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Exploring Clinical Learning Environments for Postgraduate Medical Education

Thesis presented by

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for the degree of

Doctor of Philosophy

University College Cork

School of Medicine

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Declaration

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

_____ _____

Anél Wiese Date

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ABSTRACT

Background: The premise that trainees learn through work underpins the design of postgraduate medical education (PGME). The clinical learning environment (CLE) is the *foundation* of PGME and represents the social, cultural and physical context wherein trainees learn through supervised patient encounters. Social theories of learning emphasise the role of the environment in workplace learning which, in PGME, occurs through trainee participation and engagement in the daily work of a doctor. There is a gap in the existing literature about priorities and challenges in clinical environments. Consequently, frontline practitioners and stakeholders in PGME may be at a loss about where to focus their efforts to improve trainee learning. Further exploration of clinical learning environments is needed to support the appropriate targeting of effort and resources, to achieve maximum impact.

Supervisors are central to workplace learning in postgraduate medical education. The processes involved in clinical supervision are not fully understood, and limited theory is available that explains how workplace learning occurs through supervisor-trainee interactions. Theoretical explanations about learning through supervisor-trainee interaction *and* the role of the environment in this process are needed to support improvement. For these reasons, this doctoral research programme aimed to answer two overarching questions; 1) *On what aspects of the clinical environment should we focus on to better support trainee learning? And 2) How does supervised workplace learning happen and what is the role of the environment in this process?*

Methods: This research programme involved three studies situated within the critical realist paradigm. A Group Concept Mapping (GCM) was the first study, to identify the priorities and challenges associated with postgraduate medical education within clinical environments. Findings from Study 1 was used, amongst other things, to narrow the focus of Study 2, a Realist Review of workplace learning that occurs during informal supervisor and trainee interactions. Study 2 produced a Realist Theory which was tested and refined in Study 3 through a Multiple Case Study.

1) Group Concept Mapping is an integrated mixed methods approach to generating expert group consensus. A multidisciplinary group of experts were invited to participate in the GCM process via an online platform. Multidimensional scaling and hierarchical cluster analysis were used to analyse participant inputs regarding barriers, facilitators and priorities for trainee learning in clinical environments.

2) Realist Review is an interpretative theory-driven narrative summary of the literature describing how, why, and in what circumstances complex social interventions work. The steps and procedures outlined in the RAMESES Publication Standards for Realist Synthesis were followed

and involved the translation of findings from ninety empirical studies into context, mechanism, and outcome configurations.

3) Multiple Case Study is an empirical inquiry that is used to contribute to our knowledge of complex social phenomena and allows preservation of the characteristics of real-world events. Fifty supervisor and trainee participants were interviewed across four clinical departments and specialties. Data analysis were conducted through pattern matching and cross-case analysis within and across the four cases.

Results:

1) Group Concept Mapping: Participants identified facilitators and barriers in ten domains within clinical learning environments. Domains rated most important were those which related to trainees' connection to and engagement with more senior doctors. Organisation and conditions of work and Time to learn with senior doctors during patient care were rated as the most challenging areas in which to make improvements.
2) Realist Review: The realist review described a realist theory of supervised workplace learning categorising three processes; Supervised Participation in Practice, Mutual Observation of Practice and Dialogue about Practice. These processes are underpinned by interrelated mechanisms which are led by supervisor, trainee or both; *Entrustment, Support Seeking, Monitoring, Modelling, Meaning Making* and *Feedback*. The results of the review detail how contexts at individual and interpersonal, and local and systems levels, trigger or inhibit these mechanisms and shape their outcomes. These outcomes include both key educational objectives of PGME and safe, high-quality patient care.
3) Multiple Case Study: This study illustrated the context-specificity of supervised workplace learning and indicated that trainees and supervisors experience supervised workplace learning differently across clinical environments, the level of trainee oversight may be excessive (for real-world reasons), and local contexts limit, in particular, the mechanism of *Entrustment* to generate its intended outcomes.

Conclusion: Supervised workplace learning emerges from the context in which it happens. A better understanding of supervised workplace learning *and* the role of the environment in this process is a critical adjunct to efforts to improve postgraduate medical education. This doctoral thesis generated a deeper insight into supervised workplace learning and how to contextualise, through the components of clinical learning environments, the mechanisms and outcomes of this social phenomenon. Layers of contexts shape how trainees learn with, from and about supervisors. At the centre is the supervisor-trainee relationship; at a higher level, local and systems contexts

compounding, even more, the complexity of this relationship. The final output of the synthesised literature and empirically tested and refined realist theory contributes to a more consistent conceptualisation of trainee learning through supervisor interaction. The detailed information presented in this thesis about the process of supervised workplace learning including its contexts and outcomes will allow supervisors, trainees, researchers, policymakers, and managers to appraise postgraduate medical education and have a better chance to make improvements successfully.

LIST OF ABBREVIATIONS

Accreditation Council for Graduate Medical Education	-	ACGME
Anaesthetic Theatre Educational Environment Measure	-	ATEEM
Basic Specialist Training	-	BST
Clinical Learning Environment	-	CLE
Clinical Learning Environment Review Program	-	CLER Program
Competency-based Medical Education	-	CBME
Dutch Residency Educational Climate Test	-	D-RECT
European Working Time Directive	-	EWTD
Group Concept Mapping	-	GCM
Higher Specialist Training	-	HST
Next Accreditation System	-	NAS
Postgraduate Hospital Educational Environment Measure	-	PHEEM
Postgraduate Medical Education	-	PGME
Specialist Registrar	-	SpR
Surgical Theatre Educational Environment Measure	-	STEEM
World Federation for Medical Education	-	WFME

Chapter 1
Introduction

At the outset, the topic of this doctoral research programme was clinical learning environments for postgraduate medical education. Over time, the focus narrowed to clinical supervision. Supervision of trainees happens within the context of clinical learning environments. The pursuit of excellence in training future doctors is currently topical and I would like to contribute to a better understanding of learning in clinical settings. The introductory chapter demonstrates my knowledge about the clinical learning environment and clinical supervision, and outlines how I intend to add something to current knowledge.

1 Overview

Excellence in healthcare and training hinge on the quality of the clinical learning environment (CLE). The clinical environment is where trainees learn their craft through supervised patient encounters[1–4]. Clinical settings provide multiple learning opportunities for trainees to develop knowledge, skills, and behaviours for independent practice[5]. The clinical learning environment is also where patients receive medical care and doctors work. Trainees are indispensable members of the medical workforce and work alongside supervisors to maintain the delivery of quality healthcare[6]. Creating

excellent clinical learning environments is complex because they are challenging territories, with both training and service duties competing for doctors' time[7–9].

Development of high-quality clinical learning environments is on the international research agenda because of the impact clinical workplaces have on trainee learning and patient outcomes[10–15]. As a result, multiple stakeholders, including training bodies, regulators, hospital managers, educators, and scholars want to understand, evaluate, and improve clinical learning environments for trainees[16–19].

The rest of this introduction aims to contextualise and sharpen the focus of this research agenda. Firstly, I describe the structure of postgraduate medical education (PGME) and the principles underpinning the design of training programmes. Then I discuss existing perspectives on researching clinical learning environments and elaborate on a particular aspect of the clinical learning environment – clinical supervision. I will outline specific issues pertinent to postgraduate medical education in the Irish context and demonstrate how these are illustrative of problems further afield. Finally, I will conclude with the problem statement and research aims that motivated this research programme.

2 Postgraduate Medical Education

2.1 Structure

The pathway to becoming a medical specialist varies depending on the country of training and the specialty a doctor wants to pursue[20,21]. The World Federation for Medical Education (WFME) defines postgraduate medical education as;

The phase in which doctors develop competencies under supervision towards independent practice after completion of their basic medical qualification, and might comprise pre-registration education (leading right to independent practice), systematic vocational/professional education, specialist and sub-specialist education or other formalised education programmes for defined expert functions[22].

To specialise in a particular branch of medicine, trainees typically complete an internship and several years of training. The training to become a specialist in Ireland, commences after a one-year internship, with Basic Specialist Training (BST), undertaken by all trainees and not necessarily dependent on their future specialty choice[23]. From there, trainees progress to Higher Specialist Training (HST), a four to six-year programme in the trainee's chosen speciality. In the United States, medical school graduates apply for *residencies* in their chosen field[24]. Residencies typically last between 3 to 7 years, and sub-speciality fields often require additional training in the form of a fellowship.

The traditional 'rotating' model of clinical training continues to be the gold standard of postgraduate medical education[25]. As a result, trainees undergo multiple transitions during their training[26–28]. A transition is a dynamic process in which a trainee moves from one set of circumstances to another[27] such as moving from one level of seniority status to another, rotations through various clinical environments, changes of specialty, and alternation of clinical teams[28]. Transitions are critically intensive learning periods during which trainees get familiar with a new environment and establish working relationships with other doctors[26,28]. Moreover, transitions involve trainees moving between supervisory supports from different senior doctors[29].

Changes ongoing in PGME and in healthcare service delivery, continue to impact on the design and implementation of postgraduate medical education[30–32]. Quality standards for patient care and safety are continually evolving and postgraduate medical education is changing in structure and standardisation. Competency-based medical education (CBME) is gaining momentum across the globe. CBME is *an outcomes-based approach to the design, implementation, assessment and evaluation of medical education using an organising framework of competencies*[33]. This educational approach is targeted at training professionals to achieve the required level of ability in specific medical competencies[34]. CBME is not yet widely adopted, but is widely held interest in the concept[35]. The implications of widespread implementation of this approach are not fully understood[36]. We do know that CBME de-emphasises time-based training, emphasises individual trainee development and abilities, and involves frequent assessment of competencies[33].

The European Working Time Directive (EWTD) has been in law in European countries since 1998, and the United States Duty Hour reform since 2003. In Europe, trainees are allowed to work a maximum of 48 hours for any 7-day period[37]. In the U.S., clinical work hours must be limited to no more than 80 hours per week, averaged over a four-week period[38]. There was a different impetus behind these changes in America and Europe. In the U.S., concerns about medical errors resulting in patient mortality and trainee dissatisfaction with working conditions were in large part the drivers for duty hour restrictions[39]. The Europe Union issued a directive for all paid citizens out of concern for the effect of protracted working hours on the health and safety of its people[40].

Duty hours reform has had a significant impact on the landscape of postgraduate medical education, healthcare, and medical workforce configuration. New working patterns now force trainees to reduce time spent at the workplace[41–43]. Widespread problems such as complex rotas, frequent handovers, loss of continuity of care, and missed training opportunities have resulted from the implementation of these regulations[44,45].

2.2 Learning Through Work

A trainee's working day consists of a series of professional activities such as doing ward rounds, caring for patients, conducting outpatient consultations and morning reports[46]. At other times trainees may be on call, meaning that they must take care of patients during an evening, night or weekend shift[47]. Trainee skills, attitudes, values and behaviours result from the activities they engage in within clinical learning environments. The central tenet of PGME is that trainee learning is embedded in the clinical environment and occurs through participation and engagement in the day-to-day work of a doctor[46,48–51]. Even though the design of postgraduate medical training programmes may seem formal and structured, most training happens through informal learning[52]. Informal workplace learning takes place spontaneously in response to the clinical situation[52–54]. Postgraduate medical education requires experiential learning[55]; consequently, it is designed to ensure continuous exposure to diverse clinical contexts and 'on-the-job' learning. Personal knowledge gain and independent clinical expertise arise from the accumulation of experience[55].

Trainees learn through work[46,48,56,57]. The literature on workplace learning unravels the relationship between working and learning. Both involve the interplay between a

myriad of highly complex individual, interpersonal and organisational processes. For trainees, the process of workplace learning unfolds in the clinical environment and is essential for learning the application of knowledge and skills to practice and professional behaviours and values; however, clinical learning environments can be limited in their effectiveness to generate these learning outcomes[58,59]. The clinical environment does not always readily invite trainees in or afford equal opportunities to all. Several factors affect learning in work environments like the structuring of work, individual participation, and relationships between individuals[53]. Indeed, social and physical environmental factors shape the learning that naturally occurs from thinking and acting like a doctor[49]. A duality exists between the learning opportunities that environments afford trainees and the agency of the trainee to engage with this given affordances[60]. This idea is significant because it demonstrates the reciprocal nature of the environment and the trainee, and how they form each other.

3 THE CLINICAL LEARNING ENVIRONMENT

3.1 DEFINITION

The clinical learning environment is invisible to the people embedded in it and complex[61,62]. After decades of research, the term 'clinical learning environment' does not have a standard definition. The 'foundation' of PGME[63] or the 'social, cultural and material context'[64] in which trainees learn while they work, are expressions often used to describe clinical learning environments; however, there is limited agreement between researchers about its components and constructs[65].

Often material aspects come to mind first when thinking of learning environments. Objects or equipment in the physical space can be a focal point of interaction and draw

people together[8]. For example, when supervisors and trainees look at a patient's laboratory results on a computer screen. Nevertheless, it is important that conceptualisations of clinical learning environments not be limited to the common sense understanding of the term environment. The clinical learning environment is a complex, multi-dimensional and socio-cultural entity that offers a variety of opportunities for trainees to engage or disengage in learning[66]. In its broadest sense, the 'clinical learning environment' refers to the cultural, social, psychological, and material elements which shape trainees professional development and capacity to learn[8,63,64,66–68].

For the rest of this section, I will discuss the published research on clinical learning environments for postgraduate medical education. The themes within existing literature include evaluation of clinical learning environments (including tools and the CLER program), the impact of the clinical learning environment, barriers and facilitators to learning in the clinical environment, and supervision.

3.2 Evaluation of the Clinical Learning Environment

3.2.1 Clinical Learning Environment Measurement Tools

Several tools to measure postgraduate clinical learning environments exist including the Dutch Residency Educational Climate Test (D-RECT)[19] and the Postgraduate Hospital Educational Environment Measure (PHEEM)[69,70]. The results of qualitative studies and testing of subscales through input from Delphi panels[19,69] steered the development of both of these tools. The Anaesthetic Theatre Educational Environment Measure (ATEEM)[71] and the Surgical Theatre Educational Environment Measure (STEEM)[72] are tools developed to measure conditions unique to specific specialties. These tools show considerable variability in subscales and content and view the environment from

different perspectives[17,73]. The inconsistency in structure and themes highlight the lack of consensus regarding the domains or constituents of clinical learning environments[74].

The D-RECT measures clinical learning environment components like 'supervision,' 'coaching and assessment,' and 'feedback'[19]. Uniquely, this tool also takes into account the exchanges that occur between individuals during patient care, e.g., 'professional relations between attendings' and 'patient handover'[19]. This tool has frequently been used to evaluate quality of postgraduate medical training environments[75]. It has also been used to test the association between a positive learning environment and trainee perceived supervisor performance[76]. The PHEEM is another internationally used instrument for measuring the level of autonomy, quality of teaching, and social support in clinical environments during junior doctor training[69,77]. Like the D-RECT, the PHEEM is a useful tool to identify the strengths and weaknesses of educational settings, and to provide information about particular aspects and overall quality of the clinical environment. Instruments like the PHEEM and the D-RECT can yield reliable results that can be used to give specific feedback to departments on their local learning climate[17,75].

The table below is a summary of clinical environment measurement tools and their underpinning constructs frequently seen in postgraduate medical education literature.

Tool	Subscales
D-RECT[19] **Dutch Residency Educational Climate Test**	Supervision Coaching and assessment Feedback Teamwork Peer collaboration Professional relations between attendings Work is adapted to residents' competence Attendings' role Formal education Role of the specialty tutor Patient sign out

STEEM[72] **Surgical Theatre Educational Environment Measure**	Perceptions of trainer and training Perceptions of learning opportunities Perceptions of the atmosphere in the operating theatre Perceptions of supervision, workload and support
ATEEM[71] **Anaesthetic Theatre Educational Environment Measure**	Autonomy Perceptions of atmosphere Workload/supervision/support Perceptions of teaching and teachers Learning opportunities and orientation to learning
PHEEM[78] **Postgraduate Hospital Educational Environment Measure**	Perceptions of role autonomy Perceptions of teaching Perceptions of social support

Comparison between the constructs and contents of these tool reveals that supervision, autonomy and perceptions of the supervisor (teacher) are recurring themes. Even though 'supervision' is frequently referred to, different tools view it differently. For example, the D-RECT outlines specific supervisory functions such as coaching and assessment, feedback and scaffolding, whereas the STEEM and ATEEM link supervision with workload and support.

3.2.2 Clinical Learning Environment Review (CLER) Program

The U.S. Accreditation Council for Graduate Medical Education's (ACGME) Clinical Learning Environment Review (CLER) Program was created to investigate and generate feedback that addresses several critical areas of training in CLEs, including patient safety, healthcare quality, and professionalism[79,80]. The CLER program is part of the assessment process of the Next Accreditation System (NAS) which aimed to evaluate hospitals' compliance in the six core areas[81]. The six key focus areas identified by CLER are patient safety, health care quality, care transitions, supervision, fatigue management and mitigation, and professionalism[82,83]. The domains of the CLER program is more evidence

about the lack of agreement about what defines the clinical learning environment. In the U.S., they closely link the clinical learning environment and the hidden curriculum – trainees' exposure to, for example, patient safety practices. The European notion of the clinical learning environment is different; it is more about how the environment supports the process of learning.

To date, this program has systematically reviewed hundreds of clinical sites across America and collected observational and interview data[84]. The review identified that there is a lack of engagement of trainees in patient safety and quality assurance initiatives, poor integration of educational demands and service needs, a shortfall of faculty development, and scarcity of resources for ongoing educational activities[82]. Since its inception, the CLER review group has published multiple papers and reports as guidance on how to reshape clinical environments for the future[83,85,86].

The North-American approach to the study of clinical learning environments mainly centres around patient safety and quality improvement[87,88]. This increased awareness of safe medical practice may have resulted from the 'To Err is Human' report issued in 1999 by the U.S. Institute of Medicine[89]. This study indicated that up to 98 000 people die each year as a result of preventable medical errors in the U.S. These figures were, at least in part, the incentive for the launch of the CLER program. The focus in the U.S. is quite different from research coming from the UK, Ireland and the Netherlands, which emphasise features of environments which support learning in general terms. Nevertheless, in the UK similar trends are emerging; patient safety and quality of care are growing priority areas for medical education research[16,90]. These are indications of a drive towards aligning both learning and clinical outcomes centred around the

patient[91–93]. These movements do raise the issue of learning versus service, and whether or not improved patient conditions equate to improved learning conditions and vice versa.

3.3 The Impact of the Clinical Learning Environment

There is limited evidence on the impact of the environment in which trainees learn on their future practice. Two studies identified that patient complication rates and cost trends of the clinical training setting correlate with future complication rates and influence future healthcare cost patterns[12,94]. Doctors who train in hospital environments with a smaller patient census are more likely to know when conservative patient management is more appropriate[11]. Research like this provides some empirical data on the implications of the variability of clinical learning environments across different sites and demonstrate the long-lasting impact of behaviours learned in clinical environments.

3.4 Barriers and Facilitators to Learning in the Clinical Environment

There is evidence that trainees' positive perception of their learning environment correlates to more efficient learning and use of their existing knowledge base[10,95]. Factors in clinical learning environments that facilitate learning are trainee support, being a valued member of the team, appropriate workload, and adequate clinical exposure[96,97]. Social integration – a sense of belonging - is a factor cited most frequently that influence learning in clinical workplaces[98]. On the other hand, fractured working patterns, a high workload and not enough time with patients and seniors inhibits learning in clinical environments[99]. A better learning environment supports a better quality of life, more work-life balance satisfaction, and less burn-out in trainees[100–102].

Clinical diversity and patient volume influence the perceived value of workplace learning[103]. Trainees attibute value to caring for patients with rare illnesses[104]. The quality of patient care also has a strong association with overall training satisfaction[105]. Clinical settings associated with a heavy workload have been linked to surface learning whereas environments where trainees have more autonomy result in deep learning[10]. The workflow of the clinical environment has a strong influence on the learning that occurs[8]. Timetables, change in patient status, and admissions or discharges dictate the flux in patient care activities. Patient movement can either increase or decrease time together between medical staff. For instance, transitions associated with admission or discharge bring people together creating learning opportunities. However, when the patient count is too high, encounters between individuals are relatively short and aimed at the continuation of service provision rather than education[8]. This means that a reasonably busy environment creates good opportunities for learning but being too busy decreases learning beyond the explicit purpose of service delivery[8].

3.5 Supervision and the Clinical Learning Environment

3.5.1 Defining Clinical Supervision

Clinical supervision is as a process by which senior doctors guide trainees learning[1,106]. Trainees learn as they work in partnership with more experienced doctors[2–4] and supervisors are central to many work-related activities of trainees[3,107,108].

The literature defines supervision as;

> *The provision of guidance and feedback on matters of personal, professional, and educational development in the context of a trainee's experience of providing safe and appropriate patient care. This would include the ability to anticipate a doctor's*

strengths and weaknesses in particular clinical situations in order to maximise patient safety[1].

Supervisors oversee and direct trainee doctors' work. The responsibility of clinical supervision is usually taken on by senior doctors within the clinical team. Therefore, for this dissertation, the term *supervisor* refers to any senior doctor who has oversight of postgraduate medical trainees' work, including formally named supervisors and others.

Frameworks of supervision describe direct observation, regular meetings, feedback, and reflection as requirements for effective supervision[4,109]. A recent study on how to make supervision more effective recommends better communication between supervisor and trainee before supervisory meetings, and mentoring support and guidance from supervisors in the form of feedback, career planning and goal setting[29]. These recommendations emphasise the formal, structured aspects of supervision. However, this research programme places more emphasis on supervision that occurs 'on the job' associated with workplace learning rather than formal or structured mentoring.

Very little explicit theory underpins supervisory practice in postgraduate medical education. At the moment, experience-based and workplace learning frameworks[49,51,56] that draw on social learning theory are the best tools for understanding clinical supervision. Supervision is also rooted in the 'apprenticeship model'[110,111] which is the process whereby the 'apprentice' learns an art, trade, or job under a 'master'. The manner in which trainees become progressively more independent in delivering patient care associated with a decreasing level of supervision[112] characterise postgraduate medical education. Phasing out of supervision is congruent with the traditional

apprenticeship model[113]. Contemporary trainee supervision extends beyond the traditional apprenticeship model to compensate for the current complexities of modern health care and training structures[114]. Instead of instruction from one supervisor over an extended period, there is an expectation within current training programmes of distributed supervision through relatively short engagement with multiple experts[29].

3.5.2 The Supervisory Relationship

The supervisory relationship unfolds within the clinical environment[115]. A key finding of a review on supervision[1] was that *"the quality of the relationship between supervisor and trainee is the single most important factor for effective supervision".* Indeed, empirical research recommends the support of trainee learning in the workplace through a valued connection between the supervisor and trainee[6,97,107,115–118].

Supervision implies that the trainee and supervisor work closely together, regarding both physical proximity and clinical time spent together[107]. In current health care systems, the supervisory relationship faces several challenges that influence the amount and quality of time that supervisors and trainees spend together. Working time regulation, rotations, shift working and schedule asynchrony have led to a decrease in the time trainees and supervisors spend together at work[119,120]. Nurturing a relationship may be difficult, and investment in a good supervisor-trainee relationship may not seem worthwhile when the time frame is short.

3.5.3 The Purpose of Clinical Supervision

The educational purpose of clinical supervision is to facilitate professional development; however, the most compelling reason for supervising trainees is to maintain a high standard of patient care and ensure patient safety[1,2,4,121,122]. There is some evidence

that clinical supervision improves patient- and learning-related outcomes[15]. Clinical supervision leads to safer surgery and other invasive procedures performed by trainees, a reduced risk of patient mortality and the rates of preventable deaths and complications[123]. More specifically, improved intubation skills[124], better outcomes of paediatric code events[125], advanced surgical management of trauma patients[126], fewer complications of arthroscopic treatment[127], decreased incidence of complications during emergent intubations[128] and procedural-related complications of central venous cannulation[129,130] are the result of direct clinical oversight. For appropriately selected cases, the literature supports surgical registrars performing surgery without direct supervision[131]. Surgical trainees can perform surgical procedures with similar outcomes to their consultants, but adequate clinical supervision is critical to achieving these results[132,133].

In addition to patient safety, supervision is key to successful clinical training; effective workplace learning requires guidance by experts[2,4]. Supervisors must identify and manage clinical reasoning difficulties in trainees[134], and play a significant role in how trainees experience and learn from clinical situations including adverse outcomes in patient care[115,135]. Supervisors must also determine trainees' level of clinical involvement so that they can develop competencies required for independent practice. Supervisors find this difficult to achieve since prioritisation of efficiency and risk management feed into a culture of close supervision and reduce the range of entrusted activities that trainees may undertake[58]. Sometimes, trainees mostly take on low-level repetitive tasks, instead of participating in all activities of acute and specialised clinical care. For example, during ICU rotations, opportunities for trainees to learn by admitting

patients and performing conventional invasive procedures is reported to have decreased by approximately a third over a recent 9-year period[136].

4 THE IRISH CONTEXT

In this section, I narrow the focus to PGME in the Irish context and demonstrate how local problems are similar to the more global challenges facing PGME. Several issues in PGME and the broader healthcare system, undermine Ireland's ability to achieve satisfactory learning experiences for all trainees and to retain doctors for the future. To explore these issues, the Medical Council, the Health Research Board, and the National Doctors and Planning Committee funded this doctoral research programme.

Ireland delivers high-quality medical education and world-class young doctors. The recognition of Irish graduates around the world as being of an international standard reflects this, and many renowned Irish physicians have returned after distinguished service in other countries. However, despite these indicators of success, postgraduate medical education in Ireland faces several challenges. Ireland is struggling to achieve a sustainable medical workforce. International migration of doctors is not a new phenomenon, but it has drawn much attention in Ireland recently because of concerns that it might exacerbate shortages of skilled health workers[137]. Multiple data sources indicate the same trend[138–140] – many trainees intend to leave the country. Similar to Ireland, Britain's National Health System (NHS) is also facing a significant health workforce crisis[141].

Multiple studies have indicated that many trainees in Ireland and the UK are unhappy with several aspects of the settings in which they work and learn[142–145]. Trainees appear

to compare the working conditions, training and career opportunities in Ireland unfavourably to other English speaking countries; notably Australia, Canada, New Zealand, the United Kingdom and the United States[146]. Professional reasons related to training or longer-term career opportunities underpin UK-trained doctors' emigration[147]. A UK exploratory study found that trainee perceptions of the learning environment have implications for recruitment and retention[101]. The study describes how trainees' interaction with the learning environment impact career choice, sense of professional identity and behaviour. The majority of trainees in a study on the Irish internship reported a lack of protected time for learning, insufficient feedback on performance and stressful working conditions[142]. Conditions pertaining to the clinical learning environment play a significant role, nevertheless, life experience and lifestyle factors are also motivators for working abroad[139].

An evaluation of current supervision practices in UK postgraduate training shows that trainees felt they were not receiving effective supervision[29], and that supervisory practice was highly variable[148]. This finding is supported by an Irish study which found that 12% of trainees were dissatisfied with their trainers, which correlated with trainee perceptions of the support that they received from their supervisors[143]. Irish trainees have limited opportunities for career development and time with senior staff due to factors such as heavy workloads[149]. Irish surgical trainees are dissatisfied with their operative exposure, displeased with their rotations, and feel like they do not have a mentor[144].

Since 2014, the Irish Medical Council has evaluated trainee perspectives on the quality of clinical learning environments and other features of postgraduate medical

education[145] through its annual national survey - Your Training Counts. It reports some statistically significant improvements over the period 2014-16, indicating that trainees scored the quality of their learning environment higher over the past three years. Nevertheless, several key areas require more attention[145]. Learning experiences at clinical sites are variable. Some trainees score their overall experiences very poorly, and around the same proportion score them reasonably highly. Trainees consistently rate feedback as the weakest feature of the clinical learning environment. Trainees feel unprepared to transition to more senior roles and do not receive proper induction regarding their roles and responsibilities. One-third of trainees report being bullied or undermined and more than half of trainees had witnessed someone else being bullied, undermined or harassed.

The challenges Irish PGME faces are illustrative of difficulties encountered by trainees in nations where government expenditure is declining, and shortages are rising. Doctors are emigrating because of poor working conditions. Many of the reasons influencing trainees' decisions for leaving relate to training structures[140]. Researching trainees' satisfaction with their training conditions is but one step towards resolving the difficulties facing PGME at the moment in Ireland and abroad. Broader issues are at play such as the economy, governance, and population factors. Nevertheless, the quality of training is part of the solution. It is reasonable to assume, that by providing information on how to better support training and increase the quality of clinical learning environments may improve staff retention, produce more competent doctors and increase satisfaction with the training experience.

5 RESEARCH QUESTIONS & AIMS

The principles of postgraduate medical education that I chose to focus on are; 1) training happens in clinical learning environments, 2) trainees learn through work, and 3) supervisors guide trainees' participation in workplaces. The research questions and aims I will outline are related to these principles. I designed a research approach which I felt was best suited to address the research aims. (In the next Chapter, I will discuss the conceptual orientation and the methodological approaches for this thesis. To provide greater clarity of how research aims were addressed, I will refer briefly to the methods used when stating the problems.)

The research programme aimed to answer two overarching questions;

1) *On what aspects of the clinical environment should we focus to better support trainee learning?*
2) *How does supervised workplace learning happen and what is the role of the environment in this process?*

The first question was framed at the outset of the project. Data collection in the early part of the programme, input from project partners and increasing familiarity with theory and practice led to the second research question.

1) On what aspects of the clinical environment should we focus to better support trainee learning?

Prevailing attempts to determine the scope, to stipulate the content, or to demarcate the purpose of clinical learning environments have led to mixed results. Consequently, practitioners at the frontline may be at a loss about where to focus their efforts to improve learning. The current constructs of clinical learning environments are helpful,

but only to a certain extent because they range from the all-encompassing (cultural, material, and social elements) to the simplistic (brick and mortar). Clinical learning environment evaluation methods show considerable variability in subscales and content and view the environment from different perspectives. This inconsistency in structure and themes highlight the lack of consensus regarding priority areas in clinical learning environments. The first objective of this research programme was to identify and gain agreement on the challenges and priority areas in clinical environments from the perspective of multiple stakeholders within postgraduate medical education. I wanted to draw on the experiences of the people at the frontline about what aspects of learning in clinical environments they think are important as well as achievable to address. A Group Concept Mapping study was done (reported in Chapter 3) and the findings steered this research programme in the direction of 'learning under supervision'. Narrowing the focus to clinical supervision prompted further identification of gaps in our understanding of this phenomenon and as a result further research questions and aims.

2) **How does supervised workplace learning happen and what is the role of the environment in this process?**

Supervision is key to effective workplace learning. Learning through work is well understood yet there is a lack of theory explaining how workplace learning occurs through clinical supervision. We need explanations about learning through supervisor-trainee interaction *and* the role of the environment in this process. Knowing this could lead to clear, shared principles about supervised workplace learning and the environment in which it happens.

Supervised workplace learning is complex and to understand this process better requires theory-driven research. The current literature offers frameworks and theories on workplace learning[46,48–55]. Models of workplace learning provide an understanding of trainees' development through ongoing participation and somewhat contextualises professional development. Building on existing theory requires integration of empirical evidence towards the development of a conceptual framework of workplace learning through clinical supervision. For it to be of practical relevance to frontline practitioners, such a framework must take into account influential environmental factors. Knowing more about the specific circumstances that underpin supervised workplace learning will enable learning in these settings to be better supported.

My approach to researching supervised workplace learning was a step-by-step process involving multiple perspectives and data from several sources. The first step was to complete a realist review. The aim was to develop an evidence-based theoretical framework of informal supervisor-trainee interactions that occur within clinical learning environments. The realist review identified the processes which generate outcomes from supervisor-trainee workplace interactions. It also categorised the contexts or circumstances which shape these processes' ability to facilitate trainee learning. The findings are represented as a framework of context-mechanism-outcome configurations of supervised workplace learning. The realist review method and results can be found in Chapters 4 and 5.

Following the realist review, the next aim was to test and refine the framework of supervised workplace learning. This was done through a multiple case study across four institutions and specialties. The first part of the case study, reported in chapter 6, aimed

to test to what extent observed patterns aligned with the theoretical patterns of supervised workplace learning as determined by the realist review. The results of the case study analysis revealed particular 'gaps' between observed and theoretical patterns. This divergence was explored in the second part of the case study, reported in Chapter 7, with the aim to identify institution- and specialty-specific contexts that impact on supervised workplace learning. In Chapter 8, I discuss the findings of the individual studies, outline their implications and identify areas for future research.

In conclusion, the purpose of this research programme was to explore learning in complex clinical settings with an additional focus on clinical supervision. The specific research aims were;

1. To identify and gain consensus on the challenges and priority areas in clinical environments from the perspective of multiple stakeholders within postgraduate medical education
2. To develop a realist theory of informal workplace learning that occurs from supervisor-trainee interaction in postgraduate medical education
3. To test and refine the realist theory of supervised workplace learning
4. To explore the impact of institution- and specialty-related culture and practice on supervised workplace learning

Aims two, three and four were not predetermined but emerged at different stages in the research process. By taking multiple perspectives, the aim was to produce a holistic view of the opportunities and challenges in clinical learning environments, generate a framework of learning processes occurring through supervisor-trainee interaction, and determine the impact of institution- and specialty-related culture and practice on

supervised workplace learning. The findings of this research programme contribute to the growing body of work in the postgraduate medical education arena.

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Chapter 2
Conceptual Orientation and Methodology

In this chapter, I outline the key elements of how I went about addressing the research aims. I discuss the rationale for a research programme within the critical realist paradigm and provide an account of the methodologies as they relate to this philosophy.

1 Overview

Research is the process by which we generate knowledge and understanding[1]. The way we view the world informs this process, and therefore, it is crucial first to explain what is meant by 'knowledge' – what can be known and what it means to know something. Thus, I will begin this chapter with explicit reference to the research paradigm and epistemological assumptions underpinning this work. A paradigm is a set of mutual beliefs shared among researchers about how problems should be understood and addressed[2]. The unique set of philosophical assumptions and principles relating to particular paradigms guide the way that research is conducted[3]. Research is situated within different paradigms such as positivist, constructivist, critical realist, to name a few[4,5].

Research paradigms are characterised by particular ontological and epistemological assumptions[1]. Ontology is concerned with *what is*; what constitutes truth and what exists[6]. For example, research within the positivist paradigm assumes that there is a single reality, which can be measured or observed[1]. Constructivists, on the other hand,

believe that there is no single reality, that truth is relative and socially negotiated[1]. Epistemology is an overarching philosophical term concerned with the origin, nature, and limits of human knowledge, and the knowledge-gathering process itself[7]. Constructivists have a subjectivist epistemology, meaning that knowledge cannot exist without individuals to construct it[8]. Knowledge is inherently subjective, as individuals will uniquely create reality, depending on their background and the social forces acting on them. Conversely, for positivists, the truth is objective and knowledge exists separately to individual people[9]. Knowledge is therefore discovered rather than created by the individual.

2 CRITICAL REALISM

Critical realism emerged during the time of the positivist-constructivist 'paradigm wars'[10,11]. The critical realist approach is an alternative to positivist and constructivist[12], embraces elements and addresses the limitations of both paradigms. The philosopher Roy Bhaskar developed critical realism, and it was elaborated further by himself and other critical realists[13]. Over time, it has developed into a unique school of thought about the ontology and epistemology of the social world and social phenomena[14].

Critical Realism is 'critical' in the sense that;

- *Social structures and practices are unavoidably susceptible to change through critique*[15]
- *Criticism of social phenomena can be derived directly from sound explanatory models of them*[16]

- *Social structures are seen to be critically dependent on intentional human agency and open to transformation through changing human practices which in turn can be affected by criticising the conceptions and understanding on which people act*[15]

To explain social phenomena through critical realism requires careful consideration of critical realist ontology. Critical realism uses a unique stratified or layered ontology[17]. Layers of reality mean that social structures and systems exist and operate in the world around us independently of our conception of them[14,18]. Events can be seen and experienced, but the social structures that cause them are not always readily observable. This way of conceptualising reality implies that reality is stratified and makes it incumbent on researchers to make a distinction between the events that we can experience and describe, and the hidden, but real, structures that cause these experienced events[14,18].

The critical realist paradigm is best understood when comparing its similarities and differences to the positivist and constructivist paradigms as it is positioned between these two worldviews[18]. Critical realism accepts an objective reality; it also argues that the world is socially constructed. Critical realism promotes the ontological position that there is a reality out there regardless of our observations and experiences while at the same time, departing from positivists by acknowledging that the unobservable can exist and are appropriate for knowledge construction[17]. Unlike positivists, critical realism considers not only the observable events but also the underlying structures[17]. Positivism rules out the validity of knowledge based on unobservable concepts and variables[19]. Then again, constructivists propose interpretations of different phenomena[19], and it is uncertain why one interpretation is better than the other. Critical realists agree that

knowledge is a human product and thereby recognise the social and historical situatedness of our interpretation of reality[14]. Therefore, it acknowledges the role of subjective knowledge of individuals in a particular situation as well as the existence of independent processes that constrain and enable these individuals to pursue specific actions in a particular setting[20]. Realism draws from both sides of the paradigmatic spectrum and recognises the presence of external social reality and the influence of that realism on human behaviour[21].

The table below outlines the ontological and epistemological differences of positivist, constructivist and critical realist paradigms.

