through sensitivity analysis?
D2c Costs	Are the costs incorporated into the model justified? Has the source for all costs been described? Have discount rates been described and justified given the target decision-maker?
D2d Quality of life weights (utilities)	Are the utilities incorporated into the model appropriate? Is the source for the utility weights referenced? Are the methods of derivation for the utility weights justified?
D3 Data incorporation	Have all data incorporated into the model been described and referenced in sufficient detail? Has the use of mutually inconsistent data been justified (i.e. are assumptions and choices appropriate)? Is the process of data incorporation transparent? If data have been incorporated as distributions, has the choice of distribution for each parameter been described and justified? If data have been incorporated as distributions, is it clear that second order uncertainty is reflected?
D4 Assessment of uncertainty	Have the four principal types of uncertainty been addressed? If not, has the omission of particular forms of uncertainty been Justified?
D4a Methodological	Have methodological uncertainties been addressed by running alternative versions of the model with different methodological assumptions?
D4b Structural	Is there evidence that structural uncertainties have been addressed via sensitivity analysis?
D4c Heterogeneity	Has heterogeneity been dealt with by running the model separately for different subgroups?
D4d Parameter	Are the methods of assessment of parameter uncertainty appropriate? If data are incorporated as point estimates, are the ranges used for sensitivity analysis stated clearly and justified?
Consistency	
C1 Internal consistency	Is there evidence that the mathematical logic of the model has been tested thoroughly before use?
C2 External consistency	Are any counterintuitive results from the model explained and justified? If the model has been calibrated against independent data, have any differences been explained and justified? Have the results of the model been compared with those of previous models and any differences in results explained?

Source: Philips et al. (2004).

Appendix 22: EUnetHTA Toolkit Economic Evaluations-Transferability

To assess transferability

27. How generalisable and relevant are the results, and validity of the data and model to the relevant jurisdictions and populations?

28. a) Are there any differences in the following parameters?

I. Perspective
II. Preferences
III. Relative costs
IV. Indirect costs
V. Discount rate
VI. Technological context
VII. Personnel characteristics
VIII. Epidemiological context (including genetic variants)
IX. Factors which influence incidence and prevalence
X. Demographic context
XI. Life expectancy
XII. Reproduction
XIII. Pre- and post intervention care
XIV. Integration of technology in health care system
XV. Incentives

b) If differences exist, how likely is it that each factor would impact the results? In which direction? Of what magnitude?

c) Taken together, how would they impact the results and of what magnitude?

d) Given these potential differences, how would the conclusions likely change in the target setting? Are you able to quantify this in any manner?

29. Does the economic evaluation violate your national/regional guidelines for health economic evaluation?

Appendix 23: Full Text Read Extraction Table - Study Details, Analysis and Results

Study	**Intervention**	**Design (number of studies)**	**Condition(s) or population targeted (n)**	**Type of economic evaluation**	**Outcome Measurement**
Baeten et al., (2010)	Stroke services (SS) vs. usual care (UC). SS: integration of a hospital stroke unit with nursing homes, rehabilitation centres, GP's and home care providers.	Non-randomised controlled cluster trial	Stroke SS (n = 151) UC (n = 181)	CUA + PSA	QALYs
van Exel et al., (2005)	Experimental - integrated stroke services (SS) compared to concurrent patients receiving conventional care (CC) in control settings.	Prospective non-randomized controlled trial	Stroke SS (n = 411) CC (n = 187)	CUA	QALYs
McRae et al., (2008)	Integrated approach to assisting GPs with diabetic management through use of a clinical data base to coordinate care according to national guidelines v's conventional care (CC)	Observational study	Diabetes type 2 (n = 80) incl model	CEA + CUA (using DAM)	LYG and QALE
Giorda et al., (2014)	Four diabetes care models: 1) Structured Care (SCM): patient's visited diabetes clinic, screened for complications. 2) Only Specialist (OSM): patients seeking specialist consultation but no basic screening for complications. 3) Unstructured care (USCM): patients neither seen by specialist nor screened for complications. 4) only GCI: patients received appropriate care from primary care physician without consultation with a diabetologist	Cohort Study	Diabetes type 2 (n = 25, 270) SCM = 41% OSM = 28% USCM = 26% Only GCI = 5%	Cost analysis (+ outcome description)	Cost ratios for overall and for health care services (hospitalisations, outpatient and emergency care and drugs)
Smith et al., (2008)	telemedicine interventions (TMI) with CCM vs. standard CCM	Blinded cluster RCT	Diabetes TMI+ CCM (n = 358) Only CCM (n = 277)	Cost analysis (+ outcome description)	Process, Health Outcomes + Costs
Delate et	Collaborative Cardiac	Retrospective	CAD	Cost	all cause mr,

al., (2010)	Care Service (CCCS) vs. No CCCS. CCCS: collaborative effort between registered nurses & clinical pharmacy specialists under the oversight of a physician director.	matched cohort study	CCCS (n = 628) No CCCS (n = 628)	analysis (+ outcome description)	cardiac related mr
Roberts et al., (2010)	Integrated service model for COPD	Retrospective data analysis	COPD (n = 5491))	Cost analysis (+ outcome description)	
Tummers et al., (2012)	Early supported discharge – 6 x studies/ Home-based rehabilitation – 4 x studies/Stroke Unit - 2 x studies/Stroke service – 3 x studies	Sys. Review n =15 (12 RCTs, 3 non randomised)	Stroke	Systematic literature review (6 cost analysis, 7 CEA, 2 CMA)	cost and health outcomes
Reich et al., (2011)	Integrated care models vs. basic compulsory insurance scheme	Mixed-effects regression analysis	Swiss residents (n = 399, 274)	mixed effects linear regression model	efficiency effects