Paradigm	Ontology	Epistemology
Positivist	**Realist Ontology** • Objective reality • Assumes that there is a reality separate from human knowledge of it	**Representational epistemology** • Assumes individuals can know this reality and can accurately describe and explain this objective reality
Constructivist	**Relativist ontology** • Assumes that reality, as we know it is constructed intersubjectively through the meanings and understandings, developed socially and experientially. • Reality cannot be separate from our knowledge of it.	**Subjectivist epistemology** • Assumes that we cannot separate ourselves from what we know
Critical Realist	**Realist Ontology** • There is an objective reality • Assumes that there are real-world objects apart from the human knower • Assumes that our ability to know this reality is imperfect, and claims about reality must be subject to extensive critical examination to achieve the best understanding of reality possible	**Subjectivist epistemology** • We cannot separate ourselves from what we know. • Objectivity remains as an ideal that researchers attempt to attain through careful sampling and specific research techniques

Critical realism assumes that there is a reality that can be separate from our knowledge of this; however, this objective reality remains an ideal that researchers attempt to attain but that cannot be apprehended perfectly[12]. Endeavouring to attain this ideal, presumably, will lead to more rigorous research. For these reasons, critical realist approaches are often conducted in natural settings, data collection includes comprehensive situational or contextual information, and utilise methods to triangulate participants' perceptions of reality. In other words, critical realism promotes the use of methodological pluralism[22,23]. Pluralism is a stance that accepts the co-existence of competing ways of conceptualising the same thing. The complexity of real-world issues relating to postgraduate medical education in clinical environments demands multiplicity in forms of knowledge. Furthermore, the multidimensional and ever-evolving nature of postgraduate medical education suggests a combination of data collection methods to study this phenomenon. Unlike positivism and constructivism, critical realism does not bind itself to a particular methodological orientation and is flexible with a wide range of research methods[17].

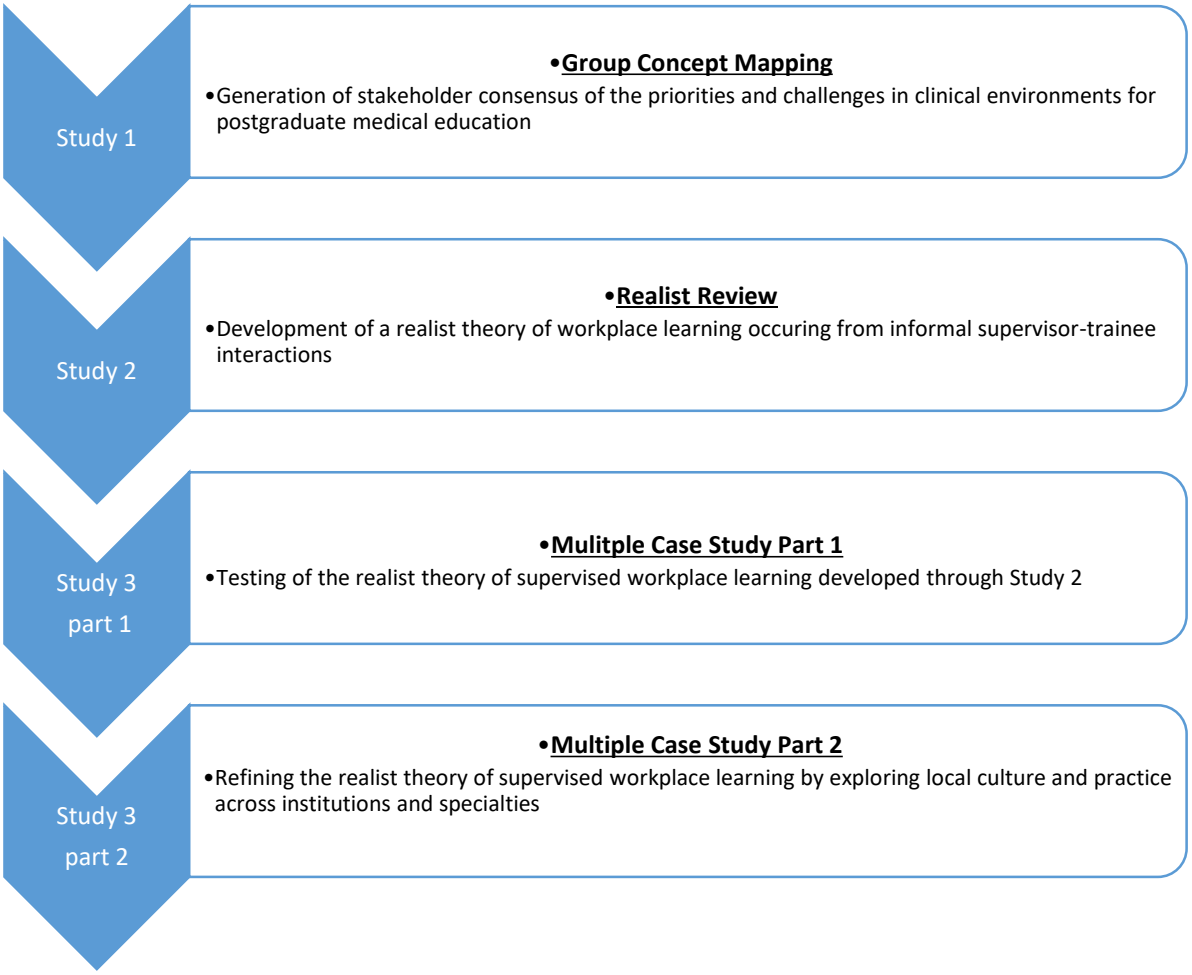
Critical realism assumes a more comprehensive view of reality which makes it robust in explanation[24]. The ultimate goal is to offer explanations, and therefore, the chosen method depends on the nature of the research problems and should be able to guide researchers to eliminate alternative explanations[20]. Robust explanations of social phenomena enable researchers to suggest practical policy recommendations to address social problems[17]. This particular research programme focuses on a complex phenomenon and is also about finding ways that may benefit trainees, supervisors, and patients. The goal is to unravel complexity and explain it in a way that is useful to the frontline workers on the ground. I required an approach that can manage both the

complexity and purpose of the research. Ultimately, I chose a research approach rooted in the philosophy of critical realism because of its responsiveness to complex research aims and settings.

Critical realism presents several pitfalls. The complexity of this school of thought makes it difficult for a novice researcher to put critical realism into practice[25]. Critical realists make inference to the best explanation and identify the causes and conditions of their findings; this requires an in-depth understanding of potential theories out there. Critical realism also employs similar data collection methods as constructivists (i.e. interviews, case study, ethnography, observation). An inexperienced researcher runs the risk of conflating these methodologies and methods.

3 METHODOLOGY

In this research programme, an integrative mixed methods Group Concept Mapping was the first study, to identify the priorities associated with postgraduate medical education within clinical environments. Findings from Study 1 was used, amongst other things, to narrow the focus of Study 2, a Realist Review of workplace learning that occurs during informal supervisor and trainee interactions. Study 2 produced a Realist Theory which was tested and refined in Study 3 through a Multiple Case Study.



3.1 Study 1 - Group Concept Mapping

Study 1 aimed to;

Identify and gain consensus on the challenges and priority areas in clinical learning environments from the perspective of multiple stakeholders within postgraduate medical education.

Group Concept Mapping (GCM) is a structured consensus-building method designed to facilitate a group of people to articulate and represent a coherent conceptual

framework of any topic or issue of interest[26]. GCM is a type of integrative mixed method, combining qualitative and quantitative approaches to data collection and analysis[26]. The method uses a combination of group processes (brainstorming, sorting, rating, and interpretation) and a sequence of multivariate statistical analysis steps that result in concept maps[26]. Concept maps are visual representations of how participants conceptualise the relationship between ideas which they have generated on a specific issue[26]. Participants rate qualitative statements (gathered during the brainstorming phase), and these are interpreted in pattern matches and value plots[26].

Group Concept Mapping is a relatively new method which was initially developed in the 1980s by William M. Trochim[26]. GCM has gained popularity over recent years and has become an established method used in a wide variety of settings and disciplines[27,28]. The method of group concept mapping is mainly a-theoretical. At its inception, its founder attempted to situate the newly emerging concept mapping method within a more general framework of structured conceptualisation approaches[27]. This was an unsuccessful attempt to articulate a general theory that would describe conceptualisation methods ranging from every day thinking of individuals in their conscious minds to the group thinking implemented in concept mapping[27]. People usually do not enact processes of conceptualisation consciously and the configuration of concepts more or less spontaneously occur. Even so, it was postulated that there must be underlying cognitive steps and that it could be possible to consciously employ these with a more 'structured conceptualisation' approach[27]. The initial theory involved three distinct processes: the generation of ideas, the structuring of ideas, and the representation of ideas[27]. The general theory of conceptualisation did not survive past its initial publication in 1985. Nevertheless, the early attempts to situate group concept

mapping as a specific approach within a comprehensive group of cognitive processes demonstrates that from the beginning it was inextricably connected to the ideas of concepts and constructs, the psychology of cognition, and conscious efforts to develop methodologies to increase our ability to express and manipulate them[27]. Furthermore, the endeavour to situate group concept mapping within a broader set of methodological approaches to conceptualisation left us with a fundamental formula on which all GCM studies are built[27]. A group of people generate the ideas, individuals structure or organise them, and an algorithm (in this case a sequence of multivariate analyses) represents them in pictorial form (in this case as a map)[27]. The separation of each step means that each is a distinct part of the whole process.

Some deliberation is given here to the assumptions underpinning the Group Concept Mapping method. At first, it appears that the epistemological basis for the GCM method favours the positivist paradigm. The positivist position in the GCM method is supported through the utilisation of a quantitative approach to data analysis and the application of statistical measures to determine 'consensus.' Furthermore, the inclusion of 'experts' assumes an ontological position of a single reality - on which 'experts' agree. Some elements of the GCM method, however, can be considered as subjective and qualitative. The process of GCM involves group generation of ideas and individual organisation of these concepts as well as researcher interpretation, to a certain extent, of participants' clustering of these ideas. This is in keeping with a constructivist perspective of reality that is socially situated and individually constructed. For these reasons, it is difficult to draw clear conclusions about paradigmatic assumptions underpinning all GCM studies, since it is reasonably apparent that certain parts of the method are more congruent with a constructivist paradigm and others more coherent with that of a positivist. Critical

realist principles may offer a solution to this dilemma in the sense that the knowledge generated from this study represents the events that participants can experience and describe. This method enabled identification of the participant's experiences of the opportunities and challenges relating to learning in clinical environments. Nevertheless, in relation to the stratified ontology of critical realism, this method does not explain the deeper causal structures of the phenomenon under investigation. Chapter 3 provides the specific steps of the method as well as the results of the study.

3.2 Study 2 - Realist Review

Study 2 aimed to;

- *Develop a realist theory of informal workplace learning that occurs through supervisor-trainee interaction in postgraduate medical education.*

I wanted to better understand how workplace learning through clinical supervision works in different circumstances. By comparing various literature synthesis methods, I was able to select the most appropriate knowledge synthesis method to address my research aim which was also suitable for dealing with the complexity of learning in clinical environments[29]. Traditional systematic reviews merely provide an answer as to whether an intervention works or not. Similarly, review methods which aim to, for instance, identify knowledge gaps, would have been inappropriate in this case. Realist review, on the other hand, is a strategy for synthesising research which has an explanatory rather than judgemental focus. Realist review is driven by the question

'What works, for whom, why and in what circumstances?' Furthermore, this methodology holds no particular preference for either quantitative or qualitative methods. Realist review integrates qualitative and quantitative evidence to elucidate a richer understanding of the contextual and theoretical underpinnings of a phenomenon. A literature synthesis designed to develop theory is beneficial to understand the phenomenon under investigation better, and it is also well suited to inform strategies for policymaking.

Realist review is a theory-driven approach to synthesising research evidence[30]. 'Theories' rather than 'programmes' are the basic unit of analysis. Realist review begins with a rough programme theory and ends with a refined, more nuanced and more powerful programme theory[18]. The results of a realist review have the potential to be useful in any subsequent occasion that such a theory comes into application[31]. Unlike medical research traditionally evaluated with randomised controlled trials, the literature on postgraduate medical education is epistemologically complex and methodologically diverse. For that reason, reviewing medical education research evidence is best suited to realist review[32].

The strengths of realist review are that it has firm roots in critical realist philosophy and it is inherently pluralist and flexible, embracing both qualitative and quantitative research evidence[22]. However, there are a few theoretical and practical limitations to this particular methodology of systematic review. Complex social interventions, like postgraduate medical education, are multifaceted, and the scope of the investigation is significant. Therefore, it is essential to narrow the focus of the review question to prioritise which aspects of the intervention to analyse. Another limitation of realist

review relates to the recommendations that can be made based on the findings. The findings or realist synthesis emphasises contextual advice regarding the circumstances which impact on the effectiveness of mechanisms ability to produce desired outcomes. Therefore, realist review offers a better understanding and contextual fine-tuning rather than generalisable hard and fast truths or standardisation. Nevertheless, realist review is fundamentally pragmatic, and on this score, it has considerable advantages for policymaking. Policymakers and others responsible for designing and implementing postgraduate medical education may find recommendations useful which explain why a programme worked better in one context than another.

Chapter 4 describes the realist review process and programme theory.

Chapter 5 reports the results of the realist review.

3.3 Study 3 – Multiple Case Study

Study 3 aimed to;

- *Test and refine the realist theory of supervised workplace learning.*
- *Explore the impact of institution- and specialty-related culture and practice on supervised workplace learning.*

Case study is an empirical inquiry that is used to contribute to our knowledge of complex social phenomena and allows preservation of the characteristics of real-world events[33–36]. This method is especially useful when the boundaries between phenomenon and context are not clearly evident[37]. A case study approach is appropriate because

contextual conditions are highly pertinent to the phenomenon studied in this research programme.

Case study is a research strategy rather than a methodology[35]. The aim of this case study inquiry served a particular purpose - in this case, testing and refining a realist theory and exploring idiosyncrasies of supervised workplace learning across cases. It is important that at all times the selected methods are used appropriately in relation to the underpinning paradigm to ensure rigour[35]. The critical realist paradigm underpinned the multiple case study because of the nature of the research aims. Like many other studies, research guided by critical realism begins with a particular problem or question, which has been guided by theory. Critical realism endorses the use of existing theory as a starting point for empirical research: *'Once a hypothesis about a generative structure has been produced in social science it can be tested quite empirically'*[17].

Case study research can use several analytical techniques[36,38]. One possibility is to stipulate a pattern of findings at the outset of the study[36,39]. The analysis would then involve the analytical technique of 'pattern matching' collected data against the initially proposed pattern. Other analytic techniques include explanation-building, time-series analysis, and cross-case analysis[35,36]. In this research programme, both pattern matching and cross-case analysis were involved to address the research aims. Cross-case analysis enables the comparison of similarities and differences in the activities and processes that are the units of analysis in case studies[40]. The multiple case study is presented in Chapters 6 and 7.

4 REFLEXIVITY

A researchers' motives, preconceptions and position towards the participants are factors that may affect the research process[41]. Hence, I end this chapter by acknowledging the subjective nature of the 'researcher' through a statement of the positionality that I bring toward the work.

I started a PhD in the field of Medical Education because I wanted to develop my research skills and I have a keen interest in Health Professions' Education. A serendipitous opportunity arose in the form of a PhD studentship right as I came to the end of a Masters in Clinical Education I was completing at the time. For my primary supervisor Dr Deirdre Bennett (DB) to obtain finance for this project, she had to submit a research proposal to the funding body before I was enrolled in the project. This meant that an outline of the research was preconceived prior to my involvement in the project. The design, procedures and outcomes of this dissertation are different to the project proposed in the beginning. The original proposal broadly emphasised clinical learning environments for postgraduate medical education. I played a role in narrowing the focus to workplace learning through clinical supervision, and the design and analysis of the realist review and the multiple case study. The group concept mapping was the first study completed and was conducted very similarly to what was proposed in the original protocol. I had a central role and were involved in all stages of the design and implementation of the research programme, the analysis of the results and the writing of manuscripts. A postdoctoral researcher (Caroline Kilty) was a part-time member of the research team for the first two years of the project; however, she departed a while before the completion of Study 2 and 3 and was not involved in the final analyses, syntheses nor output of either. One of the requirements of the funding of this research

project was to have a wider group of project partners involved to provide input into the steering of the research. Meetings were held twice a year for the duration of the project to feedback to the project partners about the progress of the project and to check concordance about the analysis and results of the individual studies. The advantage of working in a team is that everyone supports each other's reflexivity. During meetings with the core research team (AW; DB; CK), we would challenge each other's pre-conceptions and question how our own positionality may have shaped for instance the way we interviewed participants or interpreted the data.

During this research, I considered myself to be somewhat of an 'outsider' because I am a physiotherapist and not a doctor. My experience of working in healthcare settings offered me some background knowledge about the work and education of doctors. As a physiotherapist, I frequently interacted with trainees who provided me with an insight into postgraduate medical education. Furthermore, in physiotherapy clinical education, 'on the job' supervision and workplace learning are very similar to postgraduate medical education. Part of my role was to supervise and assess physiotherapy students' professional development and clinical competence in the same manner as how senior doctors supervise trainee learning. In addition to my background in health professions' education, I was also in the same age range as the trainees I interviewed, and I didn't have direct involvement in their training, and therefore one would expect that would put them at ease to reveal their thoughts on training to me. Someone more senior and involved in medical education, such as my supervisor (DB) who is the head of the medical education unit at UCC might have encountered a less candid response, mainly from participants who had been medical students at the same institution. I recognise that my background and past experiences might have influenced the way I approached and

interpreted the research. Positionality, however, is not fixed and continuously evolved because of my interaction with the research team, participants, literature, theory, and data. I also strongly adhered to the principles of critical realism and the chosen methodologies, which guided how I did the research and how I understood the findings.

The Health Research Board and Medical Council co-funded this research programme, along with certain expectations about its output. On the one hand, I wanted to fulfil my intellectual curiosity (to learn about learning) and scholarly development. At the same time, I had to produce knowledge of practical relevance that can drive positive change for trainees. It is important to state that the funding bodies involved in this project did not have any influence in the way the research was conducted or the analysis and presentation of the findings. I did, however, ensure that the written reports included programme specific information about the practical implications of the findings to enable these stakeholders to make informed decisions about the implementation of postgraduate medical education.

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Chapter 3
Challenges and Priorities in Clinical Learning Environments

1 INTRODUCTION

The clinical learning environment (CLE) is the *foundation* of postgraduate medical education (PGME)[1] and represents the social, cultural and physical context wherein junior doctors learn while they work[2,3]. Social theories of learning emphasise the role of the environment[4–8] in workplace learning which, in PGME, occurs through trainee participation and engagement in the daily work of a doctor[9–13]. Clinical learning environments shape the competencies of the doctors who train in them and provide multiple opportunities for trainees to develop profession-specific knowledge, skills, and behaviours needed for future practice[14–19] while, at the same time, providing medical care to patients. Clinical learning environments are contested territories because both training and service are competing for trainees' time[20,21]. Clinical settings troubled by overcrowding[22–24], understaffing[25], and underfunding[26–28] further exacerbate this service-training tension.

Consideration of the conditions in which trainees learn is important because they determine the long-term practice of future doctors[29–31] and trends linking adverse patient outcomes to training environments have been identified[32]. The link between clinical learning environments and patient care is an essential driver for quality improvement. High-quality clinical environments support trainee learning through

appropriate workload, adequate clinical exposure and social integration (a sense of belonging)[33,34]. Conversely, a high workload[35], limited time with supervisors, and discontinuity of working patterns[36–39] negatively impact on workplace learning[40]. In the UK and Ireland, where government expenditure is declining and shortages rising, trainees are deeply unsatisfied with their working conditions and feel that training abroad is of a higher standard[41–43]. Weaknesses relating to certain aspects of the clinical learning environment are influencing junior doctors' decisions for emigrating[44].

Strategies to optimise clinical learning environments are needed to alleviate the adverse effects of certain working conditions. Strategic planning requires prioritisation of the most critical facilitators and identification of opportunities for targeted improvement. Further exploration of clinical learning environments is needed to support the appropriate targeting of effort and resources on the part of policymakers, to achieve maximum impact. This study aimed to develop a national expert group consensus amongst a range of relevant stakeholders to; 1) identify significant barriers and facilitators to trainees' learning in clinical environments and 2) indicate priority areas for improvement. The overarching goal was to provide information to guide policymakers and those responsible for the delivery of postgraduate medical education in undertaking the delivery of high-quality clinical learning environments in challenging times.

2 METHOD

Group Concept Mapping (GCM) was the approach used to capture the perspectives of different stakeholders in PGME. GCM is designed to facilitate a group of people to articulate ideas on any topic of interest[45] and is a structured method for organising and representing those ideas in a series of interrelated maps[46]. This method integrates well-

known qualitative and quantitative processes such as brainstorming, sorting, and analyses with multivariate statistical methods[47]. Ethical approval for this study was granted by the Clinical Research Ethics Committee of the Cork Regional Hospitals.

Group concept mapping typically involves six distinct phases[45,48]; (1) preparation, (2) idea generation, (3) idea pruning, (4) sorting and rating, (5) data analysis, and (6) interpretation of results. An online software package, designed explicitly for GCM projects, was used for phases 2-5 of the study[49].

2.1 Phase 1: Preparation

During the preparation phase, the project participants were identified. Sampling in GCM research aims to include a diverse group of individuals to ensure that all alternative perspectives on the topic are being represented, even if the representation is not proportional to the population of participants. In other words, in GCM, sampling is not random and not for representativeness of a specific population. Opportunistic sampling for heterogeneity is characteristic of GCM[48], and ideally, a varied approach should be taken to identify participants including using email lists, informal networks, word-of-mouth approaches, members of organisations or committees, snowball techniques, and so on. For this study, experts and stakeholders in postgraduate medical education were purposively selected based on their knowledge and experience of clinical learning environments. Participants included doctors with senior roles in PGME, clinicians who supervise trainees, allied healthcare professionals, trainees, health service managers, and patient representatives. Each of the stakeholder groups' experiences of PGME intersects within the clinical environment, and for that reason, considered the most

appropriate (in relation to the focus of this study) participants to invite to partake in this GCM.

2.2 Phase 2: Brainstorming

This phase was anonymised. Using the online platform, participants completed a short demographic questionnaire (e.g., gender, role, and professional experience), and consent formed part of the online registration. Then, participants identified barriers and/or facilitators to learning in clinical environments in response to the focus prompt. Typically, a focus prompt is an unfinished statement which participants complete as many times as they like, resulting in a list of ideas/statements. The 'focus prompt' that was used for the complete-the-sentence instruction in the brainstorming phase was:

"One specific barrier or facilitator to trainee doctors learning within the clinical environment is…"

The participants were asked for a minimum of five statements, but they could provide as many statements as they wished.

2.3 Phase 3: Pruning

In this phase, the research team undertook a data cleansing process by removing duplicate statements, reviewing statements for any ambiguity and checking for clarity and readability. Statements were deleted, re-worded or split as required.

2.4 Phase 4: Sorting and Rating of statements

A subgroup of the original participants was asked to sort the edited statements into groups, based on similarity of the ideas therein, and to name the sorted groups of

statements. Participants were then asked to rate each statement based on two value judgements ('importance' and 'ease to address') on a 1-5 Likert scale using the following prompts:

'Rate the relative importance of each statement as a facilitator or a barrier to trainee doctors' learning within the clinical environment using a scale ranging from 1 (relatively unimportant) to 5 (extremely important).'

And

'Rate each statement for how difficult or easy it is to be addressed as a facilitator or barrier to trainee doctors learning within the clinical environment using a scale from 1 (very difficult to be addressed) to 5 (very easy to be addressed).'

In both instances, participants were encouraged to use the whole range of ratings from 1 to 5.

2.5 Phase 5: Data analysis

Concept System Global software was used for the quantitative analysis of data. By mathematical methods of multidimensional scaling and hierarchical cluster analysis concept maps were generated.

Multidimensional scaling produced a point map wherein statements were denoted by numbered points on the map. Statements that have been sorted together were near each other on the map and were similar in meaning[50]. Statements that were rarely grouped together by participants were situated further apart from each other on the map and were therefore dissimilar in meaning. A bridging value was calculated for each

statement. This is a statistic ranging from 0 to 1 which indicates how often a statement is grouped with others adjacent to it on the concept map, and whether participants have grouped it with others further away.

Hierarchical cluster analysis embedded in GCM initially tests each individual idea as a separate cluster and continues to merge ideas until it arrives at one cluster[51]. The cluster analysis results in clusters on the map which contain related statements and represent how the group see the ideas which they have brainstormed. A mean bridging value for a cluster is calculated on the individual briding values of statements comprising that cluster[52]. Mean cluster bridging values (BV), which are an indicator of the coherence of the cluster, are shown in Table 3. Lower mean bridging value for a cluster corresponds to a greater level of consensus on the content of that cluster[52]. Mean rating scores for the two value judgements – importance and ease to address - for each statement and cluster were calculated.

Furthermore, the rating data were analysed and used to produce 'pattern matches' and 'go-zones.' Both pattern matches and go-zones can be used to evaluate and prioritise the clusters/themes and individual statements within them.

Pattern matches indicate the value judgement for the rating scales for each of the generated clusters[48]. The pattern match or 'ladder graph' is a bivariate comparison of the average cluster ratings that shows aggregate patterns and can be used to compare for a single variable the ratings of multiple groups of measurement, or to compare multiple variables. Instead of being plotted in a typical x, y-axis format, the two axes are set vertically parallel to each other and joined by a separate line for each cluster which indicates average cluster rating. Horizontal lines suggest relative agreement while

overlapping lines suggest relative differences. This arrangement makes it easier to observe whether there is an overall agreement between patterns may specifically disagree. Pattern matches are particularly valuable for detecting high-level patterns.

Go-zones are bivariate value plots which can be used to prioritise statements[48]. The 'go-zone' graph is a bivariate plot of two patterns of rating at the statement level. The bivariate space is divided into quadrants based on the average x and y values. For example, when comparing importance and ease to address rating of the statements, the go-zone is the quadrant showing the statements simultaneously rated above average in both importance and ease to address. While pattern matching is especially useful for high-level pattern assessment, go-zones are particularly valuable for detailed use of the maps for planning at the statement level. The statements located in the go-zone quadrant represent the issues which would probably the best ones to address first in any plan that may result.

2.6 PHASE 6: INTERPRETATION OF RESULTS

The GCM software produced a preliminary cluster solution and generated a package of cluster merges which could be undertaken if there was sufficient conceptual similarity between clusters to do so. This qualitative element of the mixed methods analysis is underpinned by researcher interpretation and judgement[50]. During a sequence of meetings, the research team considered the cluster solutions suggested by the multidimensional scaling for 'goodness of fit' – starting with the largest number of clusters suggested and then considering whether it made sense conceptually to merge particular clusters. Once the final clusters were agreed, the research team proposed

descriptive labels for each cluster, which were refined and finalised through discussion with the broader research team.

3 RESULTS

Two-hundred and six stakeholders were invited by email to participate in the group concept mapping process. Participants were sourced from postgraduate training bodies, patient organisation and project partners. Participants were provided with a web-based link to an online platform for data collection (Concept System Global, 2012). A cover email explained the purpose of the study, the procedure and the time taken to complete the exercise. Fifty-five participants, representing all stakeholder groups, partook in the idea generation phase of the GCM. Table 1 shows participant distribution by category.

Table 1 Participants by Category (round 1)

Participant Category	N	%
Trainee	10	18%
Senior doctor / Supervisor	9	16%
Senior Strategic Role in PGME	10	18%
Patient Representative	4	7%
Allied Healthcare Professional	13	24%
Health Service Management	9	16%
Total	55	100%

Two hundred and six statements relating to facilitators and barriers to learning in clinical environments were generated. Following pruning, 97 unique ideas remained; 78 were barriers to learning and 19 were facilitators. Twenty-seven participants contributed to the sorting and rating phase (table 2). To produce valid results, the threshold for the size of sorting and rating groups is between 20 and 25[45]. This study had enough participant for the sorting and rating phases to produce valid findings and this also allowed for analysis between subgroups.

Table 2 Participants by category (round 2)

Participant Category	N	%
Trainee	3	11%
Senior Doctor/Supervisor	12	44%
Senior Strategic Role in PGME	3	11%
Patient Representative	1	4%
Allied Healthcare Professional	6 (1 physiotherapist; 3 nurses; 2 occupational therapists)	22%
Health Service Management	2	8%
Total	27	100%

First I will present the results of the 'sorting of statements', and this will be centred around the point map and cluster map. Afterward that, I will describe the results of the 'rating of statements' and, lastly I will present the go-zone and pattern matching graphs.

3.1 Point Map

Multidimensional scaling generated a point map of the statements, and the placing of the points on this map is based on bridging values calculated by the GCM software. Statements which participants had more frequently grouped together during the sorting process and are similar in meaning, appear close to each other on the point map. A

point map of the 97 statements is shown in Figure 1. In order to determine whether the point map represents the participants original sorting, a stress value is calculated. (An acceptable stress value in GCM based on previous studies is between 0.205 and 0.365[45,53,54]). The stress value for the point map was 0.3128. This is a measure of 'goodness to fit' of the two-dimensional point map and the manner in which participants grouped statements. The stress value fell within the accepted range and, therefore, it was decided that the point map is a good representation of the participants original sorting.

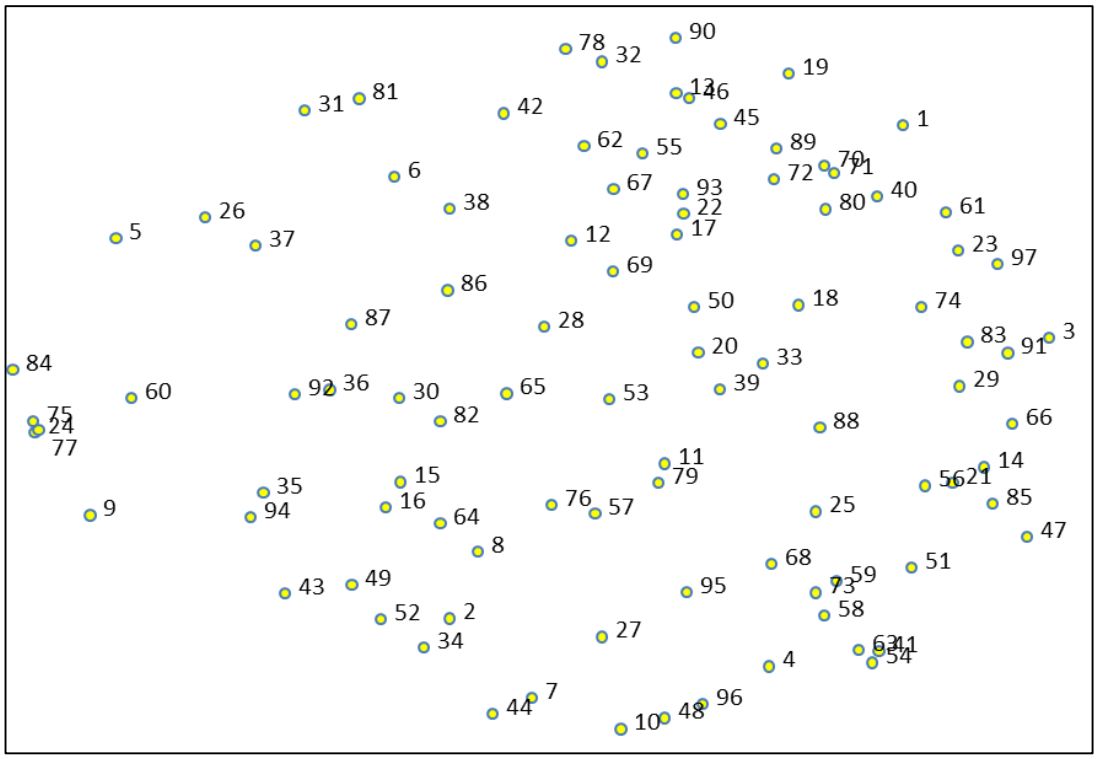


Figure 1 Point Map of 97 Sorted Statements

3.2 Cluster Map

By looking at the visual representation of the point map, several groups of statements can already be easily observed; however, it is more difficult to include statements that

are located further apart. Therefore, a hierarchical cluster analysis was done which generated 12 possibilities for grouping statements into clusters, starting with a 16-cluster solution and moving, through the merging of some of those clusters, progressively to a 5-cluster solution. Following interpretation, a 10-cluster solution describing key domains of clinical learning environments (shown in **Figure 2** and **Figure 3**) was produced. This decision was based on the conceptual sense of merging clusters based on the theme of the statements within them. Clusters were named as shown in **Table 2** and **Figure 3**. In naming the clusters the bridging values of the statements within each cluster were reviewed, paying particular attention to the statements with the lowest bridging values. Finally, the cluster in its entirety were reviewed by re-reading all statements which composed the cluster, in order to identify a unifying theme. Mean cluster bridging values are shown in **Table 2**. The most coherent clusters were **Organisation and Conditions of Work** (0.19), **Time to Learn with Senior Doctors during Patient Care** (0.23), and **Workplace Culture** (0.23). The cluster with the highest bridging value and thus least coherent was **Motivation and Morale** (0.75). In order to get a better understanding of the different clusters, a more detailed description of their characteristic statements is given below.

Figure 2 The Final 10-Cluster Solution

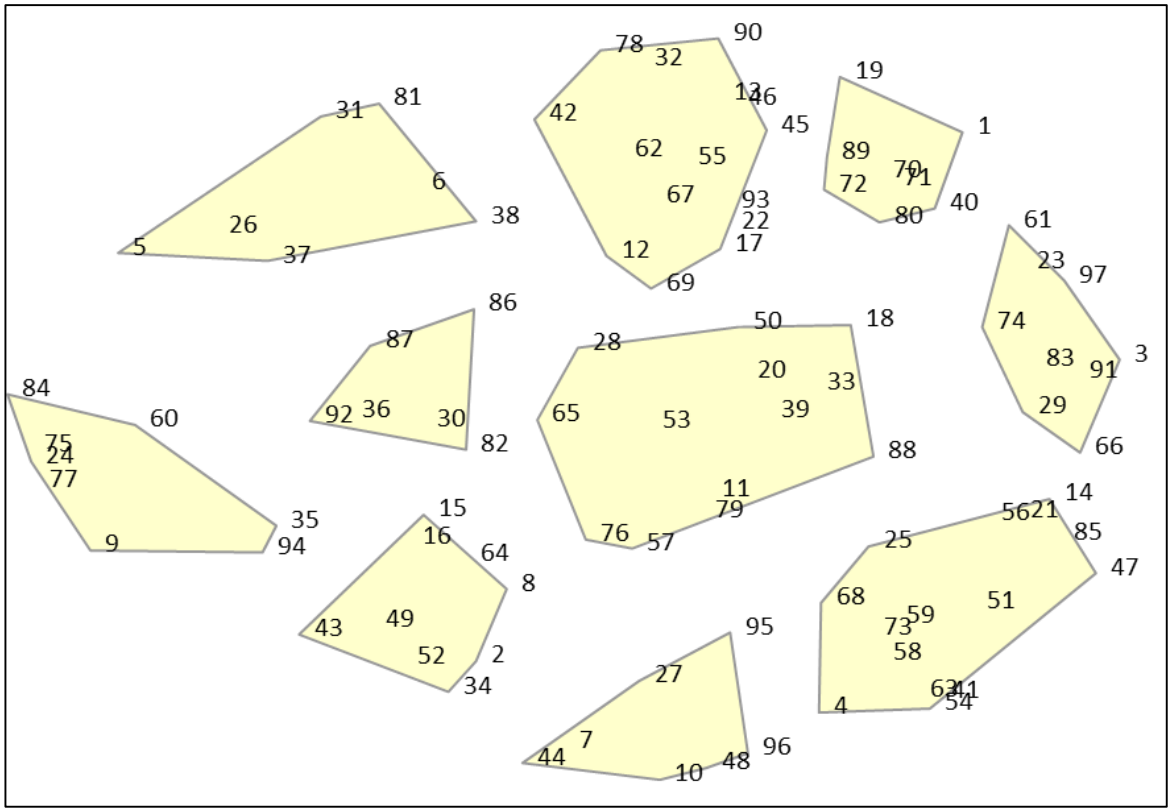


Figure 3 10-Cluster Solution with Domain Names

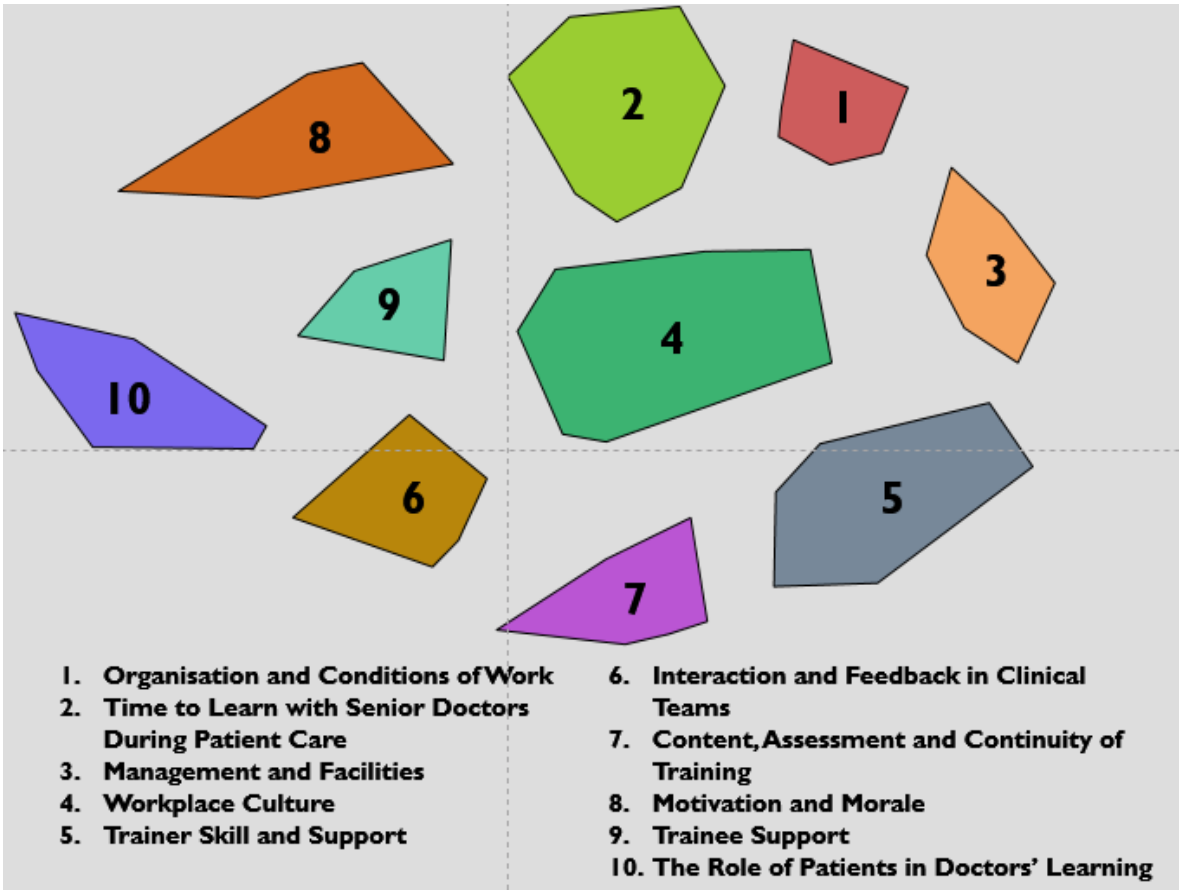


Table 3 Ten Clusters with names, definitions and sample statements of each

Title and Definition	Mean BV	Sample Statement	BV
Organisation and Conditions of Work - *relating to the tension between providing service in busy environments and needing time to reflect and learn.*	0.19	Barrier: Areas are too busy and this acts as a barrier to trainee doctor's learning.	0.05
Time to Learn with Senior Doctors during Patient Care - *relating to the way that trainees learn from work alongside senior doctors as they follow the patient pathway.*	0.23	Barrier: Time pressure at work has meant that the mentorship/apprenticeship role is lost and trainees no longer have the time/opportunity to discuss a case in-depth with a Senior Doctor.	0.11
Management and Facilities - *relating to the way in which hospital management values and facilitates training and the provision of facilities to support training at hospital sites.*	0.46	Barrier: A lack of commitment by hospital management teams to training. Management support for the training element of the workplace is inadequate - seen as very secondary to workload.	0.4
Workplace Culture - *referring to the way in which learning and trainees are valued in the workplace.*	0.23	Facilitator: Culture of the clinical site values trainees, listens to their views and takes appropriate action in response.	0.07
Trainer Skill and Support - *referring to who does the training and how they are supported.*	0.39	Barrier: There is an unwillingness to accept that education and training programmes can be delivered by people other than full time consultants.	0.2
Interaction and Feedback in Clinical Teams - *relating to team dynamics including the provision of feedback to the trainee while working together.*	0.55	Facilitator: Trainees learn best when they are challenged to state what they should do with regard to patient management and are affirmed and supported in their choices.	0.39
Content, Assessment and Continuity of Training - *relating to learning and assessment rooted in clinical practice with effective communication between senior doctors about performance.*	0.48	Barrier: Poor communication between supervisors for different clinical placements.	0.46
Motivation and Morale - *relating to morale within the healthcare system and its impact on the motivation and attitude of learners and other staff.*	0.75	Barrier: Low morale amongst all staff as they are over worked and leading to stress and tense staff.	0.41
Trainee Support - *referring to reception of the trainee into team, collegiality, respect and*	0.36	Facilitator: The trainee is encouraged to work within his/her scope of practice to safely develop skills under supervision.	0.34

support to work within scope of practice and to challenge constructively.			
The Role of Patients in Doctors' Learning - *referring to patient expectations of care, willingness and provision of feedback.*	0.44	Facilitator: Patients more informed in relation to care provision and willing to challenge those delivering care.	0.22

Figure 3 displays the relationship of the clusters to each other and were analysed to determine the relatedness of clusters. The proximity of clusters shows which are closely related and vice versa. For instance, **Workplace Culture** is at the centre of the map and is immediately adjacent to seven of the clusters which shows that most key aspects of clinical learning environments are linked to culture. Then again, **The Role of Patients in Doctors' Learning** can be seen to be relatively distant from the remaining nine clusters suggesting that it is conceptually more distinct. Furthermore, **Time to Learn with Senior Doctors During Patient Care** is relatively distant from **Content, Assessment and Continuity of Training** and **Trainer Skill and Support** which suggest two discrete aspects of clinical learning environments. The former representing the informal learning that happens during the delivery of patient care, and the latter relating more to the way learning is structured, organised and resourced.

3.3 Rating

All clusters were rated as important to address, with mean rating ranging from 3.42 to 3.95 on a scale from 1 to 5. Rating regarding 'ease to address' produced a wider spread of mean ratings which ranged from 2.37-3.65. Kruskal-Wallace testing of mean cluster rating was strongly significant for both parameters ($p<0.001$). A comparison of the

ratings provided by doctor and non-doctor participants found that these were highly correlated (r=0.7 for 'importance' and r=0.99 for 'ease to address').

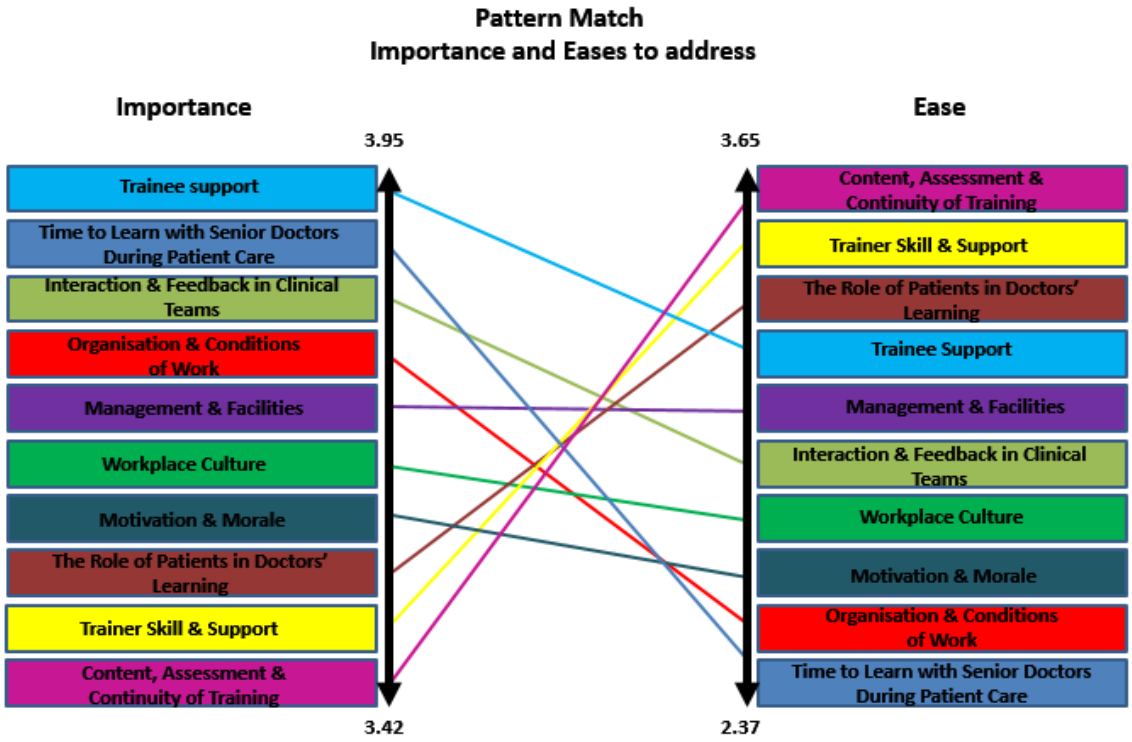
Clusters rated most important (in descending order; **Trainee Support**, **Time to Learn with Senior Doctors during Patient Care**, **Interaction and Feedback in Clinical Teams** and **Organisation and Conditions of Work**) were those which related to connection to and engagement with more senior doctors and other members of the clinical team. In addition to being the most critical domains of clinical learning environments, participants also perceived these areas as most challenging to address, with the exception of **Trainee Support**, which was seen as being more implementable. **Table 3** shows cluster ratings of 'Importance' versus 'Ease' to address. Participants identified shorter working hours as a result of the implementation of the European Working Time Directive (EWTD), as disrupting these key aspects of learning in clinical environments. Their statements indicated that less time spent in the clinical environment reduces opportunities to learn through clinical work, to benefit from role modelling and mentorship and to follow the patient pathway. Other barriers to learning identified were busy and overcrowded environments and heavy clinical workloads, with the suggestion that the Irish health service is over-reliant on trainees to provide key services. Barriers such as workload and the EWTD mainly originate beyond the local environment and might, therefore, be more difficult to resolve. Domains relating to trainers, curriculum, and assessment were rated slightly less important but were also seen as easier to address, including providing support and training for trainers and ensuring continuity in training with clear communication of performance to date and curricular requirements.

Table 4 Cluster ratings for Importance and Ease to Address

	Importance (5 = very important)	Mean Cluster Rating Importance	Ease to Address (5 = very easy)	Mean Cluster Rating Ease to Address
1	Cluster 9: Trainee Support	3.96	Cluster 7: Content, Assessment and Continuity of Training	3.68
2	Cluster 2: Time to Learn with Senior Doctors During Patient Care	3.90	Cluster 5: Trainer Skill and Support	3.56
3	Cluster 6: Interaction and Feedback in Clinical Teams	3.89	Cluster 10: The Role of Patients in Doctors' Training	3.35
4	Cluster 1: Organisation and Conditions of Work	3.81	Cluster 3: Management and Facilities	3.20
5	Cluster 3: Management and Facilities	3.73	Cluster 9: Trainee Support	3.19
6	Cluster 4: Workplace Culture	3.72	Cluster 4: Workplace Culture	3.01
7	Cluster 8: Motivation and Morale	3.63	Cluster 6: Interaction and Feedback in Clinical Teams	3.01
8	Cluster 10: The Role of Patients in Doctors' Training	3.59	Cluster 8: Motivation and Morale	2.55
9	Cluster 5: Trainer Skill and Support	3.51	Cluster 1: Organisation and Conditions of Work	2.51
10	Cluster 7: Content, Assessment and Continuity of Training	3.42	Cluster 2: Time to Learn with Senior Doctors During Patient Care	2.37

3.4 Pattern Matching

In this study, the match clearly shows that while **Content, Assessment and Continuity of Training** was judged easiest to accomplish, it was also perceived as relatively the least important. Conversely, **Trainee Support** and **Time to Learn with Senior Doctors During Patient Care** was rated as the most important while at the same time also relatively difficult to address.



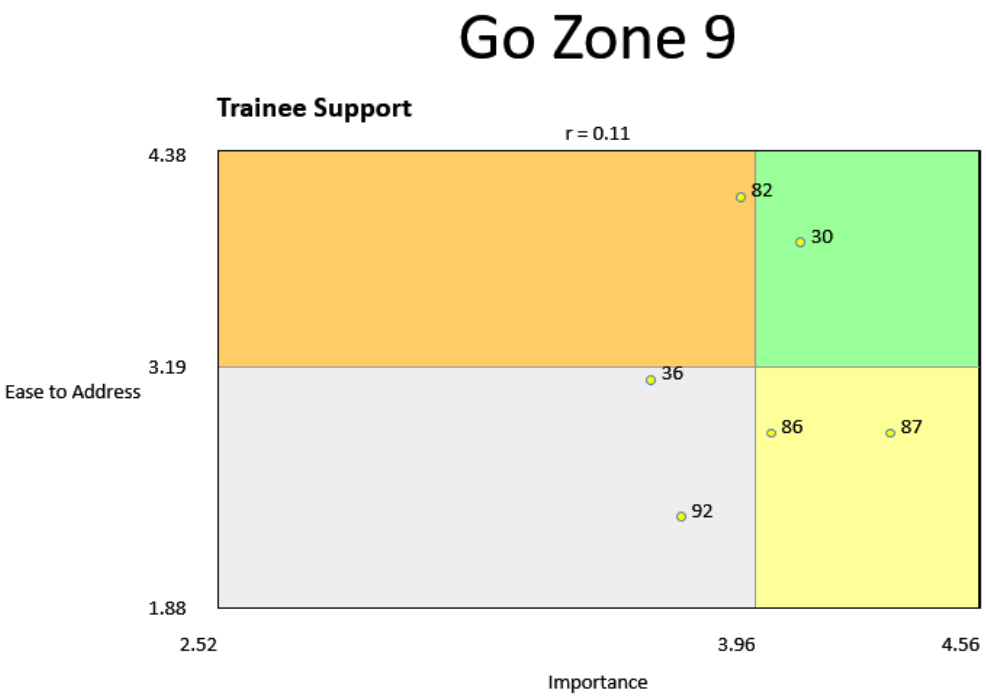
The rating results of doctor participants were matched with that of the other stakeholder groups. The first observation was that the rating range for 'importance to address' was very narrow from the doctor group (3.27-3.84). Secondly, this pattern match shows that the doctors rated **Organisation and Conditions of Work** as the most important issue to address, whereas the other participants rated **Trainee Support** the highest. Similar to the previous pattern match, both groups rated **Content, Assessment and Continuity of Training** as the least important feature of learning in clinical environments. Both the doctor participants and the other stakeholders were largely in

agreement about the ease with which different aspects of the training environment can be addressed. Both groups were in agreement that the most difficult issue to deal with is **Time to Learn with Senior Doctors During Patient Care**.

3.5 Go-Zones

The Go-Zone graph is a bivariate graph depicting the statements in a map where the x-axis represents the criteria 'ease to address' and the y-axis the criteria 'importance to address'. With the information on the Go-Zone graph, it is easily recognisable which statements scored high on both importance and ease; these statements are located in the upper right quadrant. For example, Go-Zone 9 identified the following statement to be important as well as easy to address;

Statement #30 *The trainee is encouraged to work within his/her scope of practice to safely develop skills under supervision.*



Several statement located in the Go-Zones for each cluster emphasised learning through work.

Statement #42 *EWTD - importance of exposure to patient care underemphasised. Intensity of direct experience can't be made up for by postgraduate courses, etc.*
Statement #28 *Discussing new patients and planning treatments at clinics facilitates learning.*
Statement #79 *Thinking that "training" for trainees only happens through formal activities taking place away from the clinical environment.*
Statement #9 *Patient feedback to the young doctor is beneficial and should be encouraged, especially in how they have interacted with the patient (consent information, explanations).*
Statement #77 *Most patients are willing to be a learning 'subject' for young doctors.*
Statement #15 *Culture of interdisciplinary learning.*

Similar to the findings of the cluster ratings, individual statements relating to time for supervisor-trainee interaction were also rated as important as well as achievable priorities.

Statement #55 *Time pressure at work has meant that the mentorship/apprenticeship role is lost and trainees no longer have the time/opportunity to discuss a case in-depth with a Senior Doctor.*
Statement #64 *Trainees learn best when they are challenged to state what they should do with regard to patient management and are affirmed and supported in their choices.*
Statement #44 *Assessments and feedback are fair and respectful, and include pointers to achieve improvement.*
Statement #23 *Protected time being allocated for both trainers & trainees to facilitate tutorials.*
Statement #81 *Trainees will always put patient care first, leaving less time for training.*
Statement #1: *Bleep free educational sessions still aspirational in most hospitals.*

Individual statements relating to the way training is valued and supported by postgraduate training bodies and hospital management were also identified as important and easily resolvable issues.

Statement #3 *There is no administrative support for delivering training programmes on hospital sites.*
Statement #88 *Good practice by a Consultant trainer (in terms of investing time/effort in teaching training) is not recognised as being valuable.*
Statement # 25 *Without trainee assessment of teaching sites which should be publicly available, there is little incentive for teaching hospitals to provide a competitive learning environment for trainees.*
Statement #54 *Unclear learning outcomes for each stage of training.*
Statement #63 *The absence of a proper curriculum.*

4 Summary of Principal Findings

The research questions for this study were: 'What are the significant barriers and facilitators to trainees' learning in clinical environments?' and 'What are the priority areas for improvement?' The results of this study yielded several answers to these questions and implications were derived from the ten clusters that represented the shared consensus among the participants from several stakeholder groups. These domains were mapped to provide a visual representation of their relationships. There was consensus amongst doctors and other participants that all of the domains identified are important to address to enhance postgraduate medical training. The domains rated most important were those which related to trainees' connection to and engagement with more senior doctors and other members of the clinical team (**Trainee Support,**

Time to Learn with Senior Doctors during Patient Care and Interaction and Feedback in Clinical Teams). Domains relating to the structure and organisation of postgraduate medical training programmes, such as **Content, Assessment and Continuity of Training**, and **Trainer Skill and Support** were viewed as somewhat less important.

With regard to the biggest challenges of doctor training in clinical environments, **Organisation and Conditions of Work** and **Time to Learn with Senior Doctors During Patient Care** were rated as the most difficult areas in which to make improvements. **Organisation and Conditions of Work** was strongly coherent and barriers in this domain referred to busyness, service pressure and overcrowding. This emphasises the dual purpose of clinical environments; supporting both patient care and learning, and confirms that service pressures impact opportunities to learn, resulting in cognitive overload, limiting time to reflect and discuss, and through constraints on physical space. Stakeholders identified the combination of high clinical workload and shorter working hours, after the implementation of the European Working Time Directive (EWTD), as disrupting learning through a reduction in time spent with senior doctors and a disintegration of clinical teams. Participant statements indicated that less time spent in the clinical environment reduces opportunities to learn through clinical work, to benefit from mentorship and to follow the patient pathway, compounding the challenges of learning in a healthcare system under strain. The consensus amongst participants that heavy workload and duty hour restrictions would be challenging to address may arise from the fact that both are seen as beyond the sphere of influence of academic medicine and healthcare management, but rather the consequence of national economic recession and European legislation.

Some opportunities were also captured in both the rating of clusters and individual statements. **Trainee Support** was identified as the most important to address. This domain refers to reception into the clinical team, collegiality, respect and support to work within the scope of practice and to challenge constructively. Participants rated this aspect as moderately easy to address, perhaps because it is within the control of individuals to be welcoming, supportive and respectful of trainees. Statements that fall within the go-zones should have a high impact on successfully and speedily improving the training conditions of junior doctors. The statements identified can be considered 'easy wins' and include easily implementable ideas.

The inquiry conducted at this early phase of the broader research agenda constitutes a starting point only; the results are exploratory. The results at this point speak solely to the general, and not theoretical, aspects of postgraduate clinical training, and should not be interpreted as an attempt to reflect the truth or absolute reality of the phenomenon. Nevertheless, progressing with the research agenda, all subsequent inquiry was grounded in an accurate conceptualisation of priorities and challenges as they relate to learning in clinical environments.

Further discussion of findings in Chapter 8.

5 Strengths and Limitations

The strengths of GCM over other approaches are that it can accommodate a relatively large number of people representing various stakeholder groups, and it is an impartial process because it gives an equal voice to all stakeholders without coercing them to form a consensus[55]. Group Concept Mapping is participatory and inclusive by nature,

and this was a national study which included a wide range of stakeholders. These are individuals at the frontline of medical training as well as those with more strategic roles; therefore, the findings are rooted in both practice and policy, and may have facilitated much-needed buy-in to the findings generated by the process. Moreover, this method allowed the inclusion of difficult to reach populations such as the patient representatives. One drawback of GCM is that the steps that involve participants (brainstorming, sorting and rating) present a significant participant commitment[56].

Group concept mapping offers an alternative approach to traditional surveys or qualitative interviews[57]. This study used a rigorous methodological approach to describe participant consensus and multivariate data analyses to construct maps which visually depicts the composite thinking of the stakeholder group. The instant output of the maps enhances the ease of dissemination and utilisation of the research findings. The maps constitute a framework that makes the findings accessible and immediately implementable to guide action planning and programme development. The generalisability of GCM results is usually limited, and because this study was undertaken in the context of the Irish healthcare system, it may not be fully transferable to other contexts. Even though generalisability was not intended for this study, representativeness within the participant groups was achieved.

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Chapter 4
A Realist Review of Supervisor-Trainee Workplace Interactions in Postgraduate Medical Education
Process and Programme Theory

In this chapter I outline the realist review protocol. This realist synthesis followed the steps and procedures outlined in the RAMESES Publication Standards for Realist Synthesis[1]. The review began with the objective of developing and refining a theory of workplace learning specific to postgraduate medical education derived from the literature published on the topic. A protocol was published for this realist synthesis[2] which posed the question: how, why, and in what circumstances do doctors learn in clinical environments? Since the publication of that protocol, the focus of this review narrowed from the broader topic of workplace learning to supervisor-trainee workplace interactions in postgraduate medical education.

1 Introduction

The central tenet that trainees learn through work underpins the design of postgraduate medical education (PGME)[3–7]. For over a century, since the first residency program was established at Johns Hopkins in 1889[8], the centrality of workplace learning has endured, through structural changes and embellishments[3,9–12], and recently, a shift in emphasis from the process to its outcomes[13–16]. Over the same period, the context in which healthcare is delivered has changed beyond recognition. Concerns have been expressed

that changes in clinical environments might negatively impact workplace learning, raising concerns about the relationship between the context of PGME and its outcomes[17–20].

Training doctors is a complex social process which happens predominantly during the delivery of patient care. During this process, the clinical learning environment (CLE) provides the social, cultural and material context for PGME[21]. The quality of learning environments has a direct effect on learners performance[22–26], humanism[27,28], and psychological health[29–32], and as a result, contributes to better patient care through its impact on trainees practice.

To optimise conditions for learning, those tasked with the design and delivery of PGME need to understand in detail the processes of medical workplace learning, and the influence of the social and cultural context on those processes[33]. Therefore, in any analysis of postgraduate training, it is pertinent to consider the relevance of context carefully. Furthermore, in recognition of the complexity of this task, it was necessary to use an approach which is robust enough to cope with the intricacies of clinical learning environments and postgraduate medical training itself.

Realist synthesis is well suited to the analysis of complex interventions, such as postgraduate medical education, and seeks to analyse issues with respect to what works for whom, under what circumstances, and why[34]. A realist review is based on the premise that complex interventions are successful when certain characteristics facilitate the optimal functioning of a system to produce a particular outcome when a complex intervention is applied[34]. By identifying the contexts in which interventions work, alongside the mechanisms by which they work, we can better understand how and why

interventions produce (or fail to produce) their intended effects, and thus help educators to improve interventions.

2 METHOD

Realist review is a theory-orientated and explanatory approach to evidence synthesis[35] for proposing theory for why complex interventions may or may not work. A complex intervention is one whose outcome is dependent on the interaction between its participants and their context; in this case supervisors and trainees, and the clinical learning environment. Complex interventions '*often have multiple components (which interact in non-linear ways) and outcomes (some intended and some not) and long pathways to the desired outcome(s)*'[1]. Traditional systematic reviews of such interventions tend to have mixed results and do not explain how or why the intervention worked. They generally try to eliminate the effect of context rather than understand its impact. Realist review addresses these limitations by producing rich contextual information which policymakers and practitioners can apply to their own circumstances[36].

A central part of a realist review is the development of a programme theory, which is an 'abstracted description', that delineates the key functions, strategies or activities of an intervention, the intended outcomes of the intervention and the mechanisms that contribute to particular outcomes[1]. The realist review begins with the articulation of candidate theories that may explain the characteristics required for interventions to be successful[34]. Next, identification and selection of studies is achieved through a standard systematic review approach[34]. Once relevant studies are chosen for inclusion, data are systematically abstracted form the studies and the studies are read and reread to

identify themes[34]. An iterative approach is used to identify data, quotations, tables and figures that either support or refute the candidate theories articulated at the outset. Theories are refined as more data are gathered from the articles[34]. The literature is interrogated to develop and refine the theories that support the intervention being studied (in this review, informal supervisor-trainee interactions in clinical environments), to explain what works, for whom, in what circumstances, in what respects[34].

Realist review involves the translation of empirical findings into context (C), mechanism (M), and outcome (O) configurations[37]. A CMO-configuration means that in a particular context a particular mechanism will generate a particular outcome. In realist philosophy, the concept of 'mechanism' is used to understand the relationship between contexts and outcomes. Mechanisms are causal forces that cause things to happen. Some mechanisms are obvious and intended; some are less obvious and unintended. Mechanisms are context-sensitive and generate outcomes[38]. In critical realism, causality is not simple, linear or deterministic. Interventions work through multiple mechanisms both planned and unintentional. To better explain and understand how, why, for whom, under what circumstances complex programmes work requires establishing of causal relationships. Causality, as it relates to realist review, holds that to infer a causal outcome of an event, one must understand the underlying mechanism that connects that and the context in which the relationship occurs[39]. Identification of CMO-configurations is informed by programme theory, or the underlying assumptions of how the intervention is supposed to work, and relevant middle range theories, in this case theories of workplace learning and apprenticeship. Using theory to identify CMO-configurations focuses reviewers on the underlying and transferable aspects of

programmes described rather than on the specific minutiae[1]. Realist review seeks to identify 'demi-regularities' within the complexity of interventions, based on the expectation that although outcomes will vary in different contexts that there will be some patterning on CMO-configurations[40]. Theory is also generated, tested and refined through this process.

3 PROCEDURES

This realist review was conducted by using the key stages described by Wong et al[37]: 1) clarification of the scope of the review; 2) developing an initial programme theory; 3) search for evidence; 4) study selection; 5) data extraction, and 6) data synthesis. A key feature of the realist review method is that it is iterative and the process frequently necessitates going back and forward between the different steps as the programme theory evolves. Realist principles were embedded in all stages of the process. The core review team was a group of health professions education researchers with multi-disciplinary backgrounds in the health professions (AW;DB;CK). The core review team undertook training and consulted with methodological experts throughout the review process. The steps undertaken in the review, presented here in series, were undertaken iteratively and in parallel.

3.1 DEFINING THE SCOPE OF THE REVIEW

The review started with a period of pilot testing literature searches and exploring the concepts in and around this research programmes' area of interest. The piloting phase led to exploration of databases and subject headings which might be useful, and what inclusion and exclusion criteria might be applied. It involved a search in Medline using the terms 'postgraduate medical education' and 'clinical learning environment'.

Focussing the review question was an iterative process of exploration of literature and relevant programme theories as well as consultation with experts and stakeholders. The focus of the review was discussed and refined at regular meetings with the wider project team. A programme theory for supervised workplace learning in PGME was developed and this, along with substantive workplace learning theories supported the identification of key areas on which to focus. Additionally, the scope of the review was informed by the study presented in Chapter 3, the findings of which indicated the importance of trainee support and time to learn with senior doctors during patient care. We were guided by the evidence as it was discovered and the need to ensure a manageable volume of literature for synthesis. This process subsequently led to a focus on the clinical, educational and interpersonal partnership between trainee and supervisor and refinement of the review question to;

- What are the mechanisms occurring between trainee and supervisor which result in the outcomes of PGME?
- What are the important contexts that shape the operation of these mechanisms and the outcomes they produce?

3.2 Development of the Initial programme theory

The *Programme Theory* refers to the underlying assumptions of how an intervention (e.g., PGME) is supposed to work[37]. PGME has a robust programme theory, which is detailed in international standards and guidelines for its implementation. Informal interactions that occur between trainees and senior doctors during the delivery of patient care are not well theorised in such documents, which place more emphasis on the structure and organisation of training.

3.2.1 International Standards and Guidelines for PGME

The World Federation for Medical Education (WFME)[21] global standards stated that fundamentally *'Postgraduate medical education has developed from a setting similar to apprenticeship, meaning that the young doctors work in e.g. clinical settings together with more experienced colleagues who take the responsibility for their instruction and supervision.'*

A primary WFME standard is that the apprenticeship nature of professional development must be described and respected and the integration between training and service (on-the-job training) must be assured. Integration between training and service implies on the one hand delivery of proper health care service by the trainees and on the other hand that learning opportunities are embedded in service functions. The capacity of the healthcare system should be effectively utilised meaning the use of different clinical settings, patients and clinical problems for training purposes, and at the same time respecting service functions. Similarly, the 'Shape of Training Review' which looked at PGME in the UK recommended that introduction of longer placements for doctors-in-training to work in teams and with supervisors including putting in place apprenticeship-based arrangements[3]. Professional development or professionalism was identified as a main outcome of PGME. Other outcomes within medicine and medical practice include knowledge and understanding of[21];

- *basic biomedical sciences, behavioural and social sciences*
- *medical ethics, human rights and medical jurisprudence relevant to the practice of medicine*

- *clinical sciences including clinical skills with respect to diagnostic procedures, practical procedures, communication skills, treatment and prevention of disease, health promotion, rehabilitation, clinical reasoning and problem solving*
- *skills in doctor--patient relationship with emphasis on a compassionate attitude and humanity*

Competency frameworks[6,41] also identify and describe the competencies doctors require to effectively meet the health care needs of the people they serve. These competencies are grouped thematically under several 'roles' that a trainee should demonstrate on completion of the postgraduate medical training. Such roles include *medical expert, communicator, collaborator, leader, health advocate, scholar, and a professional.*

3.2.2 Substantive Theories that underpin the design of PGME

There is a range of theories that underpin the design and application of postgraduate medical education[42,43]. Theories particularly relevant to this review are Cognitive Apprenticeship Theory[44,45], Communities of Practice[46], Workplace learning[47–49].

3.2.2.1 *Cognitive Apprenticeship*

Cognitive Apprenticeship theory gives an insight into the processes that underpin learning through supervisor-trainee interaction[44,45]. In postgraduate medical education, apprenticeship allows trainees to 'see' the processes of work as they watch a supervisor deliver patient care, when they assist a supervisor in professional tasks and when they participate in practice under the supervision of a more experienced doctor. Collins and colleagues presented the concept of cognitive apprenticeship which emphasises 'learning through guided experience'[50]. Collins' conceptualisation of apprenticeship was

aimed at teaching cognitive skills, such as reading and mathematics, to children in the classroom. Cognitive apprenticeship is an adaptation of traditional apprenticeship which emphasises the learning of a physical, tangible activity to a theory for learning cognitive skills (i.e. problem-solving, comprehension)[51]. This model attempts to deliberately bring thinking to the surface – to make learning visible[51]. This refers to both the 'thinking' of the master as well as the apprentice[51].

The 'mechanisms' of apprenticeship learning are; *modelling, coaching, scaffolding, articulation, reflection, and exploration*[51].

- In *modelling*, the apprentice observes the master demonstrating how to do different parts of the task[51]. Observation is key to learning complex skills for several reasons. It provides the learner with a conceptual model (the whole picture) around which they can organise their own approach to executing the task[51]. It also allows learners to make better sense of feedback[51]. And learners can use this information gained from observation to guide occasions when they are engaging in tasks without direct support[51].
- *Coaching* consist of observing learners while they perform a task and offering scaffolding, feedback, and modelling to narrow the gap between actual and expert performance[51].
- *Scaffolding* refers to the supports the expert provides to help the learner carry out a task[51]. Scaffolding involves the expert performing the parts of the task that the apprentice cannot yet manage[51]. To be effective, scaffolding requires an evaluation of the learner's current skill and ability[51]. The process of scaffolding

involves gradual removal of supports until the apprentice can work independently[51].

- *Articulation* is about getting a learner to articulate their knowledge and reasoning processes[51].
- *Reflection* involves enabling learners to compare their own performance to that of another[51].
- *Exploration* involves pushing a learner to think and work independently[51].

The mechanisms described by Cognitive Apprenticeship can be applied to postgraduate medical education. For instance, m*odelling* may involve supervisors showing trainees how to perform professional tasks. *Coaching* consists of supervisors observing trainees performing the task and giving constructive feedback to improve their overall performance. During *scaffolding*, trainees' levels of competence are assessed, and trainees are challenged with tasks that are suited to these levels. Supervisors need to know what support is required, and at the same time, they should gradually fade this support as trainees become more competent. This strategy relates to Vygotsky's zone of proximal development which supports the notion that effective learning occurs when learners are challenged, with support, to work beyond the level at which they can perform fully independently[52]. When trainees and supervisors discuss patient cases, *articulation* may occur when trainees provide reasoning behind their patient management decisions. During supervisor-trainee interactions, trainees reflect on their performance by comparing it to their supervisor. *Reflection* helps learners to understand their own strengths and weaknesses. Finally, *exploration* may occur when trainees are challenged to make independent decisions about and carry out patient care.

The first three strategies (*modelling, coaching, and scaffolding*) relate to traditional apprenticeship and can be viewed as supervisor-led, whereas, *articulation, reflection and exploration* can be considered to be mostly trainee-led[53]. Trainees of all levels can benefit from all the processes of cognitive apprenticeship throughout the continuum of training from internship to higher specialist training.

Sequencing of activities is another important principle of cognitive apprenticeship; this involves increasing complexity (tasks gradually increasing in difficulty) and increasing diversity (practice in a variety of situations)[51]. Cognitive apprenticeship theory offers four 'types' of knowledge required for expertise, which can be viewed as 'outcomes' of learning. This includes learning specific concepts, facts and procedures (domain knowledge), appropriate techniques for accomplishing tasks (heuristic strategies), approaches to problem-solving (control strategies), and knowing how to learn new concepts, facts and procedures (learning strategies)[44,45,51]. Cognitive apprenticeship also describes specific 'contexts' for learning, termed 'sociology' (social characteristics of learning environments), which relate to the relevance of learning as well as the motivation to learn[44,45,51]. It suggests that learning is best supported by an environment in which individuals learn by engaging in real-world tasks (situated learning), experience different ways to accomplish meaningful tasks within a community of practice, have personal goals (intrinsic motivation) and work with others to accomplish these goals[44,45,51].

3.2.2.2 Communities of Practice

Learning theory has moved on from the emphasis on learners as individuals to a more robust view of learning within a practice community[54]. Communities of practice is a conceptualisation of how a group of people (the community) involved in practice (social

construction of knowledge) pursue knowledge in a particular domain[55]. Learning within 'communities of practice' applies to most clinical learning environments and shapes our thinking about how these settings assimilate trainees.

The term 'communities of practice' originated from Lave and Wenger's ethnographic study of apprentices at work (mainly tailors and meat cutters)[56]. Through this research, they determined that apprenticeship is about learning through social exchanges with others. They named this process *legitimate peripheral participation* which is about the newcomers' apprentice-like transition into practice[56]. During this transition, individuals learn, take on more roles, and move from the outside to the centre in relation to their participation[55]. In any particular community, there are old-timers (e.g., supervisors), legitimate members (e.g., senior trainees), and more peripheral members (e.g., junior trainees). Wenger developed this model further in his book 'Communities of practice: learning, meaning and identity'[46]. Members of a community of practice learn by sharing experiences, stories, tools, and ways of addressing recurring problems[46].

Learning in a community of practice is not uni-directional as newcomers enter with their own experiences that have the potential to shape learning within the group. The third instalment of this theory conceptualises knowing and learning as a trajectory or journey through a landscape of different and complex practices[57]. Learners are not members of just one community of practice; they are members of multiple communities of practice either concurrently or sequentially. The significance of this work is the recognition of the diverse ways of knowing, learning, and sharing knowledge across communities of practice. In PGME, trainees are members of several communities of practice which

requires them to shape their identities and how they participate in practice based on unique shared practices found in different communities of practice.

Based on the principals of Communities of Practice, the initial programme theory had to acknowledge that learning is shaped to a greater or lesser extent by the social environment and social engagement[43]. Learning is intertwined with context and occurs through participation and engagement within these communities. People learn through co-participation in shared practices, and knowledge production is inseparable from the situated, contextual, social engagement within these practices.

3.2.2.3 Workplace Learning

Workplace learning has garnered much attention in medical education for more than a decade. Several authors emphasise the importance of workplace learning through participation in social practices. Workplace practices such as those shaping individual's participation and how they elect to engage in work activities have become central to understanding learning at work and the construction of the knowledge required for work. Fundamentally, training to be a specialist doctor requires working and behaving like one. Three academics who contributed most to our understanding of workplace learning are Billet[33,47,58], Teunissen[48,59,60] and Dornan[61,62].

Billett is particularly interested in how people have learned throughout history even before the advent of institutionalised educational systems. He examined how workers from a variety of occupations learned in the distant and near past and how that applies to how we conceptualise learning through work in modern day society. Even though his work did not originate from medical or health professions education, he has since

published literature on how his conceptualisation of workplace learning translates to these professions[33].

The central tenets of Billett's work are that; 1) workplace learning arises from the activities and interactions afforded in workplaces and 2) individuals choose whether to engage with these affordances[47]. Other premises that are important for understanding learning through work[33] are that;

- Learning occurs all the time from participating in work activities and interactions and is therefore not dependent on intentional educational experiences. Workplace learning is an inevitable outcome of everyday thinking and acting at work.
- Contextual factors shape workplace learning and its efficacy.
- As individuals engage in work activities, they also re-create or potentially change them.
- Individuals learning is personally mediated and to learn they must access and engage with work.
- Learning is premised on what an individual already knows, can do and value which resulted from previous experience. This means that learning from experience is dependent on the individual to a certain extent.

In his work on workplace learning, Billett places a strong emphasis on the individual's knowledge, abilities and values and how those mediate what is naturally learned from engaging in work practices[58]. Each individual has their own unique histories and experiences, which shape how and what they learn. Individuals learn differently from the 'same' work. He feels that learning from novel experiences promotes learning best, but learning from familiar experiences also have value in the sense that it provides a

person with the opportunity to improve and refine skills. Billet does recognise that certain work practices can be difficult for individuals to learn from on their own and for this problem, sees the value of 'expert guidance'[33]. Even though Billett acknowledges the role of apprenticeship in workplace learning[63], he de-emphasises the role of the 'expert' and focuses rather on how the individual mediates learning through work practices. Billett refers to 'mimetic' learning (observation, imitation, and practice) as a key process of apprenticeship learning[64]. Thereby recognising that it is important that learners need to observe and hear from others for their learning[33]. Close guidance, modelling and coaching by more experienced workers help learners to access and learn from activities that are difficult to learn and to avoid learning from mistakes[33,63]. Billett believes that apprenticeship learning can be enriched by more experienced workers articulating their thinking and acting, and telling the 'tricks of the trade'[63]. Nevertheless, he holds that these pedagogical strategies to enhance apprenticeship learning is not necessarily dependent on more experienced workers but can occur from the way individuals interact with any of their co-workers in the workplace[63].