Analysis Details

Study	**(1)Setting – country or jurisdiction (2) Perspective (2) Time Horizon**	**(4) Included costs (cost type, cost categories) and resource items**	**(5) Data source costs and resource use**	**(6) Data source outcomes and benefits**	**(7)Methods of measuring or valuing outcomes and benefits**	**(8) Discounting (rate (DR) and reference year)**	**(9) Currency and currency conversions**	**(10) Analysis of sensitivity and uncertainty**
Baeten et al., (2010)	(1) The Netherlands (2) Hospital perspective (3) Lifetime	Direct medical costs	Patient level resource use from the EDISSE study. Nursing day prices; prices from place of residence	EDISSE study	Barthel Index mapped onto QALYs using EQ-5D-5L	1.5% Health Effects and 4% for costs	Euros, 2003	PSA - One way SA (discount rate)
van Exel et al., (2005)	(1) The Netherlands (2) Health Care perspective (3) 6 months	Health care resources utilised (hospitals, nursing homes, rehab, consultations, outpatient	Resource use: patient medical files and patient interviews; Unit costs: salaries, tariffs, common market prices	Study trial	Barthel Index mapped onto QALYs using EQ-5D-5L	n/a	Euro	PSA (non-parametric boot strapping)

		care, home adaptions & assistive devices)						
McRae et al., (2008)	(1) Australia (2) Health service (3) 40 years	GP Practice programme; compliance; pharmaceutical; hospital service	GP Practice programme costs - Southern Highlands division (includes admin data entry, IT, patient access costs & exercise programme) Complications - UKPDS model,	LT outcomes programme registry & UK Prospective Diabetes Study (UKPDS)	expected life years gained, QALE generated from simulation model	5% Costs	AUS$	1 way SA (DR)
Giorda, C.B. et al., (2014)	(1) Turin, Italy (2) National health services (3) 4 years	health care services (hospitalisations, outpatient, emergency care and drugs)	Resource use: Regional Diabetes registry; prescription registry. Unit costs: DRGs; Drugs prices; tariffs (specialist visits, lab tests & outpatient services) claims (emergency care, lab tests & specialist consultations)	n/a		n/a	Euro	1 way SA (excluding over 76 yrs, insulin treated patients only)
Smith et al., (2008)	(1) Minnesota US (2) Health care system (3) 1 year	hospital & physician	Medicare reimbursement rates	ADA - NCQA Provider Recognition Programme & UKPDS			US$,2005	Not specified
Study	**(1)Setting – country or jurisdiction (2) Perspect**	**(4) Included costs (cost type, cost categories) and resource items**	**(5) Data source costs and resource use**	**(6) Data source outcomes and benefits**	**(7)Methods of measuring or valuing outcom**	**(8) Discounting (rate (DR) and reference year)**	**(9) Currency and currency conversions**	**(10) Analysis of sensitivity and uncertainty**

	ive (2) Time Horizon				**es and benefits**			
Delate et al., (2010)	(1) Denver-Boulder, USA (2) Health care (3) 3 years	health care (medical plus pharmacy) inpatient & outpatient hospitalisation, ambulatory surgery, KPCO & non KPCO medical office visit, radiology, laboratory	Resource use & unit prices: health care utilisation & ambulatory prescription drug purchases - KPCO system	KPCO system	all cause death, cardiac related mortality		USD$, 2007	SA patient matching variables
Roberts et al., (2010)	(1) Salford, UK (2) Health service (3) 1 year	Hospitalisations, Education programme, website, IT support, training, staff	Resource use: NHS Tactical Information Systems (TIS) Unit costs: ICD codes, HRG codes	Quality Management and Analysis System (QMAS) & COPD registry at participating practices	Practice level data		£stg.	Not specified
Tummers et al., (2012)	(1) European n =10 (UK n =5/10); Australia n=2; Canada n=2; Hong Kong n=1 (2) Societal n=4; health care perspective n=11 (3) 1	Hospital only (3); hospital + patient incurred (1); direct hospital and post discharge costs (8); direct & indirect costs in hospital and post discharge (3)	hospital databases/registries (12) patient interviews + hospital databases/registries (3)	Not specified	Not specified	Not specified	Varied between studies	SA performed (9) no SA (6)

	year n=9, 6 months n=6							
Reich et al., (2011)	(1) Switzerland (2) Health insurer (3) 4 years	Hospital stay, nursing home stay	Resource use and unit costs: Health insurance group Helensa	n/a		N/A	Swiss Franc	N/A