Teunissen directly studied workplace learning as it pertains specifically to doctors. His earlier research explored how doctors learn by doing their work both from the perspective of the trainee and the supervisor[48,59]. These lines of inquiry confirmed that by learning through work, trainees come across multiple ways of 'doing' professional tasks and involves the trainee also doing these and sometimes modifying them[60]. This process requires social interaction, and these studies illustrated the social and cultural situatedness of workplace learning[60]. From this research, three mechanisms involved in workplace learning were identified; *mimicking, making sense of what is happening, combining previous experiences to devise new approaches to a problem*[60]. Subsequent

research further explored the influence of context on workplace learning[65,66]. These studies identified several contexts (supervisory style, trainee goal orientations, the credibility of feedback and the supportiveness of the clinical environment) that impact on feedback behaviour[60,65,66]. Another avenue of research that was followed around the same time was about the way trainees' previous experiences influence current practice[67]. Previous experience was considered as a 'context' that trainees bring to their current workplace[67]. That research demonstrated that there is an interplay between their past experiences and current actions that trainees may not be explicitly aware of[60]. Another significant concept of Teunissen's work is about how a series of experiences results in 'trajectories' of trainees' professional development[60]. Trainees can have different starting points and multiple trajectories which can be entwined with other individuals in the workplace[60]. Trajectories can be small (i.e. becoming competent with a new procedure) or big (i.e. becoming an independent practitioner)[60]. Trajectories are not clear-cut paths because they are influenced by workplace contexts such as opportunities, expectations, norms, and values[60]. The social and cultural contexts that are reified and embedded in clinical learning environments impact learning by either creating or restricting situations trainees can participate in and gain experience from.

Dornan et al. developed a model for experience-based learning in undergraduate medical education which demonstrated how students construct knowledge and meaning through authentic workplace experiences[61]. This framework emphasised that for workplace learning to be effective, 'supported participation' has to occur. The two primary forms of 'participation' include observation and performing clinical tasks. It also highlighted the need for workplaces to offer cognitive, affective, and practical supports[49,62].

These models of workplace learning provide an understanding of trainees' development through ongoing participation and somewhat contextualises professional development. Theories of workplace learning and apprenticeship provide insights into PGME in general terms; however, they do not provide sufficient detail about how PGME works on the ground. Theory about how workplace learning through the process of supervisor-trainee interaction is also relatively sparse. The theories of Communities of Practice and workplace learning are at too high a range to stand alone in providing a blueprint for participants, practicitioners and policymakers for effective PGME; however, they provided a useful sensitising influence for the extraction, interpretation and naming contexts, mechanisms an outcomes in empirical papers on PGME. Drawing on these standards and guidelines, and substantive theory, an initial programme theory for learning through informal supervisor-trainee interactions was developed. Articulated in realist terms, PGME is effective when;

- Trainees are trusted with increasingly complex tasks as their competence grows
- Trainees seek support when they need it, but work autonomously when they do not
- Supervisors monitor the work of trainees to match complexity of work to the competence of the trainee
- Trainees observe the practice of senior doctors and integrate it into their own
- Supervisors and trainees make sense of work together through dialogue
- Trainees receive feedback from supervisors on their performance

We postulated that the effectiveness of PGME would be modulated by contexts at individual, interpersonal, local and systems levels.

3.3 Search for Evidence

The literature search involved five components. The first involved a systematic database search of Academic Search Complete, Medline, SocIndex, British Education Index, Australian Education Index, Cinahl, and PsycInfo. The second article source was the bibliography of included studies. The third source was derived from hand searches of Medical Education, Postgraduate Medical Journal, Advances in Health Sciences Education, Academic Medicine, Medical Teacher, and Graduate Medical Journal. The next phase involved specific database searches for 'bullying' and 'harassment' as these were identified as relevant by project partners. Furthermore, recurring authors were identified and subsequently a manual search was conducted to identify other relevant papers published by these individuals. Finally, an updated search was done in September 2017. The results of all the above mentioned searches were exported to bibliographic software (Endnote) and duplicates and abstracts removed. The electronic database search strategy can be found in the appendices section.

3.4 Study Selection

The title and abstracts of each candidate article were screened individually by the three members of the core review team (AW, CK, DB) and studies were selected based on the predetermined inclusion and exclusion criteria.

<u>Inclusion criteria</u>

1. Papers related to informal supervisor-trainee interactions in PGME in the clinical setting
2. Quantitative, qualitative and mixed-method studies
3. Papers published in English

4. Papers published between 1995-2017

Exclusion criteria

1. Non-empirical papers
2. Papers related to undergraduate medical education
3. Research on simulation or other non-medical interventions
4. Papers related to workplace based assessment
5. Papers related to implementation or evaluation of formalised learning in clinical settings
6. Papers related to training in General Practice

Articles were excluded if they did not cover the topic of the review (learning that occur during supervisor and trainee interactions in the clinical environment). Papers based on general practice training and workplace based assessment were excluded as the focus of the review narrowed. Studies were also excluded if they were not rich enough in data for CMO-configuration extraction. The decision to exclude non-empirical papers and the grey literature was based primarily on the volume of empirical peer reviewed papers available for synthesis. Lists of exluded articles for each screener were regularly compared and discrepancies reviewed in order to ensure consistency of the process. Disagreements were resolved through reanalysis of the manuscripts and discussion. A random sample (10%) was distributed to the wider research team (CB, AH, GOK, LP, DS, MH) to check concordance.

In alignment with realist review, studies were not excluded based on type of study or quality alone, but on their usefulness in terms of responding to the research question,

relevance of context and rigour for extrapolation to the clinical workplace setting[34]. Therefore, papers were evaluated in terms of whether they were rich enough to contribute to the refinement of the programme theory. The quality of papers was examined to determine the credibility and trustworthiness of the data which involved the use of checklists, for example CASP, as sensitising influences only. Data from relevant studies were included even when there were some methodological shortcomings. Studies which were less rigorous were given less weight at the analysis and synthesis phase.

3.5 Data Extraction

Data extraction involved an iterative analysis to identify the context-mechanism-outcome configurations and was guided by the initial programme theory and substantive theory. In order to ensure that the review process for each article were identical, a review form template was developed for the data extraction phase. An online review tool was developed in google forms to support the study. The title, authors, journal, country of origin, methodology and principle findings of each study were recorded. (A citation table can be found in the appendices section). The core review team (AW, CK, DB) read each included paper separately and together. Each researcher entered CMO-configurations for each paper into an Excel sheet. These extraction sheets formed the basis for group discussion and the synthesis process described below.

3.6 Data Synthesis

The data synthesis phase involved an in-depth synthesis of the underlying contexts, mechanisms, and outcomes at work during supervisor-trainee interactions in the workplace. The core research team met weekly over a period of six months to analyse

and synthesise the extracted data. These meetings involved loosely categorising papers according to their area/s of focus, identification and agreement of the CMO-configurations within each paper, followed by comparison between papers. As recommended by the RAMESES Training Materials the following conceptual tools were applied during this phase[37];

- **Juxtaposing** (when one study provides the process data to make sense of the outcome pattern noted in another)
- **Reconciling** (identifying differences which explain apparently contradictory sets of findings)
- **Adjudicating** between studies (based on quality of research)
- **Consolidating** (building 'multi-faceted explanations of success')
- **Situating** ('this mechanism in context A, that one in context B')

Predictable patterns (demi-regularities) were sought to determine how mechanisms act in different contexts to generate outcomes. Emerging findings were challenged and contrary examples were sought in the data and theory. This process allowed for contradictory outcomes to occur in particular contexts, and for judgements of the strength/weaknesses of research methods to be integrated into the synthesis. Any discrepancies were discussed and resolved among the core research team with reference to the wider research team if necessary. The core research team each wrote thick descriptions of the agreed mechanisms, their associated outcomes and the influence of context on these. These thick descriptions were merged to form the final report. Throughout this process the core team supported each other's reflexivity and

maintained reflexive diaries. The multi-professional nature of the research team, including stakeholders and experts, also contributed to the reflexive process.

The results of the data synthesis and refined programme theory are described in the next chapter.

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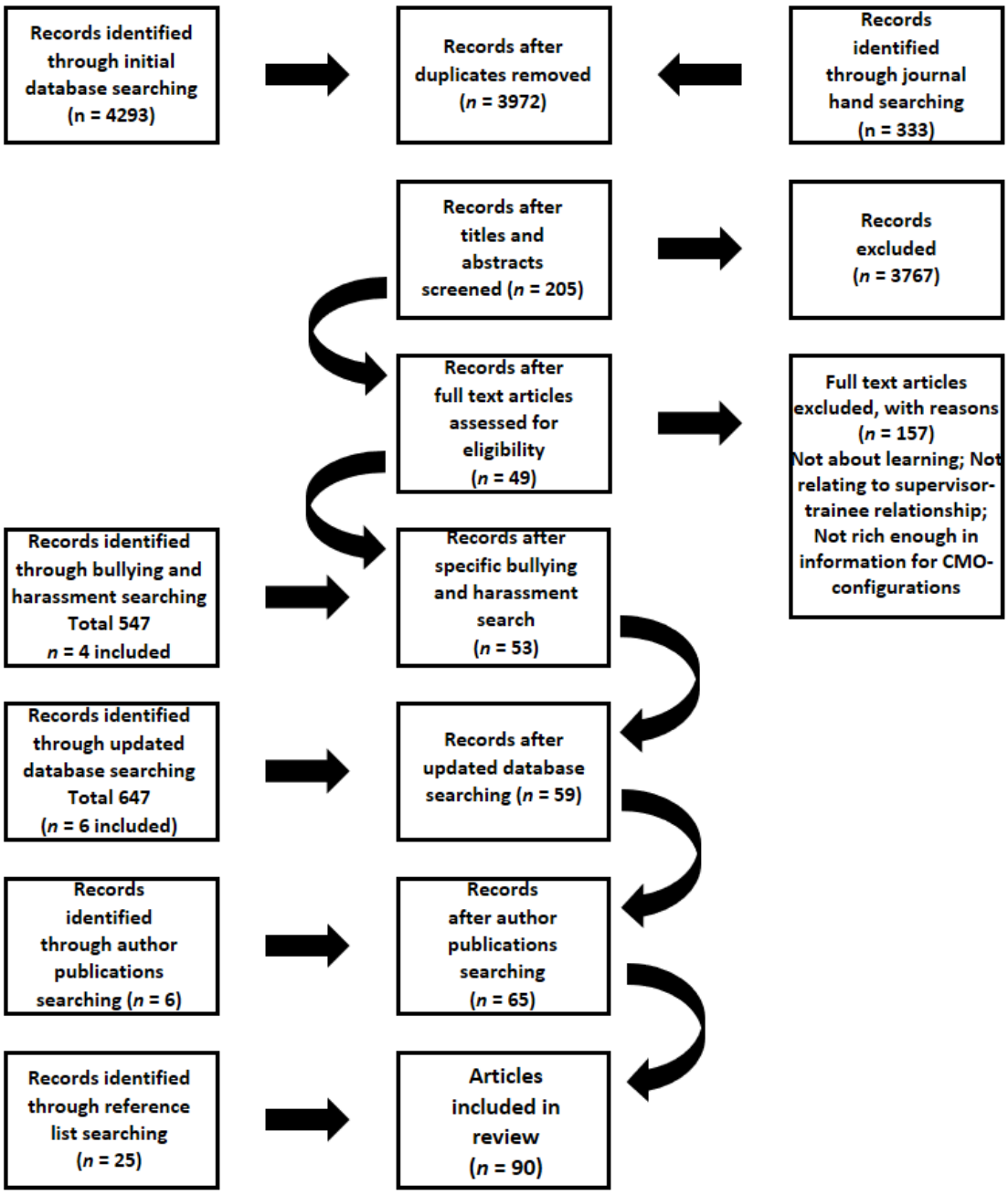
Chapter 5
A Realist Synthesis of Supervisor-Trainee Interactions in Postgraduate Medical Education

1 RESULTS

1.1 RESULTS OF SEARCH

The number of articles identified through the initial database searches was 4293. The PRISMA flow chart below, illustrates the process which led to the selection of 90 papers for inclusion in the review. Sixty-seven were qualitative studies, nineteen were quantitative studies and the remainder used mixed-methods. The United States, United Kingdom and the Netherlands accounted for 80/90 of the included studies. Almost half (38/90) of the papers reported on multiple specialties and the remainder covered a range of individual specialties; Obstetrics & Gynaecology, Internal Medicine, Surgery, Paediatrics, Anaesthesia, Emergency Medicine and Psychiatry.



1.2 Synthesis results

Synthesis of the literature revealed three inter-related processes occurring informally in clinical learning environments between supervisors and trainees in the course of patient care. These were**; Supervised Participation in Practice, Mutual Observation of Practice and Dialogue About Practice**. A pair of reciprocal mechanisms were found to underpin each of these processes (Table 1). These mechanisms were associated with primary

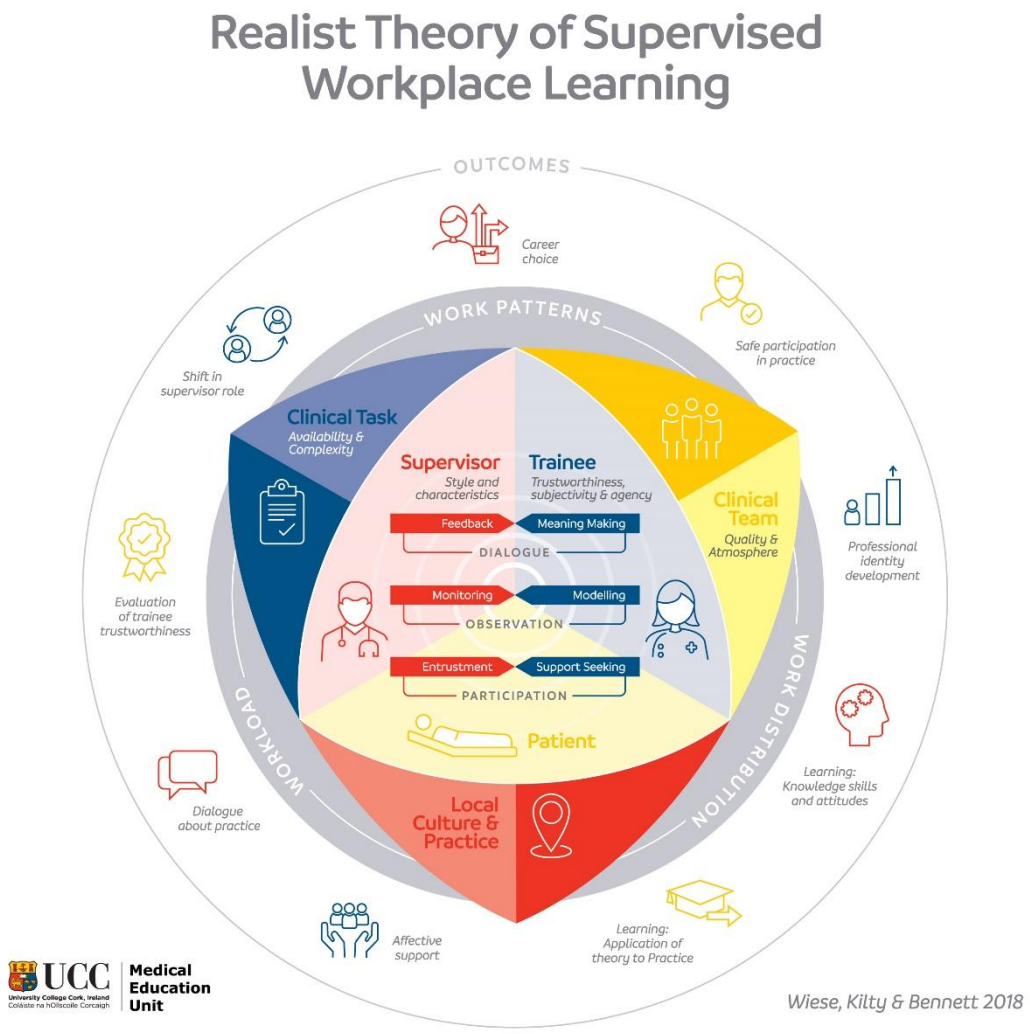
outcomes of postgraduate medical education (PGME) such as; safe participation in practice, learning skills, attitudes and behaviours, application of theory to practice, professional identity development and career choice. Contextual factors which shape the outcomes of these mechanisms related to the trainee and supervisor, both at an individual and interpersonal level, to the clinical work at hand, the clinical team and to the broader health system. An over-arching condition required for all mechanisms were that supervisors and trainees spend time working alongside each other in the delivery of patient care, and how contextual factors at health systems level impact this. The total number of papers which contributed to the description of the CMO-configurations for each mechanism is shown in Table 1.

Table 1 Supervisor-trainee processes in PGME, their underpinning mechanisms and papers contributing to individual, interpersonal and local CMOs for each

Process	Mechanisms	Papers contributing to CMO configurations in each case
Supervised Participation in Practice	Entrustment	n=31
	Support Seeking	n=17
Mutual Observation of Practice	Monitoring	n=14
	Modelling	n=33
Dialogue About Practice	Meaning Making	n=33
	Feedback	n=21

The realist synthesis is summarised in the schematic below. At the centre of the schematic are the pairs of reciprocal mechanisms that underpin each process. The inside layer are the individual and interpersonal contexts that influence these mechanisms. Contexts relating to the local clinical environment are shown at the next level and in the layer after that, health systems' contexts are shown. The way in which mechanisms operate, and the outcomes they produce, are shape by these multi-layered contexts. When appropriately triggered, they result in key outcomes of postgraduate

medical education, shown in the outer layer. These and other outcomes act in turn as both contexts and mechanisms in themselves, thus creating a cycle in which positive outcomes enhance the outcomes of future interactions.



Below is a description of each mechanism and its outcomes followed by in-depth detail of how individual and local contexts shape their operation and influence the outcomes of postgraduate medical education. Then, overarching health systems' contexts which impact these mechanisms are addressed. In the following sections mechanisms and their major outcomes are shown in bold. Contexts, mechanisms and outcomes are indicated in the text by (C), (M) and (O) as appropriate.

2 Supervised Participation in Practice

Under supervision, trainees gradually take on roles which progressively become more complex and central to the work at hand[1], thereby, providing multiple opportunities for trainees to take responsibility and gain competence[2]. Supervisors play a pivotal role in moderating when, and to what extent, trainees assume responsibility in the clinical environment[2]. Supervisors must hold the quality of care constant while balancing the amount of supervision and autonomy provided to trainees in procedural tasks and clinical decision making[3,4]. Once trainees can work on their own, supervisors gradual remove their support[1]. For this to occur safely, supervisors must determine the levels of competence of the trainees they are supervising[5].

Synthesis of the data revealed that the degree to which trainees participate in practice, and the level of supervision applied, hinge on the mutually interdependent mechanisms of **Entrustment** (M) and **Support Seeking** (M). **Entrustment** (M) is supervisor led while the trainee leads **Support Seeking** (M). The interplay between these mechanisms has been likened to dance with both supervisor and trainee leading in turns[12].

2.1 ENTRUSTMENT: MECHANISM & OUTCOMES

Programme theory suggests that postgraduate medical education is effective when trainees are trusted with increasingly complex tasks as their competence grows. **Entrustment** (M) is to confide the care of a patient or the execution of a professional activity to a trainee[6]. Current literature frequently associates the term **Entrustment** (M) with formal assessment; however, **Entrustment** (M) decision-making is a multifactorial, highly nuanced and subjective[3] and often independent of objective measures of trainee performance. Therefore, in this review, **Entrustment** (M) refers to informal 'point-of-care' competence evaluation[5] leading to ad hoc **Entrustment** (M)[6], characterised by explicit and implicit decisions regarding what a trainee can be relied upon to undertake safely[7].

Supervisors begin to contemplate trust as soon as they start working with a new trainee[7] and this can be a time of high uncertainty for supervisors[7]. Determining when trainees are ready to perform clinical tasks safely is not straightforward[3,8,9]. The scope of knowledge and skills necessary to become a competent and safe doctor, combined with the complexities of clinical learning environments intensifies this challenge[3]. Competence achieved in a specific procedure does not automatically translate to more independent practice[9].

Entrustment (M) affords trainees the opportunity for **Safe Participation in Practice** (O) allowing them to manage emerging problems[10,11], come up with solutions and make their own mistakes[11,12] while supported by a safety net of supervision and supervisors 'double-checking' their performance in the background[4,11,13]. Through **Entrustment** (M), the trainee has greater participation in the work of a doctor (O), and in turn,

trainees are socialised to become independent practitioners by learning professionalism through practice (O)[14]. Discrete moments of trainee autonomy characterise the outcomes of **Entrustment** (M) and indicate the development of emerging medical professionals[6]. The responsibility and pressure associated with **Safe Participation in Practice** (O) are necessary for learning[11] and development of trainees' competence for future practice[2,3,6,8,11,15]. Greater autonomy leads to greater confidence (O), empowerment (O) and professional identity development (O) of the trainee[9,10,12,14,16–19]. **Safe Participation in Practice** (O) lets situated, context-specific knowledge become embedded[20] and over time **Entrustment** (M) permits trainees to engage in more complex work (O)[1,2,19]. Limited **Entrustment** (M) that affords trainees only routine activities, which do not challenge their competence means that learning is likely to be slow or absent (O)[8]. On the other hand, too much **Entrustment** (M) may have adverse effects on both the patient and the trainee (O)[6,8].

Greater **Entrustment** (M) leads to a **Shift in Supervisor Role** (O) from central participation in patient care to a more supportive role[1] associated with fading of oversight and less time spent checking on trainees work[1,5,7]. **Entrustment** (M) is ultimately the determination of the level of supervision required, ranging the full continuum from direct supervision of the trainee with minimal patient contact to full trainee autonomy to carry out complex clinical tasks unsupervised[6]. The outcomes of increased trainee participation in practice (O) and reduced supervision (O) may increase supervisor vulnerability because of the risk of the trainee being involved in an adverse event[4,6].

Changes in team dynamics (O) is also an outcome of trust formation[7]. Clinical teams may achieve high levels of cohesiveness and functioning when there is trust in trainees and as trainees get to know the team and the preferences of supervisors[7]. Enhanced team collaboration facilitates membership, invites participation, gives permission for open and safe involvement, and enhances trainees' confidence[17].

2.1.1 Individual and Interpersonal Contexts for Entrustment: Supervisory Style, Trainee Trustworthiness & Trainee Agency

Supervisory style (C) has a significant impact on **Entrustment** (M) and trainee **Participation in Practice** (O)[13,21,22]. Supervisory style (C) range along a continuum, from the micromanager (C) who entrusts very little clinical responsibility to trainees (O), to the minimalist supervisor (C), who allows trainees almost total autonomy (O)[7,13,21,22]. Goldszmidt[21] described two intermediate categories; 'empowerment', which supported progressive independence, and 'mixed practice', which featured an adaptive style including direct care and minimalist approaches, according to context. Variation in supervisory style (C) may arise from personal preference, concerns about patient safety, beliefs about trainee and supervisor roles and responsibilities in patient care[2,8,9,21] and the experience of the supervisor[2,3,13].

Micromanagement (C) is associated with less experienced supervisors (C) but may also occur in more experienced supervisors (C) for whom it appears to be a personal preference[13]. Micromanagers (C) focus more on granular trainee evaluation, informed by their own experience as trainees, and are less confident in their clinical work[13]. Micromanagement may lead to trainee dis-engagement (O) and reduced **Participation in Practice** (O)[22,23] creating insecurity, frustration, resentment, confusion, lack of motivation, feelings of being undervalued[13,24]. Overbearing supervisors (C) may lead a

trainee to be more hesitant, resulting in supervisors trusting trainees less (O), whereas open and engaging supervisors (C) give the trainee room to grow and think, resulting in greater trust (O)[6,8]. Trainees who are told what to do, instead of being encouraged to take initiative or make decisions about a clinical issue, may also lead to dependence upon supervisors (C), reduced ability for self-directed learning, and trainees being inadequately prepared for independent practice (O)[6,9].

The minimalist approach (C) has been reported as unhelpful for learning[13], leading to doubts about the supervisor's commitment[22]. Trainees feel overwhelmed, fearful, inadequate and confused about their role in the face of the excessive autonomy and express concerns that their limitations might not be recognised[9,13,25–27]. Nevertheless, the absence of a supervisor may afford a trainee the opportunity to make decisions and to see a task through from start to finish. This is risky, because trainees may make mistakes, but it is also an important part of learning[12].

Differences amongst early, developing and experienced supervisors (C) have been described[13]. Supervisors who are excellent teachers actively and consciously step back to allow the trainee to participate[2]. Some supervisors find it hard to let go and standing back does not always come easily, particularly to those who are more junior (C) in their career[2]. More experienced supervisors (C) are more likely to entrust more to trainees[3,7,8,13,28]. They take a holistic view of trainees' qualities and behaviours, draw on institutional and global knowledge to guide supervision, and are confident in their ability to 'rescue' the trainee if required[13,18]. Some supervisors, particularly less experienced (C) ones, may have difficulty in allowing trainees greater independence even when they

have demonstrated their competence[7]. Supervisors with a starting point of low trust have difficulty decreasing their supervision, even when they develop trust over time[7].

Ultimately, supervisors must balance autonomy provided to trainees against the obligation to provide efficient and high-quality care[1–4]. Supervisors see themselves as 'the person ultimately in charge', and as such, they feel compelled to take control of patient care even if it may jeopardise trainee learning[2]. Supervisors feel personally responsible for their patients under their care and are concerned about whether patient care provided by a trainee, even one who is deemed competent, is equivalent to that provided by a senior doctor[8,9].

Trainee trustworthiness (C) and capability are at the crux of trainee development as well as patient safety[8]. The level of the trainee (C) and their clinical experience commonly influence the provision of autonomy and supervision by supervisors (O)[3], that is, supervisors afford more independence (O) to more senior trainees (C). For example, at the outset, there may be a degree of presumptive trust[6] derived from the seniority of the trainee (C) and prior reports of his/her competence (C). Trainee seniority is linked to a pre-determined scope of practice[3,8] and trust on this basis is often present until broken[3,6,9]. However, supervisors may consider competence as not entirely dependent on the year of training as variability between individual trainee competence may exist[8]. Furthermore, there may be differences among supervisors and trainees views of which activities trainees should be able to handle across varying stages of training[8]. Factors underpinning this dissonance include for example generational differences, inaccurate self-assessment on the part of both trainees and supervisors, and difficulties with self-determination[24]. A supervisor's familiarity of a trainee (C) generally leads to more

readily granted responsibilities[4,8]. Supervisors often find information about a trainee's prior performance not very useful for judgements of trustworthiness and may prefer to give the trainee a 'fresh start'[7]. This means that trust may develop from a starting point uninformed by prior knowledge of the individual trainee, instead, supervisors rely on their own experience of the trainee's performance to inform **Entrustment** (M) decision making[7]. More specifically, a supervisor's most recent experiences with trainees weigh heavily in their **Entrustment** (M) decisions[8]. Formation of trust generally occurs quickly, within hours or days[7] and supervisors rely on impressions shaped early in the rotation to inform their decisions of **Entrustment** (M)[3]. Supervisors consider trainees' behaviour on the first day/call and post-call interactions as particularly essential opportunities to determine the ability of trainees to manage patient admissions and to demonstrate professionalism[3]. Trainee trustworthiness (C), as manifested in their knowledge and skills, recognition of their limitations[2,4,5,7,8,10,12], willingness to seek help, self-efficacy, conscientiousness (following through on a patient) and honesty in interactions with supervisors (not holding back relevant information) all influence **Entrustment** (M)[3–5,7–9,29]. **Entrustment** (M) is closely related to the **Monitoring** (M) and **Meaning Making** (M) mechanisms described later. **Evaluation of Trainee Trustworthiness** (O) is an outcome of these mechanisms. This evaluation acts in turn as a context for **Entrustment** (M)[3,5,7,8,30]. Supervisors also evaluate trainee knowledge and skills by proxy (C); for example, trainee's clinical leadership, coaching of more junior staff and management of rounds may be used to infer patient care skills[7]. Leadership encompass organisational skills, sharing of knowledge with more junior team members, and the display of a positive, professional disposition[7]. The quality of trainee's plan for the patient (C),

including recognition of possible complications (C) encourages **Entrustment** (M), allowing supervisors to step back with confidence (O)[2,4,8].

Many **Entrustment** (M) decisions are based on trainees' personal characteristics, such as the perception of honesty, disposition, perceived confidence or perceived overconfidence of the trainee, and previous experience[3,7]. The perceived confidence or overconfidence (C) of the trainee is often a determining factor[3] as supervisors use the former to gauge a trainees' true ability and comfort and view the latter as a red flag that warrants increased oversight (O). Supervisors will grant more independence (O) to trainees who are confident (C), take the initiative(C), who are committed to knowing the patient (C), and who understand the rationale of their patient care well (C)[2,4,7,9,23,24]. Overconfidence (C), on the other hand, relates to trainees inability to recognise their limitations (C) in either technical skill or knowledge[3]. Misplacement of trust occurs (O) when trainees appear more confident than their competence warrants or undertakes a procedure considered to be above their training level (C) while away from direct supervision[7]. Some level of uncertainty (C) is seen in a positive light by supervisors because it signals that trainees have a mature understanding of their limitations[3]. Some trainees have 'quiet' personalities (C) that make taking responsibility a personal challenge[2]. More passive trainees (C)[24] and those frequently requesting help (C) are more likely to be given fewer opportunities (O)[2] and subjected to closer supervision (O)[8].

The relationship (C) between supervisor and trainee constitutes another vital contributor to judgements of **Entrustment** (M) as the two discern one another's abilities and styles[7]. The degree of mutual trust between supervisor and trainee informs the supervisor's assessment of the trainee's readiness for independent practice[9]. Knowing

individual supervisors' preferences (C), and working in accordance with them, increases autonomy (O)[31]. There is variation in the motivation, attitudes and expectations of trainees, some of whom supervisors identify as expecting training to be 'delivered' to them[32]. Trainees prefer a supervisory style adaptable to need according to stage of training[13]. Those early in their training (C), prefer to learn from more detail-oriented supervisors (C) and desire close supervision of patient management decisions (O)[13]. More experienced trainees (C), in contrast, want more autonomy and independence in directing patient care (O)[13].

Team dynamic (C) plays a significant role in the development, granting, or discouragement of trust[3], therefore, the quality, experience, and competence of the team (C) surrounding the trainee can trigger or inhibit **Entrustment** (M)[7,8]. Teams with a positive rapport (C) create a collaborative environment that fosters increased trust by the supervisor and leads to greater trainee autonomy (O)[3]. If a supervisor knows that there are supports immediately available to the trainee s/he is more likely to entrust tasks (O)[8]. Awareness that supports are limited may have the opposite effect. Team discord (C) that influences the supervisor-trainee relationship, often defined as toxic attitudes within the team, can be a reason the supervisor feels the need to engage more directly in patient care and by extension have less trust in trainees to manage their patient (O)[3]. Situations that require teams to start working together quickly in high stakes contexts (C), such as occur within medical teams, prompt the need for swift trust (O)[7].

2.1.2 Local Contexts: Clinical Task, Culture and Practice

Trainees receive independence relative to the complexity of the case (C)[24]. When the stakes are low (C), and tasks are routine (C), supervisors are less hands-on (O), and trainees are given relative independence in care management (O)[1,3,7,18,24,28]. Maintaining the quality of patient care is paramount and in situations presenting overriding concerns (C) in the clinical context, for example, more complicated patients (C), trainees and supervisors work more collaboratively (O), or the supervisor will get more directly involved with the case (O)[1,2]. Supervisors and trainees respond to the situation at hand (C) and improvise to maintain high-quality patient care (O)[2]. The presence of an ethical dilemma (C), interdepartmental collaboration (C), urgency/severity of the situation (C), and transitions of care (C) determine what **Entrustment** (M) decisions are made[3,8]. Increasing case complexity (C), especially the coexistence of legal and ethical dilemmas (C), are often factors driving greater supervisor involvement (O)[3]. Transitions of care (C), such as patient discharge or transfer, require greater communication and supervisor involvement (O) or guidance, regardless of case complexity[2,3,6–9,11]. During critical moments in trainee-led surgical procedures (C), supervisors use strategies to maintain overall control while allowing trainees to experience the illusion of control[4]. Paradoxically, complexity (C) has also been found to trigger **Entrustment** (M)[2,7,11] for senior trainees (C), providing an opportunity for them to demonstrate appropriate competence (O). Competence is context-specific and is not automatically transferable between clinical environments[9], and therefore, the level of competence that is deemed sufficient for a particular task often varies from case to case[9]. Misplacement of trust can occur, for example, when a trainee who demonstrates good decision making, but, when faced with a particularly

complex patient, proved not to know how to manage the situation appropriately (C) and failed to seek help promptly (C)[7].

In the case of craft specialties (C) such as Surgery and Obstetrics and Gynaecology, and procedure based specialities such as Anaesthetics, **Entrustment** (M) to undertake specific procedures is more explicit. In this context experience, regarding number of procedures previously undertaken (C), and trainee's own 'comfort' (C)[8,9,18,28] are essential factors. In Obstetrics multiple observations (C) of a trainee are required to trigger **Entrustment** (M) to perform a procedure at more distant supervision (O)[9]. Experience gained in a simulated setting (C) does not enhance **Entrustment** (M)[18]. In a Paediatric setting, clinically stable, older and co-operative patients (C) allow greater **Entrustment** (M)[18]. Parental preference (C) is an important context; **Entrustment** (M) is inhibited if parents specifically ask for the supervisor or if the family are perceived to be 'high maintenance'[18].

The broader organisational context can impact **Entrustment** (M) and shapes trainees **Participation in Practice** (O), for example, policies (C) mandating supervisor involvement in patient care shift trainees away from central participation in practice (O)[1]. Environmental barriers may restrict trainee autonomy such as a high patient census (C), frequent supervisor and trainee rotations (C), and the pressure of completing administrative work (C)[24]. The unpredictable clinical context adds a layer of complexity to an already complicated relationship[2]. Demanding workloads (C) and trainees' own desire for independence (C) may lead trainees to be afforded autonomy before their supervisors feel they are ready (O)[8,30].

In smaller hospitals (C) trainees tend to be more involved in independent practice (O), while in larger hospitals (C) they are more likely to take on an observer role (O)[11,33]. Smaller hospitals (C) may also allow trainees more time and contact with supervisors (O), greater opportunity to follow patients (O) and exposure to a broader range of conditions (O)[33]. Decisions on whether or not to entrust trainees with clinical tasks are affected by the supervisors' whereabouts (O)[8] which is often subject to local arrangements. Proximity to the trainee (C) enhances **Entrustment** (M) because trainees can be allowed greater autonomy (O) in the knowledge that the supervisor is nearby to step in if needed[3,8]. The amount of responsibility and independence granted to a trainee may differ between office hours and on-call hours[9]. For example, during on call when supervisors may not be on site (C), it is very likely that trainees will act independently (O)[8] and to be entrusted with clinical care activities (C)[3,8,9,15]. Sterkenburg[8] attributed this to supervisor reluctance (C) to get up and come in from home to supervise procedures usually supervised during daytime hours. Busy environments (C) may require closer supervision for activities which trainees usually do independently to maintain workflow of patient care. Conversely, the higher the workload (C), the less time supervisors may have to micromanage, and trust decision making may be greatly accelerated[7].

2.2 Support Seeking: Mechanism & Outcomes

Programme theory suggests that postgraduate medical education is effective when trainees seek support when they need it, but work autonomously when they do not. **Support Seeking** (M) refers to trainees requesting help from a senior doctor with the objective of gaining advice, reassurance, direction or active input in regards to patient care[11,30,34]. **Support Seeking** (M) is the counterbalance to **Entrustment** (M) and is

trainee driven. **Entrustment** (M) is partially based on the judgement that the trainee is aware of the limits of their own competence and that their judgement of when to call for support will be sound. **Safe Participation in Practice** (O) is an outcome of effective **Support Seeking** (M). When trainees self-identify as needing help and seek support, they may be entrusted with the continuing management of the patient (O) or the supervisor may step in and take over care to a greater or lesser degree (O)[29]. When **Support Seeking** (M) does not occur as appropriate, there may be adverse patient outcomes (O), including medical error (O) and compromised patient safety (O)[35]. Lack of **Support Seeking** (M) may result in a reversal of **Entrustment** (M) and increased supervisory vigilance (O)[29,36].

Professional Identity Development (O) is another outcome of **Support Seeking** (M). Appropriate **Support Seeking** (M) allows trainees to promote themselves to their supervisors as being confident developing professionals, capable of appropriate independence but also aware of their own limits[19,36]. In medical culture doctors are understood to be ambitious, autonomous people and trainees are pressured towards this identity[30]. Working autonomously is empowering for trainees and builds professional identity through independence of thought and action, key characteristics of doctors[30]. Thus, not **Seeking Support** (M) may lead to trainee empowerment, supporting their professional identity and credibility (O)[34]. **Support Seeking** (M) aids trainee credibility as a competent professional; however, asking too often or for too much support may threaten their credibility[30,34,36]. When triggered too frequently, **Support Seeking** (M) can also reveal gaps and weaknesses in a trainee's knowledge and skills, negatively impacting supervisor evaluations[17,34,36].

2.2.1 Individual and Interpersonal Contexts for Support Seeking: Supervisory Style, Trainee Subjectivity & Trainee Agency

The presence of a supportive supervisor (C) who is available to help with patient care tasks and shows enthusiasm (C) for trainee requests, creates an environment for a non-judgemental partnership (C)[3,17,23,34]. A safe environment (C) is imperative if trainees are to have no reservations about consulting senior doctors when they think they need advice[12,37]. At a practical level, trainees consider their supervisors' proximity (C) and availability (C) when making decisions about **Support Seeking** (M). When supervisors are perceived to be busy (C), trainees may think that their clinical situation must be sufficiently important to justify a call for help[19,34]. Furthermore, intolerant supervisors (C), or those who are difficult to track down (C), may inhibit **Support Seeking** (M), although it has been suggested that this only applies to borderline cases where the decision to call for help is not clear cut (C)[36].

The preferences of individual supervisors provide a further context for **Support Seeking** (M). Some supervisors want to be more in control than others (C) and trainees are more likely to call them (O)[19]. The language (C) used by the supervisor to communicate with the trainee can invite or deter **Support Seeking** (M)[34,38]. Clear communication (C) regarding when to call makes it more likely[38]. Any reference to being otherwise occupied (C), busy (C) or speaking negatively (C) about having been called on previous occasions makes it less likely[34,38].

Decisions about whether to seek clinical support are influenced by factors relating to trainee subjectivity (C). Trainee subjectivity (C) refers to how trainees interpret and understand the situation they encounter. Arising from previous experiences, it includes trainees' perceptions, interpretations, understandings, values, attitudes, desires and

beliefs. Trainees' perceptions of the likely outcome of **Support Seeking** (M) may trigger or inhibit the mechanism. **Support Seeking** (M) involves a dynamic process of risk assessment to counterbalance multiple consequences[30,34,36]. In PGME, supervisors not only provide clinical support to trainees but also assess their performance[34]. Trainees must balance the needs of their patients with their own desire to preserve their credibility and avoid exposing their weaknesses to their supervisors. Wallenburg[19] described trainees as 'tinkering' with autonomy and **Support Seeking** (M), as they try to negotiate **Safe Participation in Practice** (O) while presenting themselves as competent. Trainees consider whether the clinical situation falls within the scope of practice (C) that is expected of them at their level of training (C)[8,17]. They worry about the loss of trust, autonomy, respect or reputation (C)[23,37]. Trainees may also have concerns that **Support Seeking** (M) will highlight gaps in their knowledge and have a negative impact on assessment and evaluation[30,34,39] and may be concerned with being negatively compared to peers[27]. Trainees' desire to act responsibly, progress and develop as learners, and to enact the identity of an independent doctor (C) shape their decisions about **Support Seeking** (M)[19,30,34,36]. They may want to exceed supervisors expectations and can feel they are abandoning responsibility if they do not attempt to manage the patient before calling for help[27]. Kennedy[34] describes how trainees use rhetorical strategies in order to preserve credibility; justifying the call by emphasising the urgency or importance of the question when presenting the case, waiting to ask questions at times when the supervisor is nearby and available, making a plan rather than asking an open-ended question and directing questions at other, less powerful team members. Experienced and confident trainees are (C) more self-directed in their work and learning

(O)[11,19] and therefore seek supervisor input less[11]. Trainees at the start of a new rotation (C) seek support from their supervisors more often[19].

2.2.2 Local Contexts: Clinical Task, Clinical Team, Culture and Practice

Support Seeking (M) is more likely to be triggered in situations where there are severe consequences for the patient (C)[34,36]. The more urgent the clinical situation (C) in question, the more likely **Support Seeking** (M) becomes[34,36], for example, when multiple events (C) are happening simultaneously, or the presenting symptoms or underlying pathology have the potential to cause death or irreparable harm (C)[36]. If the problem falls within their expected scope of practice (C), **Support Seeking** (M) is less likely[27,34]. Some activities, such as decisions to discharge patients (C) or transfer to ICU (C), are understood as always requiring supervisor input[3,22,34].

The presence of a supportive team (C) created through the explicit declaration of availability to help with patient care tasks enhance **Support Seeking** (M)[3]. However, even in the presence of a supportive team some trainees still find it difficult to ask busy colleagues for help[35]. Too many people in the clinical team (C) limits the amount of supervisor-trainee contact, and a hierarchy develops that may be hard to overcome unless trainees are assertive[17]. Trainees feel that they should contribute to the efficiency of the team which in turn creates pressure to work independently and therefore may avoid interfering with supervisors productivity[30]. There can be a reluctance to contact supervisors at night (C) as this might antagonise them or make them tired and less productive the following day[34,36] leading to trainees frequently working beyond their competence (O)[37].

The scope of practice for the same level of trainee varies between departments and sites (C)[8,11,15]. There may be an implicit culture (C) embedded in clinical environments about acceptable **Support Seeking** (M). In the early stages of a rotation (C), trainees are more likely to seek help as they work out local practices[8]. Stewart[36] described how trainees come to learn local rules and conventions in respect of **Support Seeking** (M) early in a rotation. Rules are explicit and focused on patient safety, whereas conventions are unwritten and aimed at team efficiency. Trainees learn that conventions can be ignored when patient safety is an overriding concern. Frequent transitions impacting on the supervisory relationship is an unfavourable context for **Meaning Making** (M) and impede on trainees ability to escalate questions or concerns. Trainees may experience increased levels of anxiety, intimidation or fear during a transitional period and consequently avoid asking questions[40].

3 Mutual Observation of Practice

In the course of a working day, trainees and supervisors observe each other's work practices on a continuous basis. The mechanisms **Monitoring** (M) and **Modelling** (M) underpin this mutual observation of practice.

3.1 Monitoring: Mechanism & Outcomes

Programme theory suggests that postgraduate medical education is effective when supervisors monitor the work of trainees to match the complexity of work to the competence of the trainee and to provide trainees with feedback on their performance. Trainees' work is continually monitored in more or less overt ways by their supervisors[5,19,29]. Clinical oversight[29] has the primary objective of ensuring **Safe Participation in Practice** (O); however, for supervisors to determine the level of

Entrustment (M) applied to a trainee also requires **Monitoring** (M)[7]. **Monitoring** (M) for primarily educational reasons is uncommon in medicine, outside of workplace-based assessment[15,41,42], and direct observation of trainees is sporadic, variable in content and frequency[41]. Some elements of practice, particularly technical skills, are routinely observed while others, such as talking to families, are very rarely observed[41,43]. Watling[41] and La Donna[44] describe an exception, in the Canadian context, of informal trainee initiated direct observation for educational purposes.

Monitoring (M) extends beyond simple assessments of knowledge and skill to point-of-care multifactorial evaluations of trainee's competence[4,5]. **Monitoring** (M) involves overt observation of clinical activities, e.g. on ward rounds[7] or in theatre[4], dialogue (discussing cases, probing trainee management plans[19,45]) and 'backstage oversight' such as double checking clinical findings and reading patient records[3,5]. Routine **Monitoring** (M) leads to **Safe Participation in Practice** (O)[29]. For example, when **Monitoring** (M) raises concerns, which may be specific to a single situation, or a more general concern about a trainee, responsive oversight or increased supervisory vigilance results (O)[29]. Responsive oversight involves overt and backstage approaches including double checking of work performed by a trainee[29]. A similar outcome occurs if a supervisor discerns misplacement of trust and overestimation of a trainee's competence[7]. When that happens, the supervisor may step in, taking over patient care (O)[29]. **Monitoring** (M) by direct observation has been reported to be particularly crucial for procedural skills and for identifying 'blind spots'[44]. Direct observation can provide the confidence to go on to work with greater autonomy but may also impair trainee confidence while being observed[41,44].

Monitoring (M) may lead to **Meaning Making** (M) and **Feedback** (M) to the trainee on his/her performance and, therefore, may have significant educational, as well as patient care, outcomes[41,45]. For example, at morning report supervisors watch and challenge trainees during case presentations to gain insight into their capabilities[19]. These include generating a shared view of good clinical habits and, more broadly, what constitutes good care. Trainees learn how 'things go around here' and what supervisors expect of them[41,45]. Supervisors check the trainee's findings against their own assessment when they repeat elements of the history or physical examination[5] and read through patients' records to evaluate whether a trainee missed anything important. This may be done intentionally to evaluate a trainees' work or, most commonly, when seeing the patient concerned another time[19]. **Monitoring** (M) enables supervisors to **Evaluate Trainee Trustworthiness** (O). These evaluations provide important context for **Entrustment** (M).

3.1.1 Individual and Interpersonal Contexts for Monitoring: Supervisory Style and Trainee Subjectivity

Supervisory styles vary (C), and some supervisors monitor trainees more closely than others with outcomes for motivation and participation in practice[13,21,22]. There is evidence that supervisors use different standards when **Monitoring** (M) trainees' work. Supervisors benchmark trainee performance against a normative standard for their level of training (C) or against what they would have done themselves (C), both now or when they were trainees[7]. Surgeons evaluate trainees' satisfactory performance by their own surgical preferences (C)[31,46]. Trainees recognise this behaviour and shape their performance to match individual supervisors requirements (O)[44]. If a trainee performs in such a way that is consistent with the supervisor's own preferences (C) of performing procedures, then the supervisor would trust the trainee more, and as a result, allow

greater autonomy (O)[17]. A trainee new to a supervisor (C) may trigger increased **Monitoring** (M) and double checking[3,29] which decrease as supervisors get to know the trainee better[5]. These early judgements are based particularly on behaviour on call and during post-call interactions (C) which allow evaluating a trainee's ability to triage admissions, manage uncertainty and demonstrate professionalism[3]. **Monitoring** (M) information may come via secondary sources, such as nursing staff or allied healthcare professionals[29].

Trainees distinguish the presence of a supervisor whose role is to act as a safety net (C) and to get the job done, versus direct observation of their work for coaching/educational purposes (C)[44]. They frame the latter as assessment even if it is intended to be a formative exercise. Lack of direct observation is taken to indicate competence, and therefore unexpected observation may lead to trainee anxiety[44]. Direct observation, like **Support Seeking** (M), create a tension between autonomy and efficiency, both strong cultural values in medicine[41]. The requirement in some cases that trainees request observation exacerbates this tension; trainees are expected to seek direct observation from seniors in a culture that suggests that they should be autonomous and efficient[41]. Direct observation presents a threat to learner autonomy[41], and trainees view it as something they move on from as they become more senior and experienced[41]. The presence of an observer (C) can lead to emotional discomfort (O), altered clinical performance (O) and the trainee feeling undermined (O) in their relationship with the patient although greater frequency of direct (C) observation may lead to greater comfort (O)[44]. A positive professional relationship (C),

clear expectation setting (C) and good communication (C) regarding the purpose of direct observation[44] can enhance trainee comfort with the process (O).

3.1.2 Local Contexts: Clinical Task, Culture and Practice

Specific clinical situations (C) such as a sick patient, change in condition or critical decision required[29] trigger **Monitoring** (M) regardless of a trainee's competence. There may be considerable variation in the content and frequency of direct observation across different training programmes (C); however, observation tends to be universal for particular technical skills (C), such as surgical skills that are observed almost continuously[4,41]. During surgery, supervisors make moment to moment judgements on trainees' performance to decide trainees' future intraoperative affordances[17]. Supervisors employ strategies to monitor trainees directly to maintain overall control of the procedure without impinging unnecessarily on trainee autonomy or risking patient safety[4,19] such as regularly entering the room during surgery or taking on the role of assistant, allowing the trainee to manage complications as they arise[19].

3.2 Modelling: Mechanism & Outcomes

Programme theory suggests that postgraduate medical education is effective when trainees observe the practice of senior doctors and integrate it into their own. **Modelling** (M) is characterised by the occasions when trainees observe the practice of any senior doctor and integrating those observed behaviours into their own practice with varying degrees of consciousness on the part of both the role model and the learner[14,47–52]. The full extent of observable practice may be modelled[47,48] including technical diagnostic skills as well as interactions with patients, other health care professionals, and learners[53]. **Modelling** (M) may be reinforced and made explicit by the **Meaning Making** (M) mechanism (described in the next section) whereby

supervisors not only model specific behaviours but also think aloud, explain and reflect with trainees on that behaviours[14,20,47,54–56]. Nevertheless, typically **Modelling** (M) occurs without dialogue or intention on the part of the model[14,54,56].

Over time, trainees are exposed to an array of templates of how to speak, act and think like a doctor[46,47,57,58]. **Modelling** (M) is a means of **Learning the Application of Theory to Practice** (O)[47,56] as trainees observe variations in practice amongst senior doctors[46,57]. Trainees highly value 'practical learning', over and above book learning[47,57]. In surgery, trainees develop and learn to defend their own procedural preferences by working alongside multiple senior doctors, identifying elements of procedures that are considered non-negotiable and those where personal preference is accepted[31,46,55]. By reflecting on the various ways of doing, trainees adapt what they see for their own use, while at the same time, remaining conscious of their own individuality in relation to styles of medical practice[40,42,46–48,56,59].

Through **Modelling** (M) and reflection, trainees can contrast their conceptions with those of more experienced doctors. This comparison triggers important opportunities for **Learning Knowledge, Skills and Attitudes** (O) for future situations. Trainees may be selective about choosing which examples to imitate in their future roles[47], and thereby, develop their own style of practice. The development of professionalism is a complex social process, and **Modelling** (M) is a fundamental element of this development. Observing supervisors influence the formation of trainees' professional identity via the enculturation of professional values, attitudes and character[53]. **Modelling** is particularly associated with learning in the informal curriculum[57,60,61], in domains such as communication[42,43,47,48,56,60], collaboration[42,56,62], professionalism[14,42,56,61,62],

humanism[54], and leadership[62,63]. Error disclosure is a specific form of professional behaviour which has been shown to be an outcome of **Modelling** (M), both positive and negative[64].

Exposure to role models has a major influence on trainees' **Career Choice** (O)[65]. Supervisors, as representatives of their specialties, model career possibilities for trainees. Their satisfaction with their job, stress levels and work-life balance may attract or deter trainees[66] from specific specialities. Encountering inspirational individuals or positive role models within specialities has been identified[65,67,68] as one factor which influences career choice. Negative role models can deter trainees from choosing particular specialties with surgery often cited as an example[59].

3.2.1 Individual and Interpersonal Contexts for Modelling: Supervisor Characteristics and Trainee Subjectivity

Modelling (M) provide a standard to which trainees can aspire[16] and trainees make decisions about which of the behaviours they observe from supervisors merit imitation and which should be ignored. Supervisor characteristics (C) influence M**odelling** (M). Positive role models (C) who show a high degree of professionalism and encourage similar behaviour, have the most significant impact on trainees' professional development (O)[14]. Negative role models (C) play a role too, in that, they serve to teach trainees what not to do and how not to behave (O)[14]. Positive models show a high degree of professionalism (C) and encourage similar behaviour[14]. They are excellent clinicians (C)[50], who emphasise the psycho-social aspects of care and the importance of the doctor-patient relationship[49,59,60]. They display strong interpersonal skills (C), leadership (C), integrity (C) and teaching skills (C)[49,51,52,59]. There is evidence that perceptions of what makes a positive role model change as a trainee becomes more

senior. Superficial awareness of role models in the earlier stages of training evolves to a higher consciousness and a greater understanding as training progresses[55,59]. This may be associated with a shift in focus from knowledge and skills to communication and empathy[48]. Supervisors who are quiet (C), impatient (C), over-opinionated (C) or lacking collaborative and humanistic attitudes (C) are negative models[49,50] with whom trainees want to avoid interactions[47,48]. Negative **Modelling** (M) also occur when trainees observe unprofessional behaviour or negative traits such as cynicism in supervisors[57,69]. Reflection is a process whereby trainees contemplate, reason and examine their own values[1,10,14,15,47,48,53,55,61] and is essential for distinguishing between the behaviours of positive and negative role models. Rejection of negative behaviour from one's own repertoire is one outcome of such observation[14,47,48,57], however, failing to recognise it as unprofessional is another possible outcome[14]. Sternszus'[53] participants felt that they would be able to recognise the difference and only adopt positive behaviours.; however, Park[14] reported that the difference between the two is not always obvious and that trainee reflection is key to distinguishing the two.

4 Dialogue about Practice

On bedside rounds[70], in theatre[46,58], at morning report[19,71], during on call shifts at night[22], in corridors and even over coffee[72], supervisors and trainees talk to each other. Dialogue is reciprocal in nature and is a shared process between supervisors and trainees during every day clinical practice. These exchanges occur in various formats such as questions and answers, feedback, asking for help, and explanations. During these conversations supervisors and trainees make sense of clinical work together and

trainees ask for and receive information on their performance. This dialogic process is underpinned by the mechanisms; **Meaning Making** (M) and **Feedback** (M).

4.1 Meaning Making: Mechanism & Outcomes

Programme theory suggests that postgraduate medical education is effective when supervisors and trainees make sense of work together through dialogue. **Meaning Making** (M) is when supervisors and trainees make sense of work together through dialogue that typically centres around patient care[15,45,70,71,73]. During case discussions, for example, trainees present patient-centred information regarding the history of present illness, physical exam and diagnostic procedure results, diagnosis and treatment plan to a senior doctor[19,34,70,71]. Case discussion can also be supervisor-led before seeing the patient, explaining what they will do, and point out specific aspects of the case that the trainees should pay attention to[56]. Dialogue about patient care will prompt the supervisor to comment on the information provided by the trainee, request further information[19,71] and discuss how the case was managed which aims to stimulate critical thinking, draw out ideas and underlying presumption[71], orient trainees to salient information, and reinforce background knowledge[15,45,70,73]

Meaning Making (M) involves questioning and answering by both trainees and supervisors to gather information for their own knowledge, to evaluate trainees or to facilitate decisions at the point-of-care[1,32,47,48,70,73]. Usually, questions arise about the exact nature of the problem, which results in the trainee brainstorming and developing a diagnosis through reasoning and **Meaning Making** (M)[71]. Through questioning, supervisors test the trainee's impression and plan for congruence with their own[45] and provide the trainee with the opportunity to come to conclusions whether they are on

the right track, based on the questions asked[10]. Pauses allow trainees to re-consider incorrect responses[74]. Gaps or inconsistencies in the case presentation trigger knowledge related probing questions, sometimes leading to a specific teaching point[15,45]. Trainees also utilise questioning which can serve as a means of showing their knowledge and interest[55]. Questions may be prompted by trainees noticing discrepancies between what is accepted practice in the current workplace and what they learned elsewhere[1]. Trainees ask questions to fill specific knowledge gaps and to explore supervisors' experience with similar cases[11,73]. Rather than asking direct questions they may express uncertainty about the meaning of findings, or outline a tentative management plan[8,73], particularly in the context of **Support Seeking** (M), reasoning aloud about complex aspects of a case[11,48,73]. Non-verbal communication is also important, with gestures, mannerisms and intonations being used to express uncertainty[58,73].

Meaning Making (M) enables supervisors to **Evaluate Trainee Trustworthiness** (O) as dialogue about practice provide an insight into trainees' competence[45] to perform well in future cases[12]. Subsequently, **Entrustment** (M) can be an outcome of reviewing clinical scenarios with new trainees[7]. Trainees demonstrate their professional capabilities by asking informed questions and offering appropriate comments, based on evidence and reasoning[71]. Discussing cases provide supervisors with opportunities to evaluate clinical ability through conversational skill[45]. Language cues, structure and delivery of case presentations are important[5] as proxy indicators of clinical competence, and therefore, trustworthiness. When trainees present relevant information, unprompted, supervisors view this as an indication of good clinical judgement[5]. A high-

quality, comprehensive plan, allows the supervisor to estimate the trainee's preparation and insight into possible complications[8].

Trainees' learn the **Application of Theory to Practice** (O) through **Meaning Making** (M) whereby interpretation, construction of meaning and reflection with supervisors allow integration of new experiences[12,16]. Supervisors offer unsolicited knowledge in the form of advice giving, articulation of a plan, commentary, medical knowledge and sharing personal experience[11,58,73]. They use linguistic devices such as metaphor, simile and storytelling[58,73]. Supervisors interpret theoretical knowledge in the context of the clinical situation for trainees[20,73]. Trainees learn medical knowledge, clinical skills, and how to think, talk and act like a doctor by communicating with supervisors[70]. Solving complex problems with more experienced doctors is an important learning activity[15] which go beyond explicit guideline and protocols, extending to the implicit application of evidence to practice[47]. During surgery, the supervisor demonstrates visual cues to trainees, helping them to interpret important features in the surgical field. This may include an iterative process of reasoning, co-construction, with the trainee to interpret what is seen[58]. Co-construction is a joint dialogic process when supervisors and trainees deliberate about an issue. They discuss the possible interpretations of a clinical situation and consider the different possibilities put forward between themseleves[58]. **Meaning Making** (M) stimulates reflection, sharpens awareness and leads to an increased concentration in future situations[11,15,22]. Supervisors may also learn from trainees when trainees comment on practices they have learned elsewhere[1].

Meaning Making (M) shape **Professional Identity Development** (O) grounded in traditional medical ideology[71]. During dialogue about practice, supervisors emphasise

the importance of absolute values in medicine, such as objective and logical reasoning based on scientific principle and clinical responsibility[19,71]. Trainees demonstrate their competence by articulating the language of medicine smoothly and concisely, without hesitancy or uncertainty[71]. Professional socialisation is reinforced when trainees imitate the language of their supervisors[19,69]. Trainee increase in self-confidence and security is enhanced through **Meaning Making** (M) when their approaches and concepts match those of experts[11,15]. Informal conversations with supervisor increase and maintain shared understanding[17] and questions are a way for trainees to show their knowledge and interest in supervisors way of work[55].

Meaning Making (M) can provide **Affective Support** (O) to trainees. Talking to supervisors help trainees to deal with medical error and provide reassurance[75]. Through discussions of medical mishaps, trainees learn what might have been done differently and how similar errors[75] might be prevented in future. Hearing that those they respect have similar experiences assuages guilt and self-doubt and minimises isolation[75] and is helpful to learn how they might do things differently in the future. Both informal and formal discussion is helpful[75] in maintaining learner confidence, placing errors or negative outcomes in perspective and providing a model of reflective practice[16]. Sometimes supervisors may also express uncertainty, inviting discussion with trainees[58]. Supervisors and trainees also have more informal exchanges which do not relate directly to patient care, when supervisors treat trainees as colleagues, discussing their worries, errors they have committed or the burden of paperwork[57].

4.1.1 Individual and Interpersonal Contexts for Meaning Making: Supervisory Style and Trainee Agency

Supervisors create a safe environment for **Meaning Making** (M) by acknowledging that they do not know everything[26] and thereby enhancing team rapport and camaraderie[26,57]. Failure to proactively involve trainees (C) in discussion and decision making[11] leads to frustration and loss of learning opportunities (O)[11,24]. Focussing on the trainee's needs[26,72], and taking a collaborative, rather than didactic approach[26] are important contexts for effective **Meaning Making** (M), particularly for senior trainees (C), who prefer less structured discussion[26]. Less experienced trainees (C) are more likely to be 'taught' with supervisors repeating important information and asking them challenging questions, placing them in the role of 'student'[11]. Senior trainees (C) perceive more freedom to ask probing questions while supervisors take a more collaborative approach and express uncertainty more freely[55,58].

Supervisors use both positive and negative communication strategies with trainees[19]. Affirmation (C) has been reported as being particularly powerful because it is infrequent[71]. A respectful tone of voice and language (C) are important, particularly for more junior trainees[26]. When trainees provide incorrect answers supervisors may help them save face by treating an incorrect answer as a possibility, but requiring further consideration[74]; however, negative strategies are more commonly reported including 'critical humour', interruptions, public criticism, admonishment and warnings[71]. Rude, dismissive and aggressive communication, intimidation and harassment are features of medical culture[27,71,76–79]. This includes raised voices, swearing, undermining, unwillingness to help, sexism and racism[78,79]. Most often directed at junior members of staff, such communication comes from a wide range of sources, but often from senior

doctors[78]. Positive educational and patient safety outcomes have been used by both trainees and supervisors to rationalise dialogue which would not be acceptable in other contexts[76,79]. Despite these justifications, experiencing rude, dismissive communication causes anger and sadness and loss of motivation, individuals leaving the specialty or profession, or engaging in potentially harmful behaviours, such as excessive drinking[79]. Being bullied, scapegoated or publically humiliated (C) by senior doctors leads to less **Support Seeking** (M) and less error disclosure and therefore impacts on patient care[35,37,64].

Trainee agency (C) may trigger or inhibit **Meaning Making** (M). Competent and motivated learners risk asking questions, provoke discussion, solicit explanations and demonstrations, show commitment and initiative[11,72]. Concern about exposing gaps in knowledge and practice can hinder asking questions[72]. Consulting with a senior doctor in the field in which they intend to specialise enhances engagement[15]. Asking questions by trainees may be inhibited by sociocultural factors such as the hierarchical nature (C) of current health care systems and a culture (C) that prioritises professional autonomy[30,55]. Trainees may refrain from asking questions because of concerns about breaching patient confidentiality, being embarrassed to ask questions they think they should already know the answer to and lack of appropriate opportunity for discussions with supervisors[72]. Therefore, a tension exists between wanting to question and learn and yet not wanting to look incompetent.

4.2 Feedback: Mechanism & Outcomes

Programme theory suggests that postgraduate medical education is effective when trainees receive **Feedback** (M) from supervisors. **Feedback** (M) is information relating

to a trainee's performance that is intended to guide future performance[80]; it is intertwined with dialogue about patient care[48] and primarily serve to ensure the continuation of work, but also facilitates learning. Trainees continually receive comments such as 'better do it this way', 'don't forget to', 'be careful there' or 'remember to'[48] and these are not always viewed as **'Feedback'** (M). Trainees define informal **Feedback** (M) as 'talking things through with my supervisor' or the supervisor 'telling me how I am doing'[48]. This review focuses on **Feedback** (M) that arises during informal interactions between supervisors and trainees[81].

Feedback (M) leads to **Safe Participation in Practice** (O) by ensuring safe, effective, and efficient patient care[48,81]. In the event of trainee error, **Feedback** (M) is essential for future **Safe Participation in Practice** (O)[75]. When there is a lack of **Feedback** (M), trainees' responses to error may include detachment from patients and consideration of withdrawal from the profession[75].

Feedback (M) also facilitates **Learning the Application of Theory to Practice** (O). **Feedback** (M) provides trainees an insight into their current standard of practice[48], highlights areas of weakness and reinforces desirable professional behaviours[14]. **Feedback** (M) is especially valuable when a trainee faces difficult to interpret or potentially misleading clinical information[16]. **Feedback** (M) facilitates shared understanding about practice between trainees and supervisors[17,39]. Limited **Feedback** (M) may result in less confident or competent trainees who have difficulty to apply theory to practice[82].

4.2.1 Individual and Interpersonal Contexts for Feedback: Supervisor Characteristics, Trainee Agency and Trainee Subjectivity

Supervisor credibility (C) impact on the effectiveness of **Feedback** (M)[80]. Trainees will disregard **Feedback** (M) from a supervisor who they think has a low level of knowledge (C), poor interpersonal skills (C), lack experience as a doctor (C), or has little understanding of the trainee role(C) [39,80]. On the other hand, **Feedback** (M) from a respected clinician (C)[83] with personal and professional values which are congruent to the trainees' (C) is more acceptable[16]. Excellent communication skills (C) whereby the supervisor delivers goals and expectations support the receptivity of **Feedback** (M)[81,84,85]. **Feedback** (M) is influential when it is specific enough (C) to support the development of an action plan[80,84,85]. Two critical contexts managed by supervisors, timing (C)[16,48,80] and privacy (C)[80], are important to the effectiveness of **Feedback** (M). When trainees receive timely **Feedback** (M), they are better able to utilise the feedback more judiciously to achieve targeted outcomes[84]. Trainees also perceive **Feedback** (M) as invalid if the supervisor had never observed them or if the supervisor is inattentive towards the trainee[80,84,85]. When **Feedback** (M) is based on directly observed trainee work it is more likely to be accepted[16,84,85]. Trainees want to know shortly after an observed clinical encounter while the procedure is still clearly in mind (C), for example after surgery, how they did and want their supervisors to verbalise what they noticed[48]. It is also essential that supervisors allow the opportunity for trainees to respond to **Feedback** (M), to ask clarifying questions and to exchange ideas[48,80] Trainee development depends on the supervisor's willingness to provide negative **Feedback** (M) when necessary[85]. **Feedback** (M) may also be inhibited by ill-defined expectations for supervisors to give **Feedback** (M)[42], inadequate knowledge and training.

The level of interest (C) and engagement (C) on the part of the trainee influences the quality and frequency of **Feedback** (M)[72,84] Requesting **Feedback** (M) enhances its quality[84] while failing to do so increases the likelihood of unsolicited negative **Feedback** (M)[83]. Trainees need to achieve a certain level of comfort, which only arises from experience, to feel prepared to ask for or receive constructive **Feedback** (M)[39]. Trainees may hesitate to seek **Feedback** (M) when they are concerned about exposing gaps (C) in knowledge and practice[39,81]. Similar to **Support Seeking** (M), soliciting **Feedback** (M) involves a trade-off between perceived risks and benefits[81]. Interpretation of risk is mediated by whether trainees are more focused on learning goals or preserving credibility in the eyes of their supervisors[81].

Level of training (C) impacts on the **Feedback** (C); senior trainees (C), who have greater confidence and experience, are more likely to take ownership of their learning, to reflect on it, and to seek and accept **Feedback** (M)[39,48,83]. Greater seniority (C) associated with greater comfort with discussing mistakes and willingness to admit gaps in knowledge make negative **Feedback** (M) easier to accept[39].

Positive **Feedback** (M) is more satisfactory due to biased reasoning and a tendency to attribute negative outcomes to external factors[39]. Openness to learning (C), humility (C) and the ability to reflect (C) on negative **Feedback** (M) enhances its utility while an emotional (C) or immature response (C) to negative **Feedback** (M), feeling defensive (C) and personally attacked (C), reduces receptivity[16,84]. **Feedback** (M) which aligns with trainee values and self-assessment (C) is more likely to be accepted[8016]. Equally important is trainees belief (C) that the **Feedback** (M) they receive is coming from a

position of beneficence and non-maleficence, grounded in a strong supervisor-trainee relationship[39].

5 Health Systems Contexts for Supervisor-Trainee Mechanisms: Work Patterns, Workload & Work Distribution

There are several overlapping systems factors which reduce the amount and quality of time that supervisors and trainees spend together, and therefore impact supervisor-trainee mechanisms. Systems factors are unrelated to the characteristics of the supervisor, trainee or the clinical task[3] and include working hour regulation, efficiency pressures, workload, and policy.

The mechanisms described above can only generate their intended outcomes on the condition that supervisors and trainees are present in the clinical environment and free to spend time together[1,25,33,42,47,61,72]. Duty hour restrictions (C) decrease the total time trainees spend in clinical environments and has led to perceived losses that include time for question asking, autonomy, and reflection on patient care[86,87]. Shift-working (C) as a result of restricted hours cause schedule asynchrony, meaning that supervisors and trainees are not at work at the same time[88] and the loss of the traditional team structure[72,86]. These regulations exacerbate the intensity of work[86] with supervisors undertaking more direct patient care[3,18,28,86]. Time is a resource that raises the tension between efficiency in clinical practice, and comprehensive clinical care[73]. Supervisors and trainees now have a 'divide and conquer' approach to patient care which creates the perception of efficiency but at the cost of fragmented rounds and weakened team cohesion[89]. Lack of continuity of care and subsequent missed learning opportunities, particularly in the post call period, are additional concerns raised by trainees and

supervisors[86]. A positive supervisory relationship in which there is trust, safety, intersubjectivity, knowledge of each other's practices, values and learning needs[8,25,40,72] is a prerequisite for **Entrustment** (M)**, Support Seeking** (M)**, Monitoring** (M)**, Modelling** (M)**, Meaning Making** (M) and **Feedback** (M) to be effective. Fragmented work patterns (C)[24,33,40,56,72,82,84,86], short rotations (C)[33,56,72] and schedule asynchrony (C) make the development of a constructive supervisory relationship difficult[33,40,72,84,89]. Investment in a good supervisor-trainee relationship may not seem worthwhile when the time frame is short[8,33,40,56].

Systems contexts have a knock-on effect on all mechanisms. For instance, when supervisors don't have time or opportunity to observe trainees with patients[86] **Monitoring** (M) is inhibited which has a negative impact on **Entrustment** (M)[18], which inevitably reduce the opportunity for trainees to participate in practice[24,33,86,88,89]. Furthermore, limited time in the clinical environment means that trainees are less experienced and accountability is compromised because they do not know the patients[40,82,88]. The importance of adequate clinical experience is of more significant concern given the new duty hours restrictions, increased workload, as well as efficiency pressures[3]. Trainee absences, even when required to comply with duty-hour limits, hinder **Entrustment** (M) decisions[3]. Supervisors feel that trainees have to be physically present to make informed decisions about patient care[3]. This leads to reduction in trainee autonomy[7,24,82] and increased supervisor workload[3,18,28,86]. Systems factors which limit relationship continuity between supervisor and trainee in conjunction with heavy supervisor workload, interfere with **Modelling** (M)[43,56]. Senior doctors who are over-extended are less likely to be viewed as role models[49]. Likewise, if the supervisor

and trainee are not together, there is a decrease in opportunities for dialogue, i.e. **Meaning Making** (M) and **Feedback** (M)[40,72,82,86,87,89]. When there are competing demands and an emphasis on efficiency, communication becomes restricted to that required for patient care[70,72,86]. Supervisors do not have time to make their thinking explicit[15]. Trainees are not inclined to ask questions even if patient care demands it[40], thus compromising **Meaning Making** (M). Senior doctors are more likely to teach those they know[72]. A decreased likelihood of supervisor direct observation of the trainee[41] and the pace of clinical work precludes sitting down to have conversations impede **Feedback** (M)[84]. Trainees may deal instead with multiple supervisors who do not know them over the course of a shift[24] which makes it challenging to get **Feedback** (M)[84]. Schedule asynchrony also means that trainees cannot follow patients and supervisors who want to give **Feedback** (M) cannot do so in a timely manner[33,82,86]. Trainees do not have time to reflect on **Feedback** (M) when it is received[42,48]. Patient census relates to limited time for training and frequently cited as impacting learning[24,56,84,86,90]. The pressure of completing clerical work is another impediment to trainee autonomy[24]. Trainees have less time for observation as they are under pressure to deliver patient care[15], and therefore **Modelling** (M) is impacted. Similarly, **Meaning Making** (M) is constrained by high patient census which prevents trainees from listening attentively to experts and from asking questions for clarification and limits supervisor explanations, physical demonstrations and challenging questions[15,90]. Policies mandating supervisor involvement in patient care[1,24,28] and the legal responsibility of supervisors for the quality of patient care[3,18,19,28] shift trainees to the periphery of practice. Institutional rules about the role of senior doctors may lead to pervasive **Monitoring** (M), to the point of duplication of all work[45].

6 SUMMARY

The realist review identified, explained and contextualised the processes, mechanisms and outcomes of supervised workplace learning. The three processes are; Supervised Participation in Practice, Mutual Observation of Practice and Dialogue About Practice and their six underpinning mechanisms; **Entrustment**, **Support Seeking**, **Monitoring**, **Modelling**, **Meaning Making** and **Feedback**. Contexts at individual and interpersonal, and local and systems levels, trigger or inhibit these mechanisms and shape their outcomes; including both key educational objectives of postgraduate medical education and safe patient care. The findings clearly demonstrate that effective postgraduate medical education is a two-way process between supervisor and trainee, shaped by both, and requiring effort and leadership from both. With the current focus on the outcomes of postgraduate medical education, there is a danger that the key processes that produce those outcomes, and the contexts which support them, may be overlooked. A realist approach enabled a refocus on the processes of participation, observation and dialogue that underlie postgraduate medical education, and to situate these processes in contexts ranging from individual to systems levels.

The mechanisms **Entrustment**, **Modelling** and **Feedback**, are supported by extensive literature. **Monitoring** and **Support Seeking**, on the other hand, have been the focus of far fewer studies and do not feature significantly in substantive theory. Nevertheless, there are several high-quality studies which support the inclusion of these mechanisms in the synthesis as they are complex and discrete constructs in themselves. It is the interplay between **Entrustment**, **Support Seeking** and **Monitoring**, and their contexts, which is key to the outcomes of effective postgraduate medical education and patient safety, rather than **Entrustment** alone.

High-range theory supports the notion that trainee learning is fully situated within clinical workplaces. The findings amplify substantive theories of workplace learning, and make the mechanisms that underpin learning in clinical environments through senior guidance more 'visible'. This middle-range realist theory of supervised workplace learning which identifies its key mechanisms and influencing contextual factors is specific enough to offer practical guidance to supervisors, trainees, programme directors, hospital managers and policymakers to design, participate in, and support effective postgraduate medical education.

The realist theory requires further testing and refinement through empirical research. In the next two chapters, I use case study methodology to explore the operation of the mechanisms in different settings. Also, there is further discussion of the findings of the realist review in Chapter 8.

7 Strengths and Limitations

This study was conducted in accordance with published procedural guidelines. The core research team undertook training and expert consultation. The broader multi-disciplinary team and feedback from project partners sharpened the relevance of the focus of this review. As a middle range theory, the findings are sufficiently detailed and specific to postgraduate medical education to allow those involved in its organisation and delivery to apply them to their own context.

The decision to exclude General Practice, peer-reviewed reviews and commentaries and the grey literature limits this study. While the latter two categories have informed the study, and discussion of the findings, it is possible that inclusion would have altered or enhanced the findings. Realist synthesis involves iterative interpretative phases, and

each member of the team brings their subjectivity to bear on the process. Reflexivity was central to the approach to this review; nonetheless, it must be acknowledged that another research team might have synthesised the primary studies differently. The detailed reporting of both the methodology and findings support readers' understanding of how findings were reached and to judge its validity.