Discount rate (DR) not applicable (N/A) Kaiser Permanente Colorado (KPCO) Evaluation of Dutch Integrated Stroke Service Experiments (EDISSE) Sensitivity Analysis (SA) Diagnostic Related Groups (DRGs)

Result Details

Study	**Costs and resource use**	**Outcomes and benefits**	**ICER**
Baeten et al., (2010)	UC: €41,352 (Men €39,335 (15,951; 79,837) Women €42,944 (14,081; 95,944)). SS: €35,361 (Men €32,284; Women €38,443).	UC - 2.61 QALYs (men 2.42 QALYs, women 2.75 QALYs). SS - 3.12 QALYs (men 2.92 QALYs, women 3.33 QALYs)	SS: lower costs (€5,990) and higher life time QALYs (0.51), i.e. SS dominate UC. ICER is -€11,685/QALY; Men -€14,211/QALY; Women -€7,745/QALY
van Exel et al., (2005)	SS €16 000 (95%CI €14 670–€16 930). 43% hospital costs, 32% nursing home costs, 13% rehabilitation centre costs & 13% extramural costs.	Delft region SS better health effects than in the control regions (NSS). Haarlem & Nijmegen showed no differences with the control group.	Delft: ICER was -€19 350/QALY (0.75 probability SS acceptable at €35 000 CE threshold)
McRae et al., (2008)	Cost savings per patient pa -$34: Hospitalisations -$44 Antidiabetic prescribing -$40 Guideline compliance +$50	LYGs with intervention vs. CC 0.36 years (3.3%) Additional QALE with intervention vs. CC 0.30 (3.6%)	$8,108 / life year saved $9,730 per year of QALE gained
Giorda, C.B. et al., (2014)	SCM did not incur cost excess. OSM and USCM were most expensive. Cost drivers amongst USCM = inpatient care. Cost ratios: SCM: 1; ICG: 1.05; OSM: 1.11; USCM: 1.08	All cause mr was 84% higher for those in USCM vs. SCM. Hospitalisations 19% for patients in USCM	none
Smith et al., (2008)	TMI + CCM less outpatient (–$288 [95% CI, –$25 to –$550] for outpatient costs and total costs (–$2311 [95% CI, –$266 to –$4667]) (lower costs in non-diabetes-related costs)	TMI + CCM vs. CCM: no sign enhancement of metabolic outcomes or reduction in coronary artery disease.	n/a
Delate et al., (2010)	HC utilization expenditures/day CCCS 39 vs. No CCCS 108 (p<0.001) inpatient hospitalisation (60.8%) outpatient hospitalisations (11%) and medical office encounters (10.7%)	All cause mr CCCS 2.6% vs. No CCCS 29.9% (P<0.001). Cardiac related death CCCS 1.9% vs. No CCCS 15.6%. (p<0.001)	n/a
Roberts et al., (2010)	COPD admissions decreased from £1,772,865 in 2006-2007 to £1,528,080 in 2007-2008 (hospital admissions decreased 10% LOS decreased 0.6 days)	Pulmonary rehabilitation completion amongst patients with moderate/severe COPD increased from 84 at	

		baseline to 143 at 12 months	
Tummers et al., (2012)	Early Supported discharge studies: 6/6 reduced costs with similar (n=5) or better (n=1) health outcomes. Home based rehab: cost neutral from societal perspective. Stroke units: better health outcomes at higher cost vs. conventional in hospital care/mobile stroke teams. Integrated SS differed yet trend suggests integrating SS can be cost saving.	NS (9) Better health outcome scores (4) better adherence to process indicators & less complications (1) mixed results by region(1)	N/A Note: Home-based rehabilitation: is unlikely to lead to cost-savings, but achieves better health outcomes. Care in stroke units is more expensive than conventional care, but leads to improved health outcomes. Authors conclude that integrated stroke services can reduce costs.
Reich et al., (2011)	Cost ratios lower in all ICM's than the sample covering basic compulsory insurance model -29.7% CAP, -21.1% FDM and -22.5% TEL.	The different insurance plans vary, efficiency gains per model: 21.2% CAP, 15.5% FDM, 3.7% TEL	N/A

Usual care (UC) Stroke Services (SS) Quality Adjusted Life Years (QALYs) Incremental Cost Effectiveness Ratio (ICER) Not statistically significant (NSS) per annum (pa) Life years gained (LYGs) Conventional care (CC) Quality adjusted life expectance (QALE) mortality (mr) Structured care model (SCM) Only Specialist model (OSM) Unstructured care model (USCM) Chronic Care Model (CCM) Telemedicine intervention (TMI) Telemedicine doctor (TEL) Capitation model (CAP) Family doctor model (FDM)

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Clinical and Economic Systematic Literature Review to Support the Development of an Integrated Care Programme for Chronic Disease Prevention and Management for the Irish Health System