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Chapter 6
Testing and Refining a Realist Theory of Supervised Workplace Learning
A Multiple Case Study

1 INTRODUCTION

The premise that doctors learn through work underpins the design of postgraduate medical education (PGME)[1–5]. Trainees learn as they work in partnership with more experienced doctors[6–8] and supervisors are central to many work-related activities of trainees[7,9,10]. The processes involved in clinical supervision are not fully understood, and limited theory is available that explains how workplace learning occurs through supervisor-trainee interactions. To address this issue, a realist review of the related literature was done, as reported in the previous two chapters. The realist theory generated three inter-related processes occurring informally in clinical learning environments between supervisors and trainees. These were; Supervised Participation in Practice, Mutual Observation of Practice, and Dialogue About Practice. A pair of reciprocal mechanisms were found to underpin each of these processes. These mechanisms were linked to key outcomes of postgraduate medical education; safe participation in practice, learning skills, attitudes and behaviours, application of theory to practice, professional identity development and career choice. From a Critical Realist stance, theories may not mirror reality truthfully, and therefore, researchers should not commit to one theory and must recognise the contextual nature of all its outcomes[11].

For that reason, theories should be used to seek a comprehensive inquiry that can support, elaborate, or contradict that theory to create a more accurate explanation of reality. To test the robustness and further develop the realist theory from the previous chapter, required empirical research grounded in real-world supervisor-trainee experiences.

Supervision happens within the context of clinical learning environments. The clinical learning environment (CLE) refers to the cultural, social, psychological, and material elements which shape trainees professional development and capacity to learn[12–17]. The realist review revealed contextual factors which shaped the outcome of mechanisms related to the trainee and supervisor, both at an individual and interpersonal level, to the clinical work at hand, the clinical team and the broader health system. An overarching condition required for all mechanisms was that supervisors and trainees spend time working alongside each other in the delivery of patient care, and contextual factors at health systems level impact this. Conducting research set in authentic clinical learning environments may reveal further contexts that shape and impact on workplace learning through clinical supervision.

For the reasons outlined above, this study aimed to test and refine a realist theory of supervised workplace learning.

2 METHOD

A multiple case study approach was deemed most appropriate given the complexity and uniqueness of local culture and practice of various healthcare institutions and clinical departments. Case study is an empirical inquiry that can contribute to our knowledge of complex social phenomena and allows preservation of the characteristics of real-

world events[18,19]. This method is especially useful when the boundaries between phenomenon and context are unclear[20]. Contextual conditions are highly pertinent to the phenomenon studied in this research programme.

The 'case' is a specific phenomenon inherently bounded by time, event and place[19]. A case needs to be explicitly specified and may include individuals, social units, groups of individuals, communities, organisations, or occurrences[20,21]. In multiple case study research, the cases share a common characteristic or phenomenon[22] and allow for comparison, particularly in diverse settings[23]. In this study, multiple cases enabled comparisons that indicated whether the findings related to supervised workplace learning are idiosyncratic to a single case or constitute a pattern. Cases were located in different cultural and institutional environments, allowing for investigation through within- and cross-environment comparisons.

This study was conducted ethically. Major principles of ethical conduct are; do no harm, protect the privacy and anonymity of participants, maintain confidentiality of information, obtain informed consent of participants, and honest interpretation of the data without misrepresentation[24]. Informed consent is an integral part of ethics in research to provide participants in advance with information about the purpose and method of data collection. Information sessions were held at the study sites, to explain the objectives of the study and to outline procedures for data collection and analysis, focussing on confidentiality and data handling. This provided an opportunity to address any concerns or questions from potential participants. There was minimal anticipated risk in completing the interviews. Participation was voluntary, and participants could withdraw from the research at any stage. Data collection was overt and audio recorded.

Participants were always aware of the information that had been obtained and recorded, and they consented to it. Several strategies were used to protect personal information. Transcripts of the audio recordings were pseudonymised, interview recordings, transcripts, and field notes were stored securely in password-protected files and accessible only to the researchers analysing the data. Interview transcripts did not have identifiers, and care was taken to ensure that any quotes used in the outputs from this study could not indirectly identify the participant. The researchers abided strictly to the data protection act and guidelines[25]. The appropriate research ethics boards for each site approved the research.

2.1 Cases and Participants

Four clinical departments were purposefully chosen to investigate workplace learning in different contexts regarding institution and specialty. Cases were bound by institution, participants, and clinical specialty. Refer to Table 1 for a description of each case. Recruitment of participants occurred through a variety of routes. Gatekeepers at each site (senior clinicians and partners in this project) assisted in recruitment by providing information regarding the purpose and procedures of the study to participants. Members of the core research team (AW; CK; DB) invited participants via email or phone. Junior Trainees (Interns and Senior House Officers), Senior Trainees (Registrars and Specialist Registrars), and Consultants were invited to participate.

Table 1 Description of Cases

Case	Specialty	Organisation	Participants
1	**Geriatric Medicine**	Tertiary referral hospital	Junior Trainees, Senior Trainees & Consultants
2	**Vascular and Gastrointestinal Surgery**	General Hospital	Junior Trainees, Senior Trainees & Consultants
3	**General Paediatrics**	Acute Paediatric Hospital	Junior Trainees, Senior Trainees & Consultants
4	**Infectious Diseases**	General Hospital	Junior Trainees, Senior Trainees & Consultants

2.2 Data Collection

Data collection occurred through semi-structured interviews that were typically 30-60 minutes in duration and guided by open-ended questions (Table 2). Interview questions were not overtly based on the findings of the realist review. Participants were asked broader questions to capture an overview of trainees working and learning without being leading. The framework of supervised workplace learning developed through the realist review was explicitly used in the data analysis phase only. The purpose of the interview guide was to provide more focus and structure than a conversational approach and ensure that the same general areas of information were collected from each participant. It still allowed a degree of freedom and adaptability in getting information from the participant.

The questions facilitated participants to share and elaborate on their experiences of learning in clinical workplaces. Consultants and trainees were prompted to talk about the activities they undertake daily, how those activities bring them in contact with each other, and how learning happens over the course of a working day. The interviewer followed the participants' lead, pursuing and clarifying new information as it arose and avoided leading questions.

Table 2 Interview guide

- *Professional background and current role*
- *Describe the activities you undertake in a typical working day*
- *What determines the activities you undertake each day?*
- *How do you prioritise/decide on what is important to do?*
- *How are activities shared amongst your team?*
- *How do activities and the way they are undertaken vary across different teams/posts / clinical environments in your experience?*
- *Where does learning happen in the course of these activities?*
- *Explore views on learning vs service; are you/your trainees learning throughout the day as you/they work?*
- *What facilitates learning in clinical environments?*

2.3 Analysis

Data analysis were done through a two-step qualitative data analysis process involving pattern matching and cross-case analysis, within the case and across cases.

Pattern matching is a method of theory-testing in case study research[19,26]. When using case study to test a theory, the assumption is that there is already some explanatory framework available for the phenomenon or situation on which the research is focusing[26]. Pattern matching analysis involves comparing two patterns where one is a theoretical pattern, and the other is an observed one[19,26]. A pattern is conceptualised as a configuration of events, occurrences, behaviours or the outcomes of interventions that are observed in the raw data[26].

The value of using pattern matching is its ability to link research data to theoretical propositions that can be based on prior research. It is noteworthy that the aim is not about confirming or disputing the proposition itself[19]. It is more about building explanations on whether and why the patterns matched or not; to determine whether

patterns of conditions had occurred and the degree to which the conditions substantively aligned[26]. Pattern matching results provide greater validity and support or refine the theory underpinning the study[19,26].

2.4 Coding

Coding is the organisation of raw data into conceptual categories[27]. It was known in advance what would be relevant to the research question, based on the results of the realist review. Therefore, this process consisted of closed coding within each case which meant that set codes were derived from the results of the realist review. The data were carefully read, and all data relating to the context, mechanism and outcome patterns that emerged from the realist review were assigned to a code. Each relevant statement, phrase, sentence or whole paragraph was allocated to its appropriate code. All coding was done electronically in Word. Regular meetings and discussion with the research team (AW; DB) were held to check agreement and resolved disagreements about the analysis and coding.

2.5 Rigour

Several strategies ensured robust rigour of the research methods and therefore the validity of the findings. Purposive sampling provided inclusion of participants relevant to the study's purpose. Collecting data from three different participant groups (junior trainees, senior trainees and consultants) and combining the analysis with findings across all four cases produced data triangulation. The research team supported each other's reflexivity. There were multiple meetings and discussions with the research team (AW; DB) to review the analytic procedures and discuss and question the findings. An audit trail was maintained throughout data analysis by documenting explicit links between the data collected and the interpretations. Theory was at the forefront of the

entire data analysis process which enabled an in-depth analysis to build and refine the realist theory. The results from the realist review influenced the interpretation of the data; however, that was necessary to address the research questions.

3 Results

Fifty consultant and trainee participants representing a range of disciplines and training levels were interviewed (Table 3).

Table 3 Participants in each case

	Case 1	Case 2	Case 3	Case 4	Total
Junior Trainees	6	8	2	2	**18**
Senior Trainees	3	3	7	7	**20**
Consultants	3	1	5	3	**12**
Total	**12**	**12**	**14**	**12**	**50**

Reported below, is a synthesis of the observed patterns and how they matched with the theoretical patterns for each mechanism. Similar patterns to the theoretical pattern were observed; however, some aspects of the realist theory of supervised workplace learning did not emerge from the data.

4 Supervised Participation in Practice

4.1 Entrustment (mechanism)

The realist theory of supervised workplace learning suggests that entrusting the care of a patient or the execution of a professional activity is based on decisions on how far to trust a trainee to carry out patient care on their own. Triggering of entrustment leads to safe participation in practice and a shift in the supervisor's role. Contextual factors

relating to supervisory style, trainee trustworthiness, the clinical task, the clinical team, local culture and practice and systems contexts impact on this mechanism.

In this study, both supervisors and trainees valued learning that resulted from clinical practice. Trainees learned by getting the experience of performing clinical skills and dealing with new case presentations. Trainees' professionalism developed by learning how to prioritise work, to cope with the stress of the job and to improve future practice by reflecting on clinical experiences. Trainees learned through work, but in general, had limited autonomy - in some cases less than others.

Progressive **Entrustment** (M) was not described by participants in three out of four cases. In **Surgery** (case 2), trainees did experience progressive **Entrustment** (M). It appeared that the level of supervision (C) remained constant, and once a supervisory relationship developed, it continued more or less unchanged in particular in regards to junior trainees. **Entrustment** (M) is supposed to alter the level of supervision (O) appropriate for a trainee, but overall **Entrustment** (M) did not significantly reduce the amount of clinical oversight (O) trainees received. Participants reported that supervisors had the final say in patient management, and double-checked trainees work through direct observation (**Monitoring**) or during case discussions (**Meaning Making**).

The level of trainees (C) and their clinical experience (C) to a certain extent influenced **Entrustment** (M) and the everyday work that trainees were expected to perform. Year of training (C) alone was not a definitive factor, and **Entrustment** (M) across the four cases was variable and dependent on local culture and practice (this is further explored in the next chapter). Supervisors considered the complexity of professional activities (C) and trainees, in general, were assigned tasks which supervisors deemed appropriate

for their level of training. The roles and responsibilities (O) given to junior trainees, and in some cases senior trainees, upon entering a particular setting (in the cases examined) did not grow in complexity for the duration of their time there before rotating to a new placement.

Trainees, in particular, junior trainees (C), frequently transitioned (C) in and out of the clinical environment because of the structure of training programmes (C) as well as the requirements of working time regulations (C). This discontinuity of patient and supervisory relationships meant that trainees were less likely to be trusted. Supervisors felt that in the interest of safe practice (O) that it was better for them to take control of patient management instead of handing care over to trainees who did not have full exposure to the case. Provision of a safe and effective service was of paramount concern and opportunities for independent practice were restricted based on supervisory style (C). Trainees experienced variation in the way different senior doctors supervised (C), which impacted the manner and extent to which trainees participated in practice (O). Trainees realised that they had to learn and adapt to the way a particular supervisor preferred to perform professional activities. A supportive and collaborative team (C) increased trainees' participation in practice (O) as well as their confidence to do so. Supportive teams (C) facilitated trainees to undertake tasks under supervision and provided opportunities to seek help with patient care tasks. This finding is somewhat different to the realist theory which suggests that a supportive team influenced supervisors to trust trainees more.

*Examples of **Entrustment** from participant quotes*

According to a supervisor in **Infectious Diseases** (case 4), trainees' trustworthiness (C) were low when they demonstrated limited knowledge or provided inaccurate information. Under those conditions, the supervisor felt that he had to directly see the patient (O) because he could not trust what the trainee said. One example of **Entrustment** (M) from another supervisor in **Paediatrics** (case 3) described stepping back to let trainees make recommendations and lead ward rounds while remaining under close supervision.

I have worked with doctors who I couldn't trust (M) what they were telling me and their knowledge was quite limited (C) ….. that was extremely challenging and I felt that I had to go and see the patient myself (O) and not take anything that they said to heart. **Consultant 2 Infectious Diseases**
Getting them to make their recommendation and it may not be perfect, but that is okay, they will learn from that… Being there to support them (C) and yet not too intrusive. We used to do it on the wards with the registrar, and he would lead the round (M). It has allowed them to be able to perform tasks (O) and whatever they need to do at the level that is appropriate to their stage of development. **Consultant 2 Paediatrics**

Table 4 Pattern Matching Entrustment

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of entrustment	Entrustment	Safe participation in practice	✓
Triggering of entrustment	Entrustment	Shift in supervisor role	×
Supervisory style	Entrustment	Triggers or inhibits entrustment	✓
Trainee trustworthiness	Entrustment	Triggers or inhibits entrustment	✓

Clinical task	Entrustment	Triggers or inhibits entrustment	✓
Clinical team	Entrustment	Triggers or inhibits entrustment	✓
Local culture and practice	Entrustment	Trigger or inhibit entrustment	✓
System contexts	Entrustment	Trigger or inhibit entrustment	✓

4.2 Support Seeking (mechanism)

The realist theory of supervised workplace learning suggests that trainees request help from a supervisor with the aim to gain advice, reassurance, direction or active input regarding patient care. Trainees need opportunities to involve supervisors in instances of insecurities and questions relating to patient care. Triggering of support seeking leads to safe participation in practice and professional identity development. Contextual factors relating to supervisory style, trainee subjectivity, trainee agency, the clinical task, the clinical team and local culture and practice impact on this mechanism.

Support Seeking (M) regularly occurred in this study. Trainees would talk to a senior doctor when they had concerns about a patients' management (C). **Support Seeking** (M) resulted in case discussion (O) which influenced a supervisors' evaluation of a trainees' reliability (O). Trainees increased their trustworthiness (O) in the eyes of their supervisors by **Seeking Support** (M) when appropriate.

Supervisors approachability (C) and availability (C) were essential for trainees to feel confident that help would be on hand when they needed it. Supervisors made themselves approachable and available to be contacted by trainees and trainees did not feel hesitant to seek support when they deemed it necessary. The implicit culture (C)

embedded in a case shaped trainees' **Support Seeking** (M) behaviours. In **Paediatrics** (case 3), **Support Seeking** (M) appeared to be most acceptable, actively encouraged by supervisors (C), and as a result, occurred more frequently (O) compared to other cases.

> *The consultants are called a lot more than they are for the adult medicine… in Paeds it is very normal (C) and tends to happen a bit more; it is more acceptable to do that (C).* **Senior Trainee 2 Paediatrics**

Trainees' concerns about inconveniencing supervisors or appearing incompetent (C) influenced their decision about **Support Seeking** (M). The presence of a supportive team (C) enhanced **Support Seeking** (M) in a similar way as reported under the **Entrustment** (M) mechanism. In all cases, senior trainees were consistently the first port of call for junior trainees when they needed support. In most instances, **Support Seeking** (M) occurred along the hierarchy and junior trainees depended on senior trainees, when the situation warranted it, to escalate problems to the supervisor.

*Examples of **Support Seeking** from participant quotes*

When a patient was very sick (C), a senior trainee from **Infectious Diseases** (case 4) sought support from the supervisor (M). By getting the supervisor directly involved, the trainee learned by observing the supervisor (M) work and explaining important features of the case. In another example by a junior trainee in **Surgery** (case 2), **Support Seeking** (M) was not only triggered by unusual presentations or acutely sick patients (C) but occurred routinely as part of a working day (C). This trainee often discussed cases with

senior doctors which either led to the trainee continuing the management of the case (O) or the supervisor seeing the patient to give the trainee advice and direction (O).

As soon as you would have a patient that is very sick (C) and you would call someone senior to help (M), and you would watch what they did and maybe ask them why or they might highlight, oh you know this is important for this reason (O). **Senior Trainee 3 Infectious Diseases**
During clinic day, you will get to see the patient the same as everyone else (C). If you need to consult on what you are going to do with the individual you will go and speak to the consultant (M) at that time with the chart so that they can either make a decision, or they will come and see the patient as well with you and tell you what you need (O). **Junior Trainee 2 Surgery**

Table 5 Pattern Matching Support Seeking

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of support seeking	Support Seeking	Safe participation in practice	✓
Triggering of support seeking	Support Seeking	Professional identity development	✓
Supervisory style	Support Seeking	Triggers or inhibits support seeking	✓
Trainee subjectivity	Support Seeking	Triggers or inhibits support seeking	✓
Trainee agency	Support Seeking	Triggers or inhibits support seeking	✓
Clinical task	Support Seeking	Triggers or inhibits support seeking	✓
Clinical team	Support Seeking	Triggers or inhibits support seeking	✓
Local culture and practice	Support Seeking	Trigger or inhibit support seeking	✓

5 MUTUAL OBSERVATION OF PRACTICE

5.1 MONITORING (MECHANISM)

The realist theory of supervised workplace learning suggests that balancing the dual responsibility of training and patient care requires constant monitoring of the clinical situation and the trainee. Triggering of monitoring leads to safe participation in practice, evaluation of trainee trustworthiness, dialogue about practice. Contextual factors relating to supervisory style, trainee subjectivity, the clinical task and clinical team impact on this mechanism.

Supervisors continually monitored trainees' professionalism and performance in mostly indirect ways. Routine clinical oversight was commonplace in regular daily activity. When a trainee started a rotation (C), supervisors were particularly vigilant about evaluating trainees' level of competence. **Monitoring** (M) by a supervisor occurred, for example; when trainees interacted with patients, families or allied healthcare professionals, assisted in surgical procedures or discussed cases during handovers. **Monitoring** (M) provided supervisors with information about trainee competence (O). Supervisors using direct observation for summative assessment did not emerge from the data. The realist theory suggests that trainees frame direct observation of their work for 'educational' purposes as assessment. In this study, trainees or supervisors referred to **Monitoring** (M) in the context of the supervisor acting as a safety net and helping to get the job done. When junior trainees performed ward-based procedural tasks (C), they were predominantly monitored by senior trainees instead of supervisors.

As described under **Entrustment** (M), supervisory styles vary (C), and some supervisors monitor trainees more closely than others. In certain circumstances information about

a trainees' performance on a previous rotation was available (C). Still, supervisors preferred to closely supervise trainees in particularly when working with a new trainee (C), to make informal evaluations of a trainees' capability and trustworthiness (O).

> *That is what our log book is for, and Ireland is small so everyone talks so he already knows about what I can and what I can't do (C). He still has to make his own judgement (M); he will be keeping a very close eye for the first month at least just to see what I can and what I can't do (O).* **Junior Trainee 2 Surgery**

*Additional examples of **Monitoring** from participant quotes*

A supervisor in **Paediatrics** (case 3) provided an insight into the critical period when working with a new trainee (C). He spent the first month **Monitoring** (M) a trainee and deciding their level of competence. A supervisor in **Geriatrics** (case 1) described an example of how he implicitly monitored trainees' professionalism, in this case, interacting with nursing staff (C). Through this type of **Monitoring** (M), the supervisor was able to point out to the trainee that he behaved in an unprofessional manner while at the same time giving **Feedback** (M) on how to better perform a clinical task. A senior trainee in **Paediatrics** (case 3) provided an example of how **Support Seeking** (M) because of uncertainty (C) about a procedure led to **Monitoring** (M) by a supervisor. By taking these actions, the trainee learned how to do the procedure (O) through senior guidance, explanation and corrective **Feedback** (M).

> *The first month or so is based on trying to see where somebody's competence levels are …. (C), their competence and their confidence, and you are trying to address those and bring them along but also always keeping the care of the patient uppermost and making sure that everybody is safe (O).* **Consultant 1 Paediatrics**

I observe their interaction with nurses (M)… A nurse might ask them can you rewrite this drug Kardex and if they give a horrible answer to that nurse I just say, 'no you have to go back, that is an important thing for this ward'. I am observing their professionalism at all times (M). If they do a good admission, I will tell them I think that was really very good or something needs to be better like handwriting or a Kardex or whatever is just below par I will give that feedback (M) to them. **Consultant 1 Geriatrics**
They like to keep an eye on you and see your progress. For example, if I am doing some procedure that I am not sure of (C), obviously I will get my consultant to come along and observe me (M). A more senior registrar or the consultant will be by my side and telling me what to do and correct it and will ask questions (O). **Senior Trainee 4 Paediatrics**

Table 6 Pattern Matching Monitoring

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of monitoring	Monitoring	Safe participation in practice	✓
Triggering of monitoring	Monitoring	Evaluation of trainee trustworthiness	✓
Triggering of monitoring	Monitoring	Dialogue about practice	✓
Supervisory style	Monitoring	Triggers or inhibits monitoring	✓
Trainee subjectivity	Monitoring	Triggers or inhibits monitoring	✓
Clinical task	Monitoring	Triggers or inhibits monitoring	✓
Clinical team	Monitoring	Triggers or inhibits monitoring	✓

5.2 MODELLING (MECHANISM)

The realist theory of supervised workplace learning suggests that modelling is a mechanism associated with routine clinical practice. Modelling is implicit and inseparable from working alongside supervisors in their day to day practice. Modelling is characterised by the occasions when trainees observe the practice of any senior doctor

and integrating those observed behaviours into their own practice with varying degrees of consciousness on the part of both the role model and the learner. Modelling leads to learning skills, attitudes and behaviours, learning application of theory to practice and career choice. Contextual factors relating to supervisor characteristics and trainee subjectivity impact on this mechanism.

Modelling (M) was implicit and embedded in routine clinical practice when trainees interacted with supervisors. Trainees described observational learning stemming from watching supervisors dealing with patients during ward rounds, performing clinical procedures, and communicating with patients, families and other members of the team. Trainees learned professional traits (O) associated with the doctor identity such as leading a team, taking responsibility and putting in the effort. Participants also felt that being a professional meant that *you stayed until the job was done* and that doctors were expected to put in the extra effort. Trainees learned how to transfer book knowledge to real-life situations (O) by observing, talking about and engaging with actual clinical problems. Even when trainees did not directly participate in clinical cases, learning through observation was still viewed as valuable. Ward rounds were often the setting where **Modelling** (M) occurred.

The realist theory suggests the personal attributes of supervisors' (C) trigger **Modelling** (M) and that trainees select models with whom they share values and attitudes and that trainees make a distinction between negative and positive role modelling. Information about the identification of specific 'role models' (C) or recognition of characteristics (C) related to positive and negative role models did not arise from the data. Moreover, neither supervisors nor trainees revealed characteristics (C) or behaviours of supervisors

that had influenced their career choices (O). Supportive supervisors (C) who helped trainees mitigate the stressors of clinical environments were however identified as important to retain trainees within a specialty (O).

Your trainer might not know that in that job you are feeling the pressure. I want to do Paediatrics, but if you have no support along the line (C), you feel that it is not really worth it. **Senior Trainee 5 Paediatrics**

*Examples of **Modelling** from participant quotes*

A senior trainee from **Paediatrics** (case 3) learned a communication skill (breaking bad news) (O) by watching how different supervisors approached this difficult task (M). Another senior trainee in **Geriatrics** (case 1), learned how to manage different medical conditions (O) by observing supervisors interacting with a variety of patients during ward rounds (M). Learning through **Modelling** (M), enabled this trainee to deal with similar cases under supervision at a later stage (O). Even when complexity (C) prohibited a trainee from partaking in a procedure, a senior trainee from **Surgery** (case 2) felt that by learning through observation he was better prepared to perform the procedure soon afterwards (O).

Every day there are opportunities; the ward round (C) for example was a good way of seeing how they interact with the patients(M), breaking bad news when there has been a new diagnosis (O). I always try to present myself in those cases, it is a great learning opportunity and just seeing how they break the news and how they offer supports to the parents in their own different way, how different people approach things differently(C). **Senior Trainee 4 Paediatrics**
On the ward round (C), for example, you would have the Consultants, they are always very much on the ground, so you consistently learn through different patients, they will all have

something different wrong with them, and you tend to learn by just seeing (M). You see someone doing something, and then the next time you might be allowed do it under supervision (O). **Senior Trainee 2 Geriatrics**
Even if you're not involved in the procedure (C), you stand by the side and observe it (M). You are still learning, and if you see it again and again and again, you will, at last, be able to do that procedure by yourself (O). I was put on a procedure straight away, that I just observed and I think I did it well. **Senior Trainee 2 Surgery**

Table 7 Pattern Matching Modelling

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of modelling	Modelling	Learning skills, attitudes and behaviours	✓
Triggering of modelling	Modelling	Learning application of theory to practice	✓
Triggering of modelling	Modelling	Career choice	×
Supervisor characteristics	Modelling	Trigger or inhibit modelling	×
Trainee subjectivity	Modelling	Trigger or inhibit modelling	×

6 Dialogue About Practice

6.1 Meaning Making (mechanism)

The realist theory of supervised workplace learning suggests that meaning making between supervisors and trainees is a dialogic process typically centred around patient care. Meaning making provides insights into a trainee's understanding and thought processes. Supervisors offer knowledge in the form of advice giving, articulation of a plan, commentary and sharing personal experience. Meaning making leads to learning application of theory to practice, professional identity development, affective support

and evaluation of trainee trustworthiness. Contextual factors relating to supervisory style and trainee agency impact on this mechanism.

Meaning Making (M) frequently occurred as trainees and supervisors interacted during a working day. The intensity of work (C) and the busyness (C) of the environment meant that there was a greater emphasis on *getting the job done.* Delivering a fast and efficient service was important, and trainees avoided slowing the team down by asking questions during busy times.

> *Sometimes there are too many patients booked in and you have to move more quickly (C) and even if you have a couple of questions you might leave it for some other time because you know that you can't just slow things down by asking questions.* **Senior Trainee 7 Paediatrics**

Patient discussions were an important component of providing safe and efficient patient care (O). **Meaning Making** (M) interactions centred around patient care in the form of case presentations, in response to **Support Seeking** (M), and other informal communications as trainees and supervisors worked alongside each other. The participants described **Meaning Making** (M) that occurred directly during patient management, for example, when supervisors and trainees were performing a surgical procedure. More often **Meaning Making** (M) happened after the event, for instance, when trainees had presented cases after being on night duty or at the end of a ward round. Talking about interesting or complicated cases were also used as a teaching strategy by supervisors to facilitate trainee learning.

> *If I see a complicated patient (C) I would make specific points. I'd get an interesting patient (C), and I would bring in all the junior doctors and say have a look at this patient and what do*

you think it is, and then tell them what the answer is (M) if they don't come up with it. ***Consultant 3 Infectious Diseases***

Meaning Making (M) is essential for learning because these interactions provided trainees with opportunities to receive guidance (O), to check how accurate their patient assessment and management plans were (O), and to receive **Feedback** (M) on their performance.

They present the history and examination and their findings (M), and they will have a working diagnosis. I will always try and confirm that just to make sure the diagnosis is accurate the treatments are appropriate and I will always discuss the points of specific diagnosis (M)… and if they have missed something I will always flag that up as constructively as I can. **Consultant 3 Geriatrics**

Through **Meaning Making** (M) interactions supervisors evaluated trainee trustworthiness (O). Demonstrating a willingness to learn (C) and asking appropriate questions (C) were important actions trainees needed to take to show their dependability. Trainees viewed discussion of medical errors to be important for learning if it happened in a safe, non-judgemental manner which didn't lead to trainee embarrassment (C). Supervisors who were open about their past mistakes (C) was essential to increase trainees' confidence to take actions instead of avoiding specific professional activities because of fear of getting it wrong.

*Additional examples of **Meaning Making** from participant quotes*

A supervisor in **Paediatrics** (case 3) gave an account of **Meaning Making** (M) that occurred at the end of a ward round. Trainees presented to and discussed patient cases

with the supervisor, and together they decided on a management plan (O). A junior trainee from **Infectious Diseases** (case 4) felt **Meaning Making** (M), and case presentations were useful to evaluate the accuracy of her management plan (O) and to compare her clinical decision-making to that of the supervisor (O). Another junior trainee in **Paediatrics** (case 3) learned how to prioritise work (O) and identify what features of the patient case were important to focus on (O) through the types of questions the supervisor posed to her during case discussions.

We will do a ward round (C) and will usually just discuss it afterwards (M) and discuss what needs to be done and then follow up. They would present it to me, and then I will see it with them, and we will come up with a plan together (O). **Consultant 5 Paediatrics**
I would do a thorough clinical assessment after which I would present to the consultant (M) and at the moment she would tell me what was good about it, what was bad about it and I would see what the discrepancies are between my plan and her plan (O) and learn in that manner. **Junior Trainee 1 Infectious Diseases**
The consultants will just come in, and they will ask only three questions, they only want to know three things and do three clinical tasks (M). So you will find out what is more relevant, we just do everything, we don't really know what is relevant, and then the consultants will ask the same three questions every day and the same about a particular child with a particular condition so you learn what is more relevant (O). **Junior Trainee 2 Paediatrics**

Table 8 Pattern Matching Meaning Making

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of meaning making	Meaning Making	Learning application of theory to practice	✓
Triggering of meaning making	Meaning Making	Professional identity development	✓
Triggering of meaning making	Meaning Making	Affective support	✓

Triggering of meaning making	Meaning Making	Evaluation of trainee trustworthiness	✓
Supervisory style	Meaning Making	Triggers or inhibits meaning making	✓
Trainee agency	Meaning Making	Triggers or inhibits meaning making	✓

6.2 FEEDBACK (MECHANISM)

The realist theory of supervised workplace learning suggests that feedback is information relating to trainees' performance that is intended to guide their future performance. Feedback occurs in conjunction with supervisor-trainee dialogue about patient care and serves to ensure the continuation of work, but also to facilitate learning. Triggering of feedback leads to learning application of theory to practice and safe participation in practice. Contextual factors relating to supervisor characteristics, trainee agency and trainee subjectivity impact on this mechanism.

In all cases, unstructured **Feedback** (M) arose informally during case discussions when trainees' management plans were critiqued or commended. **Support Seeking** (M) or making mistakes (C) also triggered **Feedback** (M).

> *The single biggest factor in learning is access to a senior doctor who can provide feedback (M)... Criticise you appropriately when you do things wrong, critique you when you do things a little bit wrong, commend you when you do well.* **Senior Trainee 1 Geriatrics**

Trainees perceived **Feedback** (M) to be essential to learning but at times felt it was difficult to take criticism. Trainees who were tired after being on-call (C) or **Feedback** (M) that was harsh or negative (C), impacted on its receptivity (O). Under certain circumstances, trainees were sensitive to **Feedback** (M), but at the same time appreciated **Feedback** (M) that could improve their performance (O).

Clinical and supervisory experience (C) influenced supervisors' ability and confidence to supervise trainees effectively. Supervisors viewed being new in the role of supervisor (C) as both a challenge and an opportunity. A novice supervisor (C) might be in a position to transcend longstanding traditions and emphasise learning in a culture with embedded and outdated educational views. Nevertheless, a new supervisor with limited experience (C) found it difficult in particular when providing **Feedback** (M) to trainees who were not much more junior (C).

> *I am finding my feet as a consultant, and it would always depend on the experience gap between myself and the trainee (C). If I have somebody who is close to completing their training, I feel that my feedback might not be useful whereas I find it easier to give feedback to somebody who is more junior (C).* ***Consultant 1 Paediatrics***

The European Working Time Directive (C) significantly reduced contact time between supervisors and trainees which impacted on overall learning, but it had notably limited the **Feedback** (M) trainees received on their management of patients. Trainees lost their individuality as learners and were viewed by supervisors as *a number coming to a shift rather than an individual who is there to learn*.

*Additional examples of **Feedback** from participant quotes*

A junior trainee in **Surgery** (case 2) described how the simple act of participating in practice (C) was sufficient context for **Feedback** (M) to occur. Point-of-care **Feedback** (M) led to this trainee feeling better prepared for future practice (O). Case presentations, according to a senior trainee from **Geriatrics** (case 1), prompted supervisors to suggest alternatives to a management plan and provide insight into how

a senior doctor would approach the clinical situation. A senior trainee in **Infectious Diseases** (case 4) reported that **Feedback** (M) based on medical error (C) was an essential learning experience. Another senior trainee in **Infectious Diseases** (case 4) illustrated how a clinical situation that the trainee was uncomfortable with (C) and subsequent **Support Seeking** (M) lead to **Feedback** (M). This resulted in the trainee gaining advice on his patient care plan (O).

In theatre, if you were being shown how to do something or if you were doing something (C) there will always be feedback about maybe how you could improve it (M) or what you were doing well or what you could do next time (O). **Junior Trainee 3 Surgery**
I tell him my plans (C), and he might say: "I wouldn't have done this, I would have done this, or you did well there, but maybe you should have considered this" (M). **Senior Trainee 2 Geriatrics**
We would get feedback (M) about what has happened to the patient subsequently, and under those circumstances maybe this is what should have happened and to be talked through that. I think in any serious error (C) there should be feedback (M) to the doctor who is involved as a learning experience (O). **Senior Trainee 5 Infectious Diseases**
In terms of feedback on learning, it's more going to someone senior with something and there being an issue that you are not particularly comfortable with yourself (C) and going to talk to someone senior and then normally telling them what your plan would be (M) and getting advice on what they think you should do (O). **Senior Trainee 4 Infectious Diseases**

Table 9 Pattern Matching Feedback

Theoretical Pattern			Observed Pattern
CONTEXT	MECHANISM	OUTCOME	
Triggering of feedback	Feedback	Learning application of theory to practice	✓
Triggering of feedback	Feedback	Safe participation in practice	✓

Supervisor characteristics	Feedback	Trigger or inhibit feedback	✓
Trainee agency	Feedback	Triggers or inhibits feedback	✓
Trainee subjectivity	Feedback	Triggers or inhibits feedback	✓
Systems contexts	Feedback	Trigger or inhibit feedback	✓

7 DISCUSSION

The findings demonstrated to what extent the patterns emerging from the study corresponded with or diverged from the realist theory of supervised workplace learning. The analysis found commonalities between observed supervised workplace learning with the findings of the realist review. In particular, the way in which the mechanisms **Support Seeking**, **Monitoring**, **Meaning Making** and **Feedback** functioned across the four cases were similar to the results of the realist review.

Of the six mechanisms, the patterns of **Entrustment** that emerged from this study were the least similar to the realist theory of supervised workplace learning. Level of training and the supervisors' evaluation of a trainee's trustworthiness determined which professional activities to entrust to a trainee. Supervisors made **Entrustment** decisions early on when working with a new trainee. Once a supervisor decided an individual trainee's roles and responsibilities as well as the amount of supervision that he/she felt a trainee needed, this remained the status quo for the entire time the supervisor and trainee had a relationship. The roles and responsibilities given to trainees did not grow in complexity for the duration of their time in a particular setting before rotating to a new placement. This pattern of supervision was particularly true for junior trainees who

frequently rotated through different clinical environments. Another issue relevant to this finding is that a trainee who was new to a supervisor had a low starting point of trust. Supervisors may have had information about a trainee's performance on a previous rotation; nevertheless, supervisors preferred to make evaluations of trainee trustworthiness based on their own experiences of working with a trainee. The implication is that trainees' training trajectories were fractured. Every time a trainee came under the supervision of a new supervisor they had to start the process of **Entrustment** all over again. This created uncertainty about whether **Entrustment** would continue to progress along the same trajectory as what they were on during a previous rotation.

In this study, observational learning occurred in the same way as described by the realist theory of supervised workplace learning. Trainees observed supervisors as they interacted with their patients and went about their day-to-day work. Nevertheless, specific contexts and outcomes of **Modelling** were absent from the data. Trainee identification of 'role models' who demonstrate attitudes and behaviour associated with being a professional and which they choose to imitate, did not emerge from the data. Participants also did not refer to the influence of positive or negative role models on trainee career choices. There may be several reasons for this gap in the findings. Of the six mechanisms, modelling is the most implicit mechanism and may occur without the awareness or intention of supervisors or trainees. Also, participants were not directly asked about this feature of modelling because the interviewers wanted to avoid leading questions. On the other hand, this finding may reveal a lack of reflectiveness on the part of both supervisors and trainees of the impact of observed behaviours on trainees'

professional development and choice of specialty. If the latter is the case, this presents a significant problem for supervised workplace learning. In the literature there are ample research on the specific characteristics of supervisors that impact on trainee learning[28–36]. Supervisors who, for instance, show a high degree of professionalism and demonstrate the importance of the doctor-patient relationship lead to similar behaviours in trainees[28]. On the other hand, supervisors who are impatient, over-opinionated or lacking collaborative and humanistic attitudes are considered to be negative role models[29,32]. A lack of awareness of how receptive trainees are to their supervisors' behaviours may perpetuate unwanted or omit desired professional behaviours in trainees' future practice.

Discussion of the findings continues in Chapter 8.

8 STRENGTHS AND LIMITATIONS

By choosing to do a multiple case study, the data could be analysed within a particular setting and across different settings, unlike when a single case study is chosen. The evidence created from a multiple case study approach is considered robust and reliable[37]. Conducting a multiple case study can be an expensive and time-consuming process and the data analysis slow, iterative and labour-intensive. The findings are context-specific and therefore may not be easily transferable to other settings. The purpose of qualitative research is not to generalise but to create a better understanding of the phenomenon under investigation. The findings of this study are presented through rich, empirical descriptions of the phenomenon of supervised workplace

learning so that readers can decide to what extent the interpretations are believable and transferable.

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Chapter 7
Institution and Specialty Related Differences in Supervised Workplace Learning A Multiple Case Study

1 INTRODUCTION

Studies have shown inconsistency in trainees' perceptions of clinical learning environments (CLE) and the training that happens within these settings. In Ireland, some trainees rate their overall experience very poorly and while others rate them reasonably high[1]. Trainees attribute poor training experiences to a lack of feedback, vagueness about roles and responsibilities, and bullying behaviour[1]. In the Netherlands, there is also inconsistency in the quality of the learning climate which ranges from substandard to excellent[2] between different health service sites. The quality of the learning climate was measured through the D-RECT tool. For example, a clinical environment that rates high in the domains of peer collaboration and supervisor accessibility have an overall high score on the quality of the learning environment[2]. Conversely, low ratings for coaching and assessment, correlate to an overall low score of the quality of the learning climate[2]. The domains that score high or low depend on the context of postgraduate medical education (PGME) and varies between institutions[2]. In the U.S., the CLER program determined that there is variability across teaching hospitals in the learning content to which trainees' are exposed[3].

The previous two chapters explained the processes of supervised workplace learning and demonstrated how it is context-dependent. The abovementioned literature

indicates that trainee experiences about how their learning is supported and what they get to learn are variable across different training sites. Furthermore, the results of the previous chapter identified gaps between theoretical and observed patterns of supervised workplace learning. For these reasons, at the outset of the cross-case analysis it was assumed that; 1) supervised workplace learning will to a greater or lesser extent differ across institutions and specialties and 2) contextual conditions would be relevant to variations in supervised workplace learning.

Based on these assumptions the aims of this study were twofold. Firstly, to determine whether trainees and supervisors experience supervised workplace learning differently in different institutions and specialties. Secondly, to explain how clinical learning environment contexts influence the differences in the presentation of the same phenomenon – supervised workplace learning.

2 METHOD

The research approach used was a multiple case study as described in Chapter 6. Multiple case studies are designed to examine the similarities and the differences across cases[4]. Details about the design, recruitment and participants are in Chapter 6.

In part 1 of the multiple case study, pattern matching and cross-case analysis occurred concurrently. The pattern matching analysis involved cross-case analysis in the sense that patterns *similar* to the theory were identified within each case and across cases. The pattern matching analysis identified patterns of conditions that are consistently associated with supervised workplace learning across the four cases which aligned with the realist theory. The results of the cross-case analysis in the current chapter aimed to find and explain *differences* across cases of supervised workplace learning in different

institutions and specialties. Both parts of this multiple case study analysis aimed to compare data. The analysis in the previous study compared a theoretical pattern with an observed pattern within and across cases. The analysis in this chapter compared how observed patterns within cases are different to the observed patterns in other cases.

The analysis is grounded in critical realism which views reality as layered[5]. This means that this analysis first had to determine how trainees and supervisors experienced supervised workplace learning and whether their experiences were different to participants of other cases. Moreover, explanations of why they experienced supervised workplace learning differently to the other cases were needed.

Each case was coded separately to develop themes that describe and explain the unique aspects of supervised workplace learning related to individual cases. Transcripts were read line by line and sentences or paragraphs describing supervised workplace learning particular to the case was marked, noted and named. Identifying and naming themes were based on the realist theory, but themes that were different from the original theory were also annotated. Once each case was analysed in this manner, a cross-case analysis was done to compare themes from individual cases and synthesise the final results.

2.1 RIGOUR

Numerous strategies were used during the research design, data collection, and analysis to increase the rigour of this study. The use of theoretical perspectives (critical realism and the realist theory of supervised workplace learning) helped to build a more comprehensive explanation of the phenomenon and explore a range of plausible theoretical interpretations. The use of key participants across the four cases allowed

convergence of findings across participants and the four units of analysis which ensured triangulation of data. An audit trail was maintained throughout data analysis by documenting explicit links between the data collected and the interpretations. There were multiple meetings and discussions with the research team (AW; DB) to review the analytic procedures and discuss and question the findings.

3 RESULTS

Across the four cases, the **Entrustment** (M) mechanism, in particular, was strongly influenced by case-specific contexts. As a result, in **Geriatrics** (case 1), **Paediatrics** (case 3) and **Infectious Diseases** (case 4) **Entrustment** (M) was limited, but for different reasons. In **Surgery** (case 2), progressive **Entrustment** (M) occurred, and its interchange with the **Monitoring** (M) and **Modelling** (M) mechanisms was more explicit compared to the other cases. The first part of the results setting describes each case. Then the three patterns of **Entrustment** (limited, progressive and reciprocal) are described as well as the case-specific contexts that might explain the differences in **Entrustment** (M) across cases.

4 DESCRIPTION OF CASES: SETTING AND PARTICIPANTS, TEAM STRUCTURE, TYPICAL WORK DAY, ROLES AND RESPONSIBILITIES, PROXIMITY TO SUPERVISOR AND PATIENT POPULATION

4.1 GERIATRICS (CASE 1)

Geriatrics (case 1) was located in a Geriatric Medicine department in a tertiary referral hospital. Six junior trainees, three senior trainees, and three consultants were interviewed. Teams had trainees of all levels including interns, senior house officers and specialist registrars. All the participants worked together in teams in the same clinical environment. A typical workday involved reviewing in-patients during ward rounds,

doing consults on the wards or emergency department, attending out-patient clinic services, covering on-call duties including hand over afterwards. Senior trainees regularly did ward-based tasks like junior trainees and work amongst the team were shared equally. Junior trainees, in particular, felt that there was almost no difference between the work of an Intern versus that of a Senior House Officer (SHO). There was some differentiation between levels of training as senior trainees would perform riskier procedural tasks. Supervisors in **Geriatrics** (case 1) spent all their time in the same clinical environment as the trainees. Trainees reported that they would meet their supervisor on a daily basis. The patient population associated with the specialty of Geriatric Medicine were said to be frail, complex, and presenting with multiple organ diseases.

4.2 SURGERY (CASE 2)

Surgery (case 2) was located in a Vascular Surgery Department in an acute general hospital. Eight junior trainees, three senior trainees, and one consultant were interviewed. Teams had trainees of all levels including interns, senior house officers and specialist registrars. Trainees who were not on training programmes were also on this team in registrar posts. Interns worked exclusively with patients on the wards. Senior House Officers divided their time between wards and the operating theatre depending on service demands. Senior trainees spent the majority of their working day with supervisors in the theatre. At times when no surgeries were scheduled, senior trainees spent more time with in-patients, and the whole team would do ward rounds at certain times during the day. As part of their job description, all trainees had to complete on-call shifts and were assigned to see patients in the accident and emergency department. Junior trainees did not attend handovers after being on-call. Trainees had

clearly defined roles, and the supervisor would assign specific tasks to them. Junior trainees seemed to accept that senior trainees will get to do more than them. For them, that was the way it should be, and they were content with the role they had.

> *Obviously, the Registrar will get precedence because they are more senior than you; they will be doing more. I suppose it has to work that way; anything difficult will be done by the Registrar. It's a hierarchy in that sense because you're more junior than they are and that is the way it has always been so I don't see a problem with that.* **Junior Trainee 2 Surgery**

The supervisors worked closely with senior trainees and trainees present in the operating theatre. Supervisors would be in contact with junior trainees intermittently throughout the day during, for example, ward rounds. The patient population associated with **Surgery** (case 2) were people with complex surgical and medical needs. Participants dealt with acutely sick patients presenting with cancer and vascular diseases. Patients with the most serious conditions had priority over elective surgical procedures.

4.3 PAEDIATRICS (CASE 3)

Paediatrics (case 3) was located in a General Paediatrics department in an Acute Paediatric Hospital. Two junior trainees, seven senior trainees, and five consultants were interviewed. The team included senior house officers and specialist registrars. There were no interns in the team. All participants worked in teams in the same clinical environment. During a typical workday, trainees would do clinics and ward rounds. Trainees would also see patients in the emergency department and during on-call. Junior trainees did not attend handovers post call. There were no interns in this case,

and that meant that SHOs' were expected to perform tasks usually relegated to more junior trainees.

> *I feel that my tasks are quite similar to what they were when I was an Intern. You get a lot of jobs that would traditionally be an interns job because there is no intern.* **Junior Trainee 1 Paediatrics**

This institution was the smallest of the four cases and was a tight-knit community. People were in close and frequent contact and knew each other well. Participants described the clinical team as a 'family'.

> *This is a small hospital, so we get to know the trainees, and I suppose there is a family vibe here.* **Consultant 1 Paediatrics**

Service provision was at all times supervisor led and even though senior trainees had some scope for independent practice and decision-making, everything they did had to be run by the supervisor. Participants provided medical care to young, fragile patients with complex conditions and had to work closely with not only the patients but also their families.

> *In Paeds it's consultant-led; lot of time we will manage a patient, but you will have to run most things by the consultant… you do have some authority in making management plans, but you have to run it by the consultant before you make a decision.* **Senior Trainee 4 Paediatrics**

4.4 Infectious Diseases (Case 4)

Infectious Diseases (case 4) was located in an Infectious Diseases department in a general hospital. Two junior trainees, seven senior trainees, and three consultants were interviewed. The team included senior house officers and specialist registrars. This case had no interns on the team. A typical work day included reviewing patients during ward rounds, doing consults with out-patients in clinics and providing on-call during nights or weekends including attending hand over afterwards. Only senior trainees provided out-patient consults with supervisors. Similar to **Paediatrics** (case 3), the SHOs had to perform tasks traditionally associated with an Intern role because there were no interns. Supervisors spent more time with senior trainees as they worked alongside each other in the out-patient clinics. Supervisors would have contact with junior trainees sporadically throughout the day during for example ward rounds or if a junior trainee contacted the supervisor. Participants, in this case, provided specialist medical care to patients presenting with HIV, sexually transmitted infections (STI) and other infectious diseases. The nature of the diseases treated was a primary reason why historically interns were not placed in this department.

> *We have no Intern on any of our services, that was historical at a time when HIV was not treatable, and people were concerns about Interns doing procedures on new in patients going back twenty years. So the SHO is the first qualified trainee in providing care so that they tend to do a combination of SHO and Intern tasks.* **Consultant 2 Infectious Diseases**

5 LIMITED ENTRUSTMENT

In **Geriatrics** (case 1), **Paediatrics** (case 3) and **Infectious Diseases** (case 4), **Entrustment** (M) was limited. It appeared that trainees did not experience a significant increase in responsibility and contexts such as level of training (C) or competence (C) rarely triggered **Entrustment** (M) to produce outcomes such as fading of oversight (O) and greater participation in practice (O). Contextual factors related to each case may explain the restriction on trainee's participation in practice.

5.1 RESTRICTED PARTICIPATION IN PRACTICE: GERIATRICS (CASE 1) AND PAEDIATRICS (CASE 3)

In **Geriatrics** (case 1) and **Paediatrics** (case 3) the scope of practice for trainees was significantly reduced to the point where 'running everything by the consultant' was the norm. In **Paediatrics** (case 3) supervision was referred to as; *hands-on*, *maternalistic, and cushioned*. Senior trainees in **Geriatrics** (case 1) and **Paediatrics** (case 3) who were at a stage in their training when they needed more responsibility, felt that they were being *babysat* and described supervision as *crippling* at times.

The nature of the jobs that they are, they have to be consultant-led, so you don't get a lot of scope as a registrar to take on a certain amount of responsibility yourself because every time something happens you have to ask them is it okay if I do this. **Senior Trainee 2 Paediatrics**
All new patients would be either seen directly by the consultant, or if not, they will be reviewed with the consultant, and in Geriatrics, I don't think that is no bad thing. **Consultant 3 Geriatrics**
You reach a level of training, and you want to take up a bit more, do a bit more decision making, you could make a few mistakes, but that is all part of learning. If you are babysat on rounds, it doesn't help you and a lot of times I do feel that I am able to make decisions and it is crippling sometimes if you feel you are over-supervised. **Senior Trainee 5 Paediatrics**

The patient population (C) associated with the specialties of **Geriatrics** (case 1) and **Paediatrics** (case 3) were a driver for keeping close supervision. Supervisors in **Geriatrics** (case 1) and **Paediatrics** (case 3) also spent all their time in the same clinical environment as the trainees. Supervisor proximity (C) to trainees appeared to be another reason in both these cases for the close oversight and restricted independent practice of trainees. Supervisors in **Paediatrics** (case 2) recognised this overprotective behaviour and said that the competency or seniority of the trainee did not influence their practice. Even when a trainee was considered to be competent, close supervision persisted throughout the duration of the trainee's time in that department. One supervisor felt that after a 6-month period of working with the trainee, he felt confident in the trainee's ability, but that did not appear to benefit the trainee as he was moving on to a new rotation at that stage. Another supervisor also mentioned that he would frequently interact with trainees on a daily basis. Even with the amount supervisor-trainee interaction, **Entrustment** (M) did not progress to allow more independent practice or less clinical oversight.

I would be very hands-on with them no matter how good they are. You teach them how to do something but you know every single thing is closely supervised really and as time goes on in the six months they are getting good just when they are leaving. I would see a lot of them many times every day. **Consultant 4 Paediatrics**
I just see every patient. We're all a bit maternalistic we have to mind everybody a bit too much maybe. I had a clinic yesterday, and I had a Registrar who was very good and very well able, it's no reflection on her that I see everybody, it's just my practice, and I think that the patients and the parents quite like it. **Consultant 5 Paediatrics**

Local culture was another context which impacted on **Entrustment** (M). In **Geriatrics** (case 1), supervisors replicated and maintained practices that have been long established and consequently remained in charge of key aspects of clinical care, pushing trainees to the periphery of practice. The following quote from a supervisor in **Geriatrics** (case 1) explains how 'tradition' dictated in which activities trainees could participate.

> *Maybe I am too much of a traditionalist, but here in Geriatric Medicine the consultants receive the case notes after discharge and do the summary fairly quickly. It gets out to the GP then quite promptly, so they get a very accurate, crisp account of what happened and what the follow-up plan is… Our G.P. colleagues over the years, over the decades, have been very happy with that service. I think we are still one of the few services where the summary is done by the consultant… I suppose we are hidebound by tradition maybe.* **Consultant 3 Geriatrics**

Close supervision, limited autonomy, and the lack of opportunity to do more challenging professional tasks impacted on trainee learning in **Geriatrics** (case 1) and **Paediatrics** (case 3). In all cases junior trainees were expected to perform routine, ward-based tasks such as signing forms, ordering investigations, cannulations and documenting cases. However, trainees in **Geriatrics** (case 1) and **Paediatrics** (case 3) took a particularly negative view of these undertakings and felt that doing repetitive, low-level tasks impacted on junior trainees' learning. Trainees used words with negative connotations such as 'mundane' and 'monotonous' to describe junior trainee work activities. In conjunction with this, trainees in **Geriatrics** (case 1) and **Paediatrics** (case 3) had the least autonomy with the most supervision.

A senior trainee in **Geriatrics** (case 1) felt that the amount of direct supervision impeded his ability to work more independently. He thought that it was necessary for his

professional development to have the freedom to do work by himself and learn from his mistakes. He also pointed out that the close supervision was beneficial for junior trainees because it provided a safety net and made the job less stressful. Nevertheless, close supervision meant that trainees were not challenged to take on tasks to improve their independent capability. Another senior trainee in **Paediatrics** (case 3) pointed out that junior trainees may not be well enough prepared to make the transition to a senior trainee role. When trainees of different levels were treated the same, it caused uncertainty about their roles and responsibilities.

There might be times when you would rather not be supervised and just crack on and do it. Just a lot of supervision, sometimes there is too much, sometimes the only way to learn is to go off and make your own mistakes, try to do something yourself. The SHO's are very lucky in Geriatric Medicine because they are very sheltered… it makes their jobs easier and less stressful, and they can focus on training… sometimes you do need to be pushed a little bit out of your depth in a supervised setting to learn properly. **Senior Trainee 1 Geriatrics**
I think if you came here and you did all your general paeds here, as an SHO you would definitely miss out, I think there would be a huge jump from that to being a Reg here. They are very much more like Interns here; they don't do much. **Senior Trainee 6 Paediatrics**
There is a mix of junior and senior registrars, and everybody is treated the same. I think sometimes it is good to know who can take a bit more responsibility and take a few more decisions and obviously run it by the consultant and see that the consultant is happy. **Senior Trainee 5 Paediatrics**

5.2 Restricted Participation in Practice: Infectious Diseases

In **Infectious Disease** (case 4), **Entrustment** (M) was also limited but for different reasons than seen in **Geriatrics** (case 1) and **Paediatrics** (case 3). **Infectious Diseases** (case 4) was the only case where participants viewed the outsourcing of particular procedural skills to other departments and teams (C) (i.e., Radiology) as an impediment

to trainee learning. Senior trainees did have some scope to perform a few procedural tasks such as lumbar punctures. The availability of resources (C) and policies (C) around patient safety were the primary drivers of this change in local practice. The intervention of other teams to perform more complex procedures has led to a loss of skills for senior and junior trainees. A safe and efficient service has restricted trainees to develop essential clinical skills.

I suppose two things are contributing towards the reduction in tasks by more junior trainees; one is the more senior people are doing it, they are going to do the lumbar punctures. And then the second is the role of interventional procedures in doing some of the biopsy's or procedures that we would have done as trainees. Now you never do a liver biopsy like we did when we were going through. **Consultant 2 Infectious Diseases**
When I was an Intern, we trained in a lot more procedures… practice has changed in that intervention radiology would now be doing a lot of the procedures that we would have done as trainees. **Senior Trainee 7 Infectious Diseases**

In **Infectious Diseases** (case 4), time in the clinical environment (C), was another barrier to trainees' participation in practice. An issue particularly emphasised in **Infectious Diseases** (case 4) was junior trainees rotating (C) through the department as a result of working time regulation (C) and the structure of training programmes (C). Due to trainee rotations and working hour regulations, the team structure had changed, and senior trainees and supervisors felt they did not really know or have strong relationships with junior trainees. Supervisors had difficulty identifying junior trainees' strengths and weaknesses and as a result, could not modify their supervision according to trainees individual learning needs. Due to the limited time trainees spent in the clinical

environment, junior trainees did not get to know patients sufficiently well to be entrusted to get involved with their clinical management.

The SHO's rotate, so suddenly we will have no SHO, because they have been on a week of nights, and then they are a week off… that is difficult for clinical management in terms of their learning. **Consultant 3 Infectious Diseases**
The constant turnover of staff is another barrier… they are turning over every three to four months… they never reach that stage of feeling confident about the job, so the learning never gets a chance to be consolidated. **Consultant 1 Infectious Diseases**

Limited autonomy and experience impacted on trainees learning and confidence. Trainees also had concerns about future practice and not having the necessary skills to perform tasks in circumstances when the radiologists may not be able or willing to do it. The lack of opportunities to perform procedural skills has also impacted on trainees' identity as a doctor. Trainees believed their own abilities stunted in comparison to their supervisors who were *wizards* who could do anything. Trainees thought that it was 'not right' to be a doctor who could not be hands-on with patients and do what was expected of a person in their profession.

It's weird being a doctor and you are not able to do much hands on. **Senior Trainee 2 Infectious Diseases**
You know the consultants, their generation do lots of things, they were wizards, they could do everything, and they were very practical people, whereas now, I feel the skills are being taken away from us. **Junior Trainee 2 Infectious Diseases**

6 PROGRESSIVE ENTRUSTMENT

Participants' experiences of supervised workplace learning in **Surgery** (case 2) were very different to that of participants from the other three cases. Trainees experienced progressive **Entrustment** (M). Discrete moments of trainee autonomy of new tasks characterised **Entrustment** (M) which developed over time. In **Surgery** (case 2), **Entrustment** (M) led to growing independence(O) but was dependent on more than just a trainees' level of training, experience or trustworthiness. Three key contexts determined whether a supervisor would afford a trainee opportunity to participate in specialised practice;

a) The supervisor's perception about whether a trainee is suited to the specialty. "*It depends on one's philosophy, and I don't believe that everyone is suited for surgery or is going to make it… there are some people one looks at, and realise quite early that they have got no hands.*" **Consultant 1 Surgery**

b) Whether a trainee had decided to choose the supervisor's specialty as a career (C). "*What they are allowed to do also depends on what they are going to do for life. And there is no point pushing one's self and putting one's self under huge pressure to get a Registrar competent if they are not going to be doing it for life.*" **Consultant 1 Surgery**

c) The interest that a trainee showed in learning about the specialty during his/her interactions with the supervisor (C). "*If the trainee is interactive, that's the fundamental thing for me, and if they are asking questions and progressing and if they demonstrate by questions or by action that they are interested in listening and trying to learn then I will give them attention and time.*" **Consultant 1 Surgery**

Coinciding with supervisor subjectivity, **Surgery** (case 2) was the only case where trainees strongly emphasised the importance of demonstrating an interest (C), a motivation to learn (C), and being prepared (C) to increase their chances of being more involved in clinical practice. Trainee interest and motivation were demonstrated by asking questions, interacting with the supervisor, and being on time and involved in the preparation of the patient for surgery.

That's important for people to show interest in surgery. If they show interest, they come forward and do things. If they don't show interest, they will be in the background. **Senior Trainee 1 Surgery**
They don't want you standing there disinterested just holding things they want you to be more involved. **Junior Trainee 2 Surgery**
If you are working hard, if you are trying to be on time everywhere and if you have everything organised before they come in… it shows interest. **Junior Trainee 6 Surgery**

The pressure of time-efficiency was another context which a supervisor had to take into consideration. In the following vignette, a supervisor described two examples of trainees who worked at a slow pace; one trainee the supervisor felt was very competent and had excellent surgical skills and another trainee who was in the supervisors' view incompetent and struggled with learning basic skills after several demonstrations. Both trainees were time-inefficient; however, the trainee that showed the most potential for the profession did not put the supervisor off training this individual despite causing tension relating to time management. In fact, it prompted the supervisor to try and come up with a solution to the time problem. On the other hand, the trainee who showed no progress after repeated attempts by the supervisor to teach a specific skill, the supervisor lost complete faith in and felt the trainee was 'untrainable' and on whom

he did not want to waste more time. The first trainee was perhaps inefficient with the patient's and other surgical staff's time, yet the supervisor could tolerate this to a certain degree. The supervisor did not tolerate his time being wasted with a trainee that showed no potential to progress.

Trainee No. 1

Most trainees have no idea at all about time. I remember looking at the clock and thinking that we have three more cases to do, we better speed up here. And one of my former trainees who was very good and was interested in vascular and made good progress. I got the impression that this fellow was never in a hurry.

I asked this chap one day: "What time is it now?"

And he looked at me and said: "Excuse me?"

I said: "What time is it?"

And he said: "I have no idea."

And I said: "Well you should actually know; I know exactly what time it is. I know when you started this case, I know how much you have left to do, and I know what is left on the list."

I am very aware of it because the lists as very full for the most part and occasionally there is an urgent case to be added on and there is huge pressure to finish on time. You don't want them to be rushing to the extent that it is dangerous obviously but I always make the point to them that if you speed up, just kind of non-critical stuff as in transferring the patient, shaving, and be ready to do all these things immediately one can save some time as opposed to rushing through the operative steps. I have often thought of having a specific kind of Registrar training list where you would maybe put two or three veins on it and let it last all day, but with the best will in the world, it doesn't happen.

Trainee No. 2

We had a chap recently who was holding the langenbeck (surgical tool), which is probably the most basic thing on earth and is applicable to any open operation no matter what discipline.

I said: "How many times have you done this before? Do you think it was twenty or thirty or more?"

"It's probably more", the trainee volunteered.

And I said: "Well we shouldn't really have to discuss this twenty to thirty times, and I could understand two, three, four times, but it is not complicated. I have demonstrated it to you every time we have spoken, and we haven't made progress have we? No."
So that kind of a trainee for me is untrainable. And I am not going to waste a patients' time and the theatre nurses time and my own time in that scenario. What I do might seem a bit harsh and old school but I pick out two or three of the group that I think are interested and have potential and I put my energy into them. **Consultant 1 Surgery**

The supervisor considered all the contexts relating to their preferences, time and a trainee's potential, and decided whether he would invest time and effort into a trainee's learning. Then, a stepwise approach was used to entrust trainees to perform professional activities based on their level of experience. Trainees became gradually more involved in specialty-related professional activities. The complexity of the task steadily increased as trainees were entrusted to take on more responsibility. Eventually, trainees got to work mostly independently, but the supervisor was always close by to monitor the situation and step in when needed. A significant differentiation between **Surgery** (case 2) and the other cases, were afforded opportunities to participate in a greater range of profession-specific activities. Supervisors ensured trainee involvement and patient safety by adapting and customising their supervisory approach to an individual trainee's needs.

In the following quote, the supervisor described how he adapted clinical oversight based on the trainee's level of experience and the complexity of the task. A senior trainee might autonomously perform a straightforward procedure while the supervisor was nearby monitoring the situation. A junior trainee might also be afforded the opportunity to gain experience, and the supervisor did not prevent a junior trainee from

participating in surgery just based on their year of training alone. The supervisor implemented specific strategies to prepare the trainee in advance. For example, telling the training to read and memorise the steps of the procedure and to talk through the procedure before commencing the surgery. Once the supervisor was confident that the trainee had the relevant knowledge of how to perform a particular surgery and the trainee has demonstrated that they did not overlook the basics regarding preparation for the surgery, then the trainee was afforded participation in practice.

> *Depending on the level of what's going on; if it is straightforward appendectomy, for example, the Registrar will do it for the most part… I will look in but generally will not have to scrub, and they are competent with it, and which they are at this stage, there isn't much to say unless it is a difficult one.*
> *If it is an SHO, one will usually tell them you need to read up about x and y… I would then expect them to be able to sing off the steps of it… Starting at the very basic stuff like prepping properly, gowning properly, draping all that and they have to talk through what they are going to do before doing it.* **Consultant 1 Surgery**

Junior and senior trainees mirrored the supervisor's description of progressive **Entrustment** (M). Trainees recognised the benefit of breaking a complex task down into manageable components which can be learned piece by piece over time. They also described this as a safe environment where they had 'peace of mind' and 'space to take decisions'.

> *You start off doing the basics; you need to learn how to crawl before you walk. One of the foundation operations would be a laparoscopy… you learn how to put the ports in because there are multiple techniques for putting in ports, and then you learn how to grasp the tissues; you learn each small component.* **Junior Trainee 2 Surgery**

> *My consultant lets me do lots of things once trust is developed. There is peace of mind and have a lot of space to make decisions. That's the best thing. I learn in that kind of environment.*
> **Senior Trainee 2 Surgery**

6.1 Supervised Workplace Learning in Surgery: Real-time reciprocity between entrustment, monitoring & Modelling

In addition to **Entrustment** (M), the **Monitoring** (M) and **Modelling** (M) mechanisms were also prominent in **Surgery** (case 2). As demonstrated in the previous chapter, these mechanisms were active in the other cases as well, but in this case, the interplay between these mechanisms was more explicit. In **Geriatrics** (case 1), **Paediatrics** (case3) and **Infectious Diseases** (case 4) trainees often missed out on opportunities for observational learning because of service demands and the structure of their working day. In **Surgery** (case 2), learning from **Modelling** (M) was more common due to the nature of the specialty (C).

The interplay between **Entrustment** (M), **Monitoring** (M), and **Modelling** (M) was tangible in this case. When **Entrustment** (M) was low, learning through **Modelling** (M) increased. As **Entrustment** (M) increased, **Monitoring** (M) replaced **Modelling** (M). This interchange led to continuous learning regardless of the circumstance. **Modelling** (M) in this case also created opportunities for **Meaning Making** (M) to take place.

The following vignette illustrates the real-time reciprocity of the mechanisms of supervised workplace learning. Throughout a surgery, the supervisor made moment-to-moment decisions alternating between the mechanisms **Modelling** (M), **Entrustment** (M), and **Monitoring** (M), depending on the phase of the surgery, the trainees' performance and the patient's status. The supervisor described this as a stepwise

approach whereby a trainee could learn an entire operation without having to perform the surgery from beginning to end. Ensuring patient safety was paramount; however, efficiency was also an important determinant of the supervisor's level of involvement.

> *They won't do anything at first apart from assisting and it takes quite a while to get them to assist delicately…*
> *I usually start by getting them to do bits, for example making the skin cuts, put in a couple of ports, then hold the camera properly and retract properly. The next time they can put in a port, catch the gallbladder, dissect a bit and leave it and move on stepwise… I never have a scenario where I get them to do the entire thing.*
> *When the artery is dissected out, if it is a straightforward case I will get them cut the artery open and start taking out the plaque.*
> *But I will take it out of the internal which is the critical bit and put in the first few stitches in the internal because that is one where one doesn't want it to tear and if it is a strong enough artery I will let them stitch the rest of it… they are doing bits of the dissection, once they become competent in stitching.*
> *If the patient is any way unstable, then I just crack on with it.* **Consultant 1 Surgery**

The supervisor also described how he would monitor a trainee while operating and if he observed inaccuracies in the trainee's performance, for instance, holding a needle wrong, the supervisor's role changed from **Monitoring** (M) to **Modelling** (M) and demonstrated to the trainee the correct way to hold it. When a trainee was not trusted to execute a particular professional activity due to, for example, the complexity of the procedure or the lack of experience, observational learning became the primary mode of learning. Another trainee explained how **Meaning Making** (M) occurred while they watched a supervisor at work.

> *And one day we were doing a very difficult aneurysm, and up to that I used to say no you are holding that wrongly, that angle is wrong and sometimes I would have to stand behind him*

because when he was across the table, if you know the fella is holding the needle wrong, I can't visualise, you have to kind of stand and say this is the way it should. **Consultant 1 Surgery**
In any of those risky situations it is always the consultant that is going to do it but I from a learning point of view it is still valuable because we wall aspire to be at that stage so there is absolutely no reason why you can't learn from even watching them do it. **Junior Trainee 2 Surgery**
Our consultant is very interactive, he asks a lot of questions, and throughout the entire case he shows what's happening, what he's going to do, what's the next step, and he asks questions. **Senior Trainee 1 Surgery**

7 Summary of Principal Findings

A cross-case analysis was performed to compare the differences in supervised workplace learning across four cases. Synthesis of the findings identified case-specific contexts explaining variability in supervised workplace learning. Contextual factors related to each case attributed to a different presentation of some aspects of supervised workplace learning. **Entrustment** (M) was a supervised workplace learning mechanism mostly affected and featured in all four cases; however, different contexts specific to each case impacted this mechanism.

The realist theory of supervised workplace learning suggests that **Entrustment** (M) should lead to decreased clinical oversight and increased trainee participation in practice. This did not occur in **Geriatrics** (case 1), **Paediatrics** (case 3) and **Infectious Diseases** (case 4). Contextual factors related to supervisor proximity, supervisor style, patient population and local culture specific to the **Geriatric** and **Paediatric** cases best explained this phenomenon. Contexts such as trainee competence, level of training and

the time trainees and supervisors spend together should enhance **Entrustment** (M), yet these contexts did not have a strong enough effect to produce expected outcomes.

The trainees in **Infectious Diseases** (case 4) had limited participation in practice, similar to **Geriatrics** (Case 1) and **Paediatrics** (case 3) but for different reasons. In **Infectious Diseases** (case 4), supervisors trusted trainees with professional activities appropriate to their level of training and direct supervision was applied as necessary, yet, trainees experienced limited participation in practice. Both trainees and supervisors emphasised the impact of interventional radiology on training. **Infectious Diseases** (case 4) was the only case where this issue was raised unprompted. All four cases are part of the national health service, and therefore it can be assumed that similar resources and patient safety policies were operational in all settings. Nevertheless, participants highlighting this as a barrier to learning makes this issue unique to the **Infectious Diseases** case. The introduction of patient safety measures which resulted in the outsourcing of procedures to specialised clinical teams, as was seen in **Infectious Diseases** (case 4), adversely impacted on trainee learning. This illustrated that improved patient safety conditions do not necessarily equate to improved learning conditions. Trainee transitions was another issue voluntary raised by participants in **Infectious Diseases** (case 4). Participants from the other cases recognised the impact of working hours' regulation; however, in **Infectious Diseases** (case 4) the structure of training programmes and the local organisation of work such as rostering, presented a dilemma particular to this case.

In **Geriatrics** (case 1), **Paediatrics** (case 3), and **Infectious Diseases** (case 4), junior trainees were most severely affected by contextual factors related to those cases. Junior trainees more frequently rotated through placement (every three months) whereas

senior trainees tended to spend longer in one setting (6-12 months). **Paediatrics** (case 3) and **Infectious Diseases** (case 4) had no interns on their teams. When comparing teams who had a full complement of trainees with teams that did not have an intern the impact of team structure was easily recognisable.

Surgery (case 2) stood in stark contrast to the other three cases for several reasons. In **Surgery** (case 2), progressive **Entrustment** (M) and its intended outcomes occurred in the same way the realist theory of supervised workplace learning suggests it should. Trainee-related contexts such as level of training, experience and trustworthiness and supervisor style shaped **Entrustment** (M). Supervisor subjectivity also had a significant role in the way trainees participated in practice. A supervisor decided whether a trainee was suited to the specialty, considered whether the trainee had chosen the supervisor's specialty as a career and the quality of a trainee's motivation and interest in the specialty. Trainees visibly responded to supervisor subjectivity and made concerted efforts to demonstrate motivation and interest. The supervisor also had to consider time-efficiency and the pressures from the institution to maintain a proficient service. The supervisor did, however, appear to tolerate a certain amount of slowness from a trainee he felt had great potential and demonstrated competence. The issue about 'time' extended beyond the time spent on service provision and included the time and effort a supervisor was willing to invest in a trainee. Level of training played a role in the way trainees participated, but did not preclude a junior trainee from practice. The supervisor achieved this by tailor-making clinical oversight to a trainee's needs.

Trainees in **Surgery** (case 2) experienced progressive **Entrustment** (M). The nature of the specialty best explained this phenomenon. Furthermore, in **Surgery** (case 2), real-

time reciprocity between **Entrustment** (M), **Monitoring** (M) and **Modelling** (M) was more evident than observed in other cases. As demonstrated in the previous chapter, these mechanisms were active in the other cases as well, but in this case, the interplay between these mechanisms was more explicit.

The findings of this study illustrate the context-specificity of supervised workplace learning. The results of the realist review linked particular mechanisms to particular outcomes. For example, **Entrustment** (M) should generate outcomes such as safe participation in practice (O) and a shift in the supervisor's role (O), yet, as seen in this study the impact of contextual factors may inhibit or support these outcomes. The findings also demonstrated how specific supervised workplace learning is to the specialty within which it occurs. For 'craft' specialities (i.e., surgery) supervised workplace learning appeared to be much more obvious with supervisors taking a deliberate approach to supervision and making clear distinctions between trainees' level of training. The nature of the surgical specialty also allowed more direct contact time between supervisors and trainees and therefore enabled the mechanisms of supervised workplace learning to interact freely. For the other specialities in this study, supervisors appeared to have a uniform approach to supervision and trainees did not benefit much by virtue of their level of training or clinical experience.

The impact of organisational culture was made evident by the cross-case comparison. In **Geriatrics** (case 1) and **Infectious Diseases** (case 4) junior and senior trainees participated in handovers after being on-call the night before, whereas junior trainees in **Surgery** (case 2) and **Paediatrics** (case 3) were not expected to attend. The European Working Time Directive was operational for junior trainees in all cases; however, it

appeared that local cultural expectations trumped regulation and trainees in two cases conformed according to local expectations. A culture that supports close clinical oversight and determines trainee's scope of practice was also evident in the **Geriatric** and **Paediatric** cases.

Further discussion of the findings in Chapter 8.

8 LIMITATIONS

The limitations of cross-case analysis relate to the difficulties of conducting a multiple case study in general as stated in the previous chapter.

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Chapter 8
Discussion

1 Overview

The research programme presented in this thesis consists of four distinct yet interconnected phases involving two empirical studies and one literature review. The four phases are; the Group Concept Mapping study, the Realist Review, and the two cycles of analysis of the Multiple Case Study. The impetus for the development of this research programme was a call from the Irish Medical Council and Health Research Board for research to optimise the clinical learning environment (CLE) for postgraduate medical education (PGME).

Studies have been done on this topic. Researchers in Europe have designed tools and implemented them to measure the learning environment, whereas in the U.S. a review program evaluated clinical environments with a particular focus on patient safety and the hidden curriculum[1–6]. Evaluation of clinical learning environments has produced information on how they support learning, and demonstrated variability across different clinical settings. Existing literature has identified important aspects of clinical learning environments but these findings do not give them relative priority or consider the difficulty in implementing them. Policymakers, frontline practitioners and other influential stakeholders in postgraduate medical education have limited time and resources to make changes, and therefore any recommendations have to pinpoint exactly where to target efforts that are easily implementable and supported by robust evidence. For these reasons, the initial research question was: *'On what aspects of the*

clinical environment should we focus to better support trainee learning?' To provide clarity on this issue, I chose to draw on the experiences of people directly involved in postgraduate medical education including trainees, supervisors, and clinicians in strategic roles to gain their consensus about which features of the clinical learning environment needed the most attention. The group concept mapping study was a good starting point and indicated that the main priorities are trainee support and time with supervisors. The participants involved in the study, however, also felt that these issues were relatively difficult to address. What the GCM study could not answer was why working alongside more senior doctors were so important to trainee learning. Before making recommendations about where practitioners at the frontline should focus their attention, a better understanding of this phenomenon (which I, later on, began to refer to as supervised workplace learning) was needed. Subsequently, this led to the second overarching research question; *'How does supervised workplace learning happen and what is the role of the environment in this process?'* The realist review and multiple case study were the approaches I chose to explore this process. The findings of these two studies not only provided a better understanding of supervised workplace learning but also enhanced the robustness of the answer to the first question. Every context (clinical learning environment component) identified that has an impact on the 'mechanisms' of supervised workplace learning is relevant because these mechanisms are linked to outcomes of postgraduate medical education.

Conducting this research programme was an iterative process influenced by three key elements. 1) The studies informed each other; the results of preceding studies guided the pathway of inquiry. Gaining familiarity with the literature and input from project partners also had a role in steering the focus of the research. 2) The principles of critical

realism underpinned this research. A critical realist stance meant that data had to be interpreted in such a way that not only provided a description but also explained why the data appeared the way it did. For example, in the multiple case study, local contextual detail illustrated differentiation in the levels of supervision across clinical specialties. 3) Theory was another prominent factor in this research programme, as I will describe in the next section.

2 THEORY

'Theory' is a set of ideas or assumptions intended to explain a phenomenon[7]. The realist review was the first real turning point in this research programme towards the theoretical. A significant feature of realist review is that it starts with theory and ends with theory[8]. This means developing an initial programme theory which explains the assumptions underpinning the 'intervention' which is under review. Then, synthesising of empirical research produces a more robust and nuanced theory to explain why, when, for whom and under what circumstances the intervention works. The 'intervention' in this research programme was postgraduate medical education with a specific focus on supervisor-trainee interactions which ultimately led to a description of supervised workplace learning.

To develop an initial programme theory required careful consideration of existing theories which explain how trainees learn in postgraduate medical education. There is no singular theory of workplace learning in postgraduate medical education, therefore, to understand how trainees learn through work required an eclectic combination of available theories. (The theories on which the initial programme theory was based were described in Chapter 4. I will briefly refer to these again because they offer an important

contribution to understanding the findings of the realist review in particular and the research programme in general.)

By drawing on substantive theory, an initial theory was outlined which was further developed by synthesising the findings of empirical studies to produce a realist theory of supervised workplace learning. The realist theory described three processes; Supervised Participation in Practice, Observation of Practice, and Dialogue about Practice, and their six underpinning mechanisms; Entrustment, Support Seeking, Monitoring, Modelling, Meaning Making and Feedback. The realist theory explains how contexts at individual and interpersonal, and local and systems levels trigger or inhibit these mechanisms and shape their outcomes. The mechanisms of supervised workplace learning may generate outcomes related to safe participation in practice, a shift in the supervisor role, professional identity development, evaluation of trainee trustworthiness, dialogue about practice, learning knowledge, skills and attitudes, learning the application of theory to practice, affective support and career choice. Subsequently, this framework underpinned the analysis of the multiple case study, which led to further testing and refinement of the theory.

2.1 Alignment of the realist theory of supervised workplace learning to substantive theory

This research programme drew on several substantive theories including Cognitive Apprenticeship[9], Communities of Practice[10] and Workplace learning as described by Billett[11,12], Teunissen[13–15] and Dornan[16,17]. Below is a discussion of how the findings of this research programme aligned with these theoretical perspectives and the limitations of substantive theory to adequately explain or contextualise supervised workplace learning for postgraduate medical education.

2.1.1 Cognitive Apprenticeship

The principles of cognitive apprenticeship are prevalent in the clinical training of doctors[18] and were useful for developing an initial theory for explaining trainee learning through supervision. Cognitive Apprenticeship conceptualises 'learning through guided experience'[19] and involves conscious demonstration by 'making thinking visible'[19]. These processes are captured in the Meaning Making, Monitoring, and Modelling mechanisms. The description of Meaning Making also draws on Cognitive Apprenticeship concepts of articulation (learner verbalisation of knowledge and thinking) and reflection (comparing performance with that of experts)[9,19]. Whereas Monitoring is very similar to 'coaching' – observing and facilitating a learner performing a task[9,19]. The apprenticeship model does have limitations. Collins' conceptualisation of apprenticeship centres around teaching cognitive skills, such as reading and mathematics, to children in the classroom, and therefore does not account for the complexity of supervised workplace learning. From the findings of this research programme, it became evident that being 'competent' as a doctor is a complex concept, and 'expertise' is not a straightforward transition from novice to expert because the system in which it occurs is not stable; it is a fragmented and open system. In the complex profession of medicine, 'expertise' is not a fixed state of what an individual knows, can do or value, but a product of what a group (a community of practice) value and need at a certain moment in time[20] as illustrated by the multiple case study. The 'process' of apprenticeship, however, does provide valuable insights. Even though the transition from novice to expert is not linear and does not have a deterministic endpoint, learning still occurs from 'novices' and 'experts' interacting with each other in a specific social and cultural context.

2.1.2 Communities of Practice

Communities of Practice was another useful perspective for looking at, and understanding supervised workplace learning and postgraduate medical education in general. Communities of Practice have some similarity to Cognitive Apprenticeship as both emphasise the importance of newcomers to a community to learn by working alongside more experienced individuals[10,21]. The process of legitimate peripheral participation was identified in the realist review and multiple case study whereby supervision mediated a trainee's proximity to practice. Communities of Practice also involves learning by sharing experiences, stories, tools, and ways of addressing recurring problems[10] which was mirrored by the findings relating to the Meaning Making mechanism. Becoming a member of a community of practice involves newcomers demonstrating accountability through valued knowledge and behaviours that may lead to greater participation – this notion was reflected by the Entrustment mechanism. Moreover, Communities of Practice provide insights into contexts for the Support Seeking mechanism, describing participation as a claim to recognition as a competent member[10].

Communities of Practice theory also played a role in the multiple case study where similarities and differences across specific communities of practice (i.e., a particular specialty within a particular institution) were investigated. The case study identified case-specific structures that shaped individuals' engagement with supervised workplace learning. It also indicated that trainee engagement in a particular context shaped their professional development, but that development was limited to the expectations, values and structures of the setting (community of practice) in which supervised workplace learning occurred. Furthermore, the findings of the group concept mapping

study were also congruent with Communities of Practice. The GCM study indicated that the consensus amongst doctors and other participants was that the domains related to trainees' association and engagement with supervisors and other members of the clinical team. Supervised workplace learning takes place in the context of trainee interaction with more senior doctors.

2.1.3 Workplace Learning

Trainees learn through work. Learning is an inevitable outcome of everyday thinking and acting at work and arises from the activities and interactions afforded in workplaces. Moreover, individuals choose whether (or not) to engage with these affordances[11]. The Modelling mechanism described in the realist theory is typically unaccompanied by verbal explanation, similar to Billett's mimetic learning (observation, imitation and practice)[12]. Likewise, Teunissen identified three mechanisms involved in workplace learning; *mimicking, making sense of what is happening, combining previous experiences to devise new approaches to a problem*[15] which were reflected by the description of the Modelling mechanism and its outcomes.

Both Billett and Teunissen recognised that what an individual already knows, can do and value impact learning and are the product of previous experiences[15,22]. This means that learning from experience is dependent on the individual to a certain extent; previous experience is a 'context' that trainees bring to their current workplace[23]. This is reflected in trainee-related contexts identified in the realist review.

Dornan described a model of Experience Based Learning, which is based on undergraduate medical students clinical learning experiences[16,17]. This model shares many features with the realist theory. Like the results of the realist review, Experience

Based learning also emphasises the importance of dialogue and observation of practice for learning and professional identity development. Dornan's model also identified some contexts for example relating to the curriculum[16] that impact on these processes; however, the contextual differences between undergraduate and postgraduate medical education limits the transferability of this framework.

2.1.4 Limitations in applying substantive theory to supervised workplace learning

None of the theories described place a strong emphasis on the supervisory relationship on how supervisor-trainee interactions shape and generate learning. Monitoring, as described in the realist theory, is not prominent in substantive theory perhaps because it is driven more by patient safety than educational outcomes. Substantive theory does not distinguish between general dialogue and Feedback; however, this was described as a mechanism in its own right because of the substantial literature relating to it and its specific outcomes and context. High range theories do not provide sufficient 'programme specificity' to apply directly to the design and delivery of postgraduate medical education, and they are insufficiently contextualised to apply to postgraduate supervised workplace learning directly. This research programme addressed these limitations. As a middle-range theory, the results of the realist review unravelled how higher substantive theories apply to postgraduate medical education acknowledging the critical role of context and complexity.

3 ISSUES THAT EMERGED FROM THE RESEARCH

The analysis of the case study data was underpinned by the realist theory of supervised workplace learning. By taking this approach the realist theory was tested and refined, and also provided an opportunity to investigate and compare the process of supervised

workplace learning in several contexts. More work has to be done in this area, and later on in this chapter I outline suggestions for future research. Nevertheless, several issues were identified through the case study which are important to highlight again at this point. The points I discuss below relate to the overarching finding that supervised workplace learning emerges from the local context. Local culture and practice impact on supervised workplace learning in general, and the outcome of trainee participation in practice in particular. Early in the research programme the GCM study indicated that the domain workplace culture was central to seven of the other domains, including those rated most important to address. This indicated that most aspects of clinical learning environments are linked to workplace culture, a finding that was echoed in particular by the findings of the multiple case study and also by the results of the realist review.

3.1 Limited Trainee Participation in Practice

In the case study, there were commonalities of supervised workplace learning across all four cases as demonstrated by the pattern matching analysis of the data. On the other hand, certain patterns of supervision were idiosyncratic to individual cases. The Paediatric and Geriatric cases, for instance, appeared to support a culture of close clinical oversight. In the Paediatric case, a culture of 'running everything by a consultant' was embedded, and supervisors expected this behaviour from trainees. In the Geriatric case, the culture of 'this is the way we do things' was the norm. Supervision of trainees in both cases appeared to be disproportionate to their learning needs which impacted trainees' participation in practice. The term 'helicopter parenting' is often used for parents who are overinvolved in their children's' lives by trying to control every part of it. In the Paediatric and Geriatric cases, a form of 'helicopter supervision' occurred and

trainees felt suffocated by the experience. Trainees in Infectious Diseases also had a limited range of professional tasks from which they could gain learning experience. Local practice and policy, instead of workplace culture, led to trainees missing out on performing these tasks. In all three cases, trainees expressed their concern about the impact of limited practice on their professional development.

3.2 The Static Supervisory Relationship

Limited trainee autonomy was associated with a static supervisory relationship. A static supervisory relationship was characterised by limited or no evolution of trainee roles and responsibilities or fading of oversight. This phenomenon was most prevalent in the Geriatric and Paediatric cases and mostly affected junior trainees. Some senior trainees wished that they 'could do more' and a Paediatric supervisor said that even when she came to trust a trainee over time, she still felt that she had to take the lead in patient management. Participants often described patient care as supervisor-led; however, the data indicated that patient care is perhaps better described as supervisor-delivered in a lot of cases.

Contexts which best explained why supervisor and trainee roles remained more or less unchanged during their time together (i.e. duration of a rotation) related to workplace culture, supervisory style, patient population and the structure of training programmes. Supervised workplace learning experienced in the surgical case illustrated that supervision and autonomy are not mutually exclusive. By interchanging the mechanisms of supervised workplace learning, a supervisor was able to balance the duality between supervision and autonomy.

3.3 Fractured training trajectories

Another issue that relates to the previous points is that we can assume that trainees who are new to a supervisor have a low starting point of trust. The findings of the multiple case study indicated that even when having access to information about a trainees' previous performance, supervisors prefer to make evaluations of trainee trustworthiness based on their own experiences of working with a trainee. At the beginning of rotation or transition to a clinical workplace, several interactions occur between trainee, supervisor, and the environment. At the start of a rotation, trainees are likely to seek senior support as they work out local practices[24]. Junior doctor learning is understood as situated, and entails participation in a community and emphasises the ways trainees learn to fit in with the culture and working practices of their new environment[21,25]. Trainees come to learn local rules and conventions regarding contact with their supervisor early in a rotation[26]. Additionally, we know that trust becomes a consideration when a supervisor works with a new trainee[27] and involves a degree of presumptive trust[28] derived from the seniority of the trainee. The balance between trust and supervision at this early stage can vary amongst supervisors and may be characterised by uncertainty[27]. The implication is that individual training trajectories are fractured. Every time a trainee comes under the supervision of a new supervisor they have to start the process all over again, and there is no guarantee that Entrustment will continue to progress along the same trajectory as what they were on during a previous rotation.

3.4 Lack of Recognition of Trainees' Role in Supervised Workplace Learning

Too little attention has been given to the role of trainees in the process of supervised workplace learning. The literature on supervision predominantly centres around what

the supervisor is expected to do and strategies on how to be an effective supervisor[29,30]. Descriptions of supervision often emphasise that the supervisor 'provides' something to a trainee. Kilminster's suggested the following definition of supervision[31];

> *The provision of monitoring, guidance and feedback on matters of personal, professional and educational development in the context of the doctor's care of patients. This would include the ability to anticipate a doctor's strengths and weaknesses in particular situations in order to maximise patient safety.*

Likewise, apprenticeship theory emphasises what the 'expert' is expected to do (i.e., coaching, scaffolding, etc.). Literature also identifies ways in which supervisors can contribute positively to trainee learning through the skills and qualities supervisors' possess or can develop[31]. Supervising trainees' workplace learning is not just an act of giving or delivering; it is a process. The results of the realist review indicate that supervised workplace learning is a two-way process, requiring leadership, input and effort from both supervisor and trainee. The mechanisms of Entrustment, Support Seeking, Monitoring, Modelling, Meaning Making and Feedback are inherently reciprocal and inter-dependent. Supervisors cannot trust trainees if they cannot depend on them to seek support when appropriate. Monitoring is supervisor-led whereas Modelling requires reflection from trainees. Dialogue about practice is naturally a joint enterprise whereby supervisors and trainees make sense of clinical work which guides further learning and the continuation of patient care. The findings of this research programme offer a description of supervision that expands on Kilminster's definition;

Supervised workplace learning is a process whereby a supervisor entrusts, monitors and offers feedback relative to trainee work performance, at the same time, a trainee seeks support, models, and makes meaning from, about and with supervisors in relation to his/her work performance. This process requires input, effort and ability from both supervisor and trainee as well as both party's awareness of the influence of the workplace in which these interactions happen.

Explicitly defining not just the supervisor's but also the trainee's role may facilitate a shift away from trainees being passive recipients of pedagogical strategies towards becoming proactive partners in their learning.

4 Practical Implications

It is important to acknowledge that these findings are based on a 'snapshot' of supervised workplace learning in a specific time and place, with a limited number of trainees and supervisors. Furthermore, my reflections on these findings are not intended to be a criticism of how postgraduate medical education occurred in these cases, but rather by highlighting the idiosyncrasies of trainee learning across different contexts, lessons can be learned that may help improve PGME as a whole. Studies evaluating PGME often reflect harshly on supervisors i.e., that they do not provide enough feedback, poor communication skills, lack of time etc. My intention is not to produce similar information. When looking deeper than the superficial observation of how participants experience supervised workplace learning, you come to realise that all participants' including supervisors' behaviours are shaped based on the external forces acting on them. Concerns about patient safety, the 'tyranny of efficiency', and the

diminishing time trainees spend in the clinical environment are some of the contexts which may explain how trainees are supervised. Erosion of trainee autonomy has been noted in the literature also, and factors such as the fear of lawsuits, regulation, differing views about autonomy to name a few have led to supervisors restricting trainees' practice[32,33].

Acknowledging that the way supervised workplace learning occurs arises from the context in which it happens is the first step in any attempt to optimise trainee learning. The findings of the case study indicate that trainees and supervisors experience supervised workplace learning differently across settings, the level of trainee oversight may be excessive (for real-world reasons) and local contexts limit the mechanisms of Entrustment to generate its intended outcomes. When Entrustment does not produce both the outcomes of increased trainee participation in practice and a decrease in supervisory support, the risk is that trainees may not learn to become self-sufficient. When considering trainee participation in practice, complete autonomy may not be expected or even desired, at the same time, trainees need to be challenged to learn. Clinical environments creating a situation where trainees are excessively supported may have negative repercussions on the readiness of trainees to take on more senior roles, for instance, when transitioning to a higher level of training or independent practice. The findings of the realist review suggest that the decision to seek support is highly complex and knowing when to seek support is an essential professional skill. Trainees cannot learn this skill if they are not afforded the chance to make independent decisions about patient care. Trainees need to navigate real-world situations by using their own knowledge, skills and effort. Experiencing the bumps and bruises of real-life medical

practice is a valuable component of professional growth and development. It strengthens trainees resolve, decision-making and resilience when facing challenges.

Below I outline some suggestions of how to address the issues highlighted by this research. These suggestions are based on what we know about how the mechanisms of supervised workplace learning and the role of the environment in this process and require input from supervisors, the broader health system and training bodies, and importantly, the trainees themselves.

4.1 Trainees' role

Trainees can be proactive partners in their learning because they possess agency. Agency is the ability or capacity of an individual to act consciously; it implies a sense of free will, choice or autonomy. Agency is often associated with reflexivity (conscious monitoring and reflecting upon the consequences of experiences), rationality (selecting behaviours most likely to achieve given preferences or intentions) and motivation (the desire to realise a particular intention or preference)[34]. Trainees should be prepared to be agentic learners and empowered to make informed, responsible choices about their learning. To achieve this, trainees need to be better equipped with knowledge tools to enable them to create positive environments themselves. Communities of Practice tells us that learning is not a uni-directional transfer of knowledge, skills and behaviours; newcomers have the potential to shape learning within the group[10]. Likewise, Billett identified that individuals choose how they interact with workplace affordances[11]. This means that trainees should and can initiate actions that support their learning within the context of their learning environment. By preparing trainees to be agentic learners

implies that they will be the producers of their training instead of merely products of clinical workplaces[35].

Trainees need to understand how their learning is happening fully and the potential of the mechanisms of supervised workplace learning to be activated in any clinical situation they find themselves. Additionally, trainees have to become more reflective about influential contexts in their learning environment and recognise how these are likely to impact on their training so that they can adjust their approach to learning accordingly. Trainees must learn to 'see' what the environment affords; to recognise learning opportunities and take responsibility for their own learning processes and outcomes. It is important that trainees recognise the diverse ways of knowing, learning, and sharing knowledge across clinical learning environments. Context matters and requires continual evaluation to determine how it may restrain or create opportunities for learning. This means that trainees have to be acutely aware and vigilant about determining the contexts which may impact on learning that are specific to the setting in which they are based. This should be a continuous process throughout the duration of a supervisory relationship (or rotation) and repeated across all settings in which training happens. The realist review and case study can perhaps offer templates of contexts that should be considered, but of course, the findings of this research is not an exhaustive list and trainees should be open to other possibilities. Trainees must recognise that learning can occur even when they find themselves working with a supervisor who will not allow much autonomy. Dialogue and observation are key in such a situation. If a trainee finds himself in a situation where they feel they want more autonomy, a better understanding of how supervisors make entrustment decisions may be helpful; what they are looking for in a trainee, what trainee-related contexts increase

their perception of trustworthiness and what behaviours are considered to be red flags. These contexts were outlined in detail in Chapter 5.

4.2 Supervisors' role

Trainees taking a more proactive approach to their learning does not preclude supervisory intervention. Supervisors should contribute to this process equally. The findings from the multiple case study are an excellent example of the importance of the supervisor explicitly deciding and giving roles and responsibilities to trainees. For example, in the surgical case where trainees had clear roles and responsibilities trainee perceptions of the learning value of those roles were positive. In the Geriatric and Paediatric cases where roles and responsibilities were not clearly defined, trainees had negative attitudes to the jobs they were given – mundane, repetitive, etc. In the style of the surgical supervisors, supervisors in all cases should have a more deliberate approach to training. Presumptive trust based merely on level of training is not good enough, and supervisors should be explicit about what they expect, what is going to happen and who is doing what and why.

4.3 Health and Training Systems' Role

The most influential members of the supervisory partnership are the supervisor and the trainee; however, some aspects of training require external intervention on the part of postgraduate training bodies, policymakers and health service providers. The realist review demonstrated a clear relationship between effective supervised workplace learning and safe patient care. This makes postgraduate medical education as much the mission of health systems managers as it is of programme directors. The realist review identified multiple overlapping systems' contexts influencing the mechanisms of supervised workplace learning. Clinical workload and shorter working hours as a result

of the European Working Time Directive were also identified as barriers to this key aspect of learning in clinical environments by the GCM study. Working hour regulation has led to a reduction in trainee time spent with senior doctors, an increase in workload for both trainees and supervisors, and fragmentation of clinical teams[36–39]. The individual statements made in the GCM about these issues indicated that less time spent in the clinical environment reduces opportunities to learn through clinical work, to benefit from apprenticeship learning and has led to trainee discontinuity with patient care. The realist review demonstrated how patient census related to time constraints and was frequently cited as impacting on trainee learning[36,40–42]. Frequent transitioning is considered compulsory to expose trainees to a variety of experiences that guide specialty choice and promote clinical expertise. Rotating through different environments, teams, specialties and patient populations has its advantages, but it cannot be denied that frequent rotations can be very disruptive to the supervisory relationships and trainee learning. What this research has reemphasised is that trainees and supervisors need more time together. Shared practice takes time and sustained interaction[43]. Time for supervisors and trainees to work alongside each other should be a primary consideration when organising work and education.

One of the barriers identified in the GCM study as important to address was the lack of curriculum in postgraduate medical education. A curriculum is a plan for learning and usually includes information about the learning objectives, content, and assessment trainees will experience. Postgraduate training bodies outline the educational pathway of trainees in broad terms; however, detailed information about the components of trainees' programme of study is not readily available. Not knowing the planned learning and intended outcomes of postgraduate medical education may leave supervisors and

trainees unsure of what is expected of them, what they can expect, what they need to do or how to prepare for learning. The results of the realist review captured major curricular components; it offers a comprehensive blueprint of what learning processes trainees encounter and the learning outcomes that these processes are expected to generate. The advantage of using the realist theory as a guide to creating a workplace learning curriculum is that it links the process by which learning occurs to educational and health care outcomes. For example, to ensure that trainees achieve the outcome of learning the application of theory to practice, a workplace learning curriculum should afford learning experiences that would trigger the mechanisms of Modelling, Meaning Making and Feedback to occur through supervisor-trainee interaction. Another key outcome of PGME is professional identity development, and therefore, a workplace learning curriculum must stipulate that learning environments should encourage Support Seeking behaviour and emphasise the importance of dialogue with senior doctors. A supervised workplace learning curriculum for PGME can be planned similarly to the previous two examples by incorporating all the CMO configurations described by the realist theory.

The realist theory of supervised workplace learning may apply to the clinical training of medical students. In undergraduate medical education, students spend time in clinical environments and depending on the institution may have a limited role in participating in practice. Therefore, medical students experience supervised workplace learning albeit to a lesser extent than postgraduate trainees. Similar mechanisms as described by the realist theory may be triggered during undergraduate medical training. It is reasonable to suggest that the mechanisms Monitoring, Modelling and Meaning Making would be at play when, for example, medical students participate in a ward round. Or,

when a medical student takes a patient history, the mechanisms Entrustment, Monitoring and Feedback could be activated as a supervisor observes the interaction and debriefs the student on his/her performance. However, without further research, it is not possible to state the relevant contexts and outcomes which may relate to these mechanisms during medical student interaction with senior doctors. Stakeholders within the medical education system should promote clinical learning environments that support effective supervised workplace learning across the continuum of medical education. Doing this, may promote medical student and trainee professional development and enable young doctors to recognise the nature of workplace learning at an earlier stage which in turn may allow them to get the most out of their undergraduate and postgraduate training.

5 FUTURE RESEARCH

5.1 FURTHER DEVELOPMENT AND REFINEMENT OF THE REALIST THEORY

The framework of supervised workplace learning described in this dissertation will continue to be a work in progress. As new developments and research in this field emerge, it is anticipated that further contexts, outcomes and possible mechanisms may be identified. The application of the framework to different settings, trainees and supervisors will determine its utility in medical education research and to support the design and implementation of postgraduate medical education.

5.2 SUPERVISED WORKPLACE LEARNING AND TRANSITIONS

Trainee learning is a journey through a landscape of different and complex practices[44]. The rotatory model will remain standard practice in postgraduate medical education; therefore, we must find ways to support the supervisory relationship especially during

critical times such as transitions. Not enough is known about how supervisors and trainees navigate frequent transitional moments. Furthermore, transitions occur within clinical environments unique in their culture, practice, and work activities and, therefore, we need a better understanding of how these contextual factors shape trainees' and supervisors' response to change. Further research about how the supervisory relationships forms, particularly during the crucial time at the beginning of a new rotation may give us a better insight into how to optimise this process. Existing research refers to transitions as 'critically intensive learning periods' during which trainees adjust to the idiosyncrasies of a new workplace and form relationships with other doctors[45]. Transitions can present both challenges and opportunities. Frequent transitions allow for greater diversity and breadth of clinical experience, teach trainees how to adapt and cope with multiple practice styles and promote greater trainee independence[46]. At the same time, when entering a new clinical environment, trainees may find it challenging to handle the new responsibilities that accompany the transition[47]. There is ample literature on how supervisors develop trust in trainees[27,28], how they progress trainees independence in clinical practice[24,48] and manage trainee autonomy[49]. In the current literature, there is an emphasis on 'preparing' medical graduates and trainees for transitions[50,51]. There are some programs (mostly aimed at medical students and interns) like boot camps and simulation, which are helping trainees prepare for transitions and practice[52,53]. An alternative approach is to gain a better understanding of how to help newcomers to cope with change and trainees' process of adaption to contextual change. I was recently granted funding to undertake research to investigate this issue.

5.3 SPECIALTY-SPECIFIC SUPERVISED WORKPLACE LEARNING

Specialty is an important context which influences how trainees experience supervised workplace learning in particular when comparing 'craft' or procedure-based fields with other specialties. Proximity to the supervisor related to the Geriatric, Paediatric and Surgery cases appeared to generate different outcomes. In the Geriatric and Paediatric cases, trainees and supervisors spent a lot of time together in the same clinical environment. Trainee proximity to the supervisor facilitated the mechanisms of supervised workplace learning to a certain extent, yet, trainees still experienced limited participation in practice. In surgery, on the other hand, trainees and supervisors were also in frequent contact with each other. Supervisors spent a lot of time with trainees, in particular, in the operating theatre and unlike the Geriatric and Paediatric cases, trainees experienced progressive entrustment and their participation in practice gradually increased. The nature of the work associated with each specialty seems to be the best explanation for this observation, but may not be the full picture and is worthy of further exploration. It is important to learn more about this issue to find ways to better support the supervisor-trainee dynamic and learning associated with growing independence in all specialties.

6 STRENGTHS AND LIMITATIONS

The research programme had several strengths. The adoption of critical realism as an underlying philosophical approach allowed a more in-depth exploration of trainee learning in clinical environments. By taking a critical realist stance a realist theory was developed which explains the processes and mechanisms of supervised workplace learning as well as the impact of context on these mechanisms ability to generate outcomes. Critical realism argues against the predictive use of theory, and this led to

subsequent empirical research to test and refine the theory. This research programme demonstrated how a critical realist approach facilitates the steady unearthing of deeper levels of understanding about a phenomenon.

The conceptual orientation and methodologies in this research programme are not often explicitly used in medical education research. It was challenging at times, as I did not have much literature in this field to turn to on how to apply, in particular, critical realist theory and case study methods, to practice. I hope that the work that I did will support other researchers whom may wish to adopt a similar approach in future. The more the approach is used, the more it will develop and become of more practical relevance to the field of medical education research.

Combining different research methods enabled data triangulation, which enhances one's confidence toward the results[54–57]. Triangulation, in this research programme, was achieved in several ways. Firstly, data triangulation, which involved gathering data at different times and situations, from various subjects. Secondly, investigator triangulation, which included more than one field researcher to collect and analyse the data. And lastly, methodological triangulation, which meant the combination of different research methods[58]. The pluralism implied by these forms of triangulation is coherently underpinned by the ontological and epistemological assumptions of critical realism.

By choosing case study research, I was able to examine the phenomenon of supervised workplace learning within multiple contexts that it happens. Furthermore, the detailed qualitative data produced by the case study helped to explain the complexities of real-life situations which may not have been captured through, for example, survey research.

Some limitations of this research programme must also be acknowledged. Drawbacks of case study research are that it is long, difficult to conduct and produces a big amount of data. I dealt with this issue by managing and organising the data systematically. Lack of generalisability is another frequent criticism of case study research, then again the intent of the research was not to generalise findings, but to deliver valuable context-dependent knowledge. All the empirical research was conducted in an Irish context; therefore, the findings may not accurately mirror the reality of postgraduate medical education elsewhere. The realist theory was generated from empirical research from multiple countries and specialties and a large part of the theory aligned with the observed data patterns from the case study. For that reason, I feel confident that the framework will be useful to researchers and other individuals involved in postgraduate medical education locally and abroad. Either way, the findings that are presented in rich and robust narrative description which will allow readers to judge for themselves the usefulness of the knowledge generated by this research programme.

7 IMPACT STATEMENT

The research presented in this thesis has the potential to have impact within and beyond academia. I have promoted the research through various routes such as knowledge-exchange and engagement with knowledge-users, and dissemination of the research outputs. Throughout this project, I established relationships with knowledge-users who were partners in this project. These individuals are representatives of Postgraduate Training Bodies, the Medical Council, and the Health Service Executive (HSE). The results will be valuable to these knowledge-users to support trainee learning through

policy, design and operationalisation of postgraduate medical education. The results will enable health service managers and postgraduate medical education policymakers to understand how they and their organisations can support postgraduate medical education and make changes to their policies and practices accordingly. The knowledge-users that I engaged with during this programme are well-positioned to lead dissemination and identify audiences within their own organisations. The Medical Council and Postgraduate Training Bodies are frequently involved in public engagement. Based on their experience, they will be able to assist with the dissemination of events to ensure effective dissemination. The outputs of this research will be officially launched later this year in conjunction with a meeting hosted by these organisations. Public dissemination of the project and its outputs will be through news and social media. I also presented the research at national and international conferences and published and submitted for publication in peer-reviewed journals. The research was only completed recently, and therefore it is difficult to determine the impact at this early stage. By continuing to promote the project and engaging with knowledge-users, I am hopeful that this work will contribute to the advancement of the postgraduate medical education locally and abroad.

Conference publications

Meeting	Title
ICRE (International Conference on Residency Education) Quebec City, 21st October 2017	Oral presentation. *High-quality graduate clinical learning environments in challenging times.* Poster presentation. *Clinical learning environments for graduate medical education: A realist synthesis.*
AMEE (Association for Medical Education in Europe) Helsinki, 26th August 2017	Oral presentation. *Realist review of workplace learning in postgraduate medical education and training.*

INMED (Irish Network of Medical Educators) Cork, 8/9th February 2018	Oral presentation (hot topics). *A Realist Synthesis of Clinical Supervision in Postgraduate Medical Education* Oral presentation. *Workplace and Specialty Related Culture and Practice of Clinical Supervision - A Multiple Case Study*
INMED Dublin, 28th February 2017	Oral presentation. *Clinical Learning Environments for Postgraduate Medical Education: A Realist Synthesis.*
INMED Belfast, 5th July 2016	Oral presentation. *Exploring allied health staff and students' experiences and opportunities for using inter-professional education in clinical practice.* Oral presentation. *Learning and working in clinical environments*
ASME (The Association for the Study of Medical Education) Belfast, 7th July 2016.	Oral presentation. *Clinical learning environments for postgraduate medical education: a realist synthesis.* Oral presentation. *Exploring Clinical Learning Environments for Postgraduate Medical Education & Training. A Group Concept Mapping study.*

Also, I will present my doctoral report at AMEE in August 2018.

Journal Publications

- Kilty C, Wiese A, Bergin C, Flood P, Fu N, Horgan M, Higgins A, Maher B, O'Kane G, Prihodova L, Slattery D., Stoyanov S, Bennett D. *A national stakeholder consensus study of challenges and priorities for clinical learning environments in postgraduate medical education.* BMC Medical Education. 2017 Nov 22;17(1):226.
- Wiese, A., et al. (2017). *Protocol for a realist review of workplace learning in postgraduate medical education and training*. Systematic Reviews 6: 1-6.
- Realist review - accepted for publication in *Medical Education*
- Case study – in preparation for publication in *Medical Education*

8 Conclusion

I started this research programme with the goal to make recommendations to improve clinical learning environments for postgraduate medical education. Early on, I gathered data from key stakeholders about essential and easily implementable ways of doing this. Along the way, my focus narrowed to supervisor-trainee interactions in clinical environments. At the same time, I realised that a better understanding of supervised

workplace learning and the role of the environment in this process is a critical adjunct to efforts to improve postgraduate medical education. What I ended up with is a better understanding of how to contextualise, through the components of clinical learning environments, the process, mechanisms and outcomes of supervised workplace learning. Understanding the context of supervised workplace learning is vital because it will affect its success. Layers of contexts shape how trainees learn with, from and about supervisors. At the centre is the supervisor-trainee relationship; at a higher level, local and systems contexts compounding, even more, the complexity of the relationship. The final output of the synthesised literature and empirically tested and refined realist theory contributes to a more consistent conceptualisation of trainee learning through supervisor guidance. A better understanding of supervised workplace learning including its contexts and outcomes will allow supervisors, trainees, researchers, policymakers, and managers to appraise postgraduate medical education and have a better chance to make improvements successfully.

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Appendices Section

A. Research ethics committees' documents
B. Group Concept Mapping: journal publication
C. Realist Review protocol: journal publication
D. Realist Review: search strategy
E. Realist Review: data extraction form for citation table
F. Realist Review: citation table

Appendix A1 – Research ethics approval (Group Concept Mapping)

UCC

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Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

COISTE EITICE UM THAIGHDE CLINICIÚIL
Clinical Research Ethics Committee

Lancaster Hall,
6 Little Hanover Street,
Cork,
Ireland.

Our ref: ECM 4 (l) 13/10/15 & ECM 3 (hhhhh) 13/10/15

21st September 2015

Dr Deirdre Bennett
Senior Lecturer
Medical Education Unit
University College Cork
Room 2.53
Brookfield Health Sciences Complex
College Road
Cork

Re: Group concept mapping of strengths and weaknesses of clinical learning environments for postgraduate medical education and training.

Dear Dr Bennett

The Chairman approved the following:

- Insurance Details.

Full approval is now granted to begin this study.

Yours sincerely

Professor Michael G Molloy
Chairman
Clinical Research Ethics Committee
of the Cork Teaching Hospitals

The Clinical Research Ethics Committee of the Cork Teaching Hospitals, UCC, is a recognised Ethics Committee under Regulation 7 of the European Communities (Clinical Trials on Medicinal Products for Human Use) Regulations 2004, and is authorised by the Department of Health and Children to carry out the ethical review of clinical trials of investigational medicinal products. The Committee is fully compliant with the Regulations as they relate to Ethics Committees and the conditions and principles of Good Clinical Practice.

Ollscoil na hÉireann, Corcaigh - National University of Ireland, Cork.

Appendix A2 – Research ethics approval (case study)

UCC

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Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

COISTE EITICE UM THAIGHDE CLINICIÚIL
Clinical Research Ethics Committee

Lancaster Hall,
6 Little Hanover Street,
Cork,
Ireland.

Our ref: ECM 4 (r) 01/12/15

23rd November 2015

Dr Deirdre Bennett
Head of Medical Education Unit
University College Cork
Room 2.53
School of Medicine
Brookfield Health Sciences Complex
College Road
Cork

Re: Activity System Analysis: Exploring Clinical Learning Environments for Postgraduate Medical Education and Training.

Dear Dr Bennett

Expedited approval is granted to carry out the above study at:

- Cork University Hospital
- Mercy University Hospital.

The following documents have been approved:

- Protocol Submission Form signed 26th October 2015
- Study Protocol
- Insurance Certificate
- Participant Information Leaflet for Interviews
- Participant Consent Form for Hospital Staff
- Semi-Structure Interview Guide for Senior Doctors, Trainers and Trainees
- Semi-Structured Interview Guide for Allied Healthcare Professionals
- Interview Guide for Focus Group for Trainees and Trainers
- Participant Information Leaflet for Audio-Diaries
- Participant Information Leaflet for Observation
- Participant Information Leaflet for Focus Group
- Study Consent Form.

We note that the co-investigators involved in this study will be:

- Professor Mary Horgan, Dean School of Medicine, Dr Mike O'Connor, Clinical Director, Dr Siun O'Flynn, Head of Medical Education, Professor Colm Bergin, Dean of Postgraduate Training, Professor Patrick Flood, Professor of Organisational Psychology, Dr Dubhfesa Slattery, Consultant Paediatrician, Dr Michelle Reardon, Dr Bridget Maher, Senior Lecturer, Professor Martina Kelly, Dept of Family Medicine, Professor Agnes Higgins, School of Nursing, Mrs Margaret Murphy, Patient Advocate, Dr Na Fu, Business School at Dublin City University, Dr Grainne O'Kane, Chair and Dr Slavi Stoyanov.

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6 Little Hanover Street,
Cork,
Ireland.

Yours sincerely

Professor Michael G Molloy
Chairman
Clinical Research Ethics Committee
of the Cork Teaching Hospitals

The Clinical Research Ethics Committee of the Cork Teaching Hospitals, UCC, is a recognised Ethics Committee under Regulation 7 of the European Communities (Clinical Trials on Medicinal Products for Human Use) Regulations 2004, and is authorised by the Department of Health and Children to carry out the ethical review of clinical trials of investigational medicinal products. The Committee is fully compliant with the Regulations as they relate to Ethics Committees and the conditions and principles of Good Clinical Practice.

DEPARTMENT OF RESEARCH
Children's University Hospital
Temple Street, Dublin 1
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Dr Deirdre Bennett
Head of Medical Education Unit
Room 2.53 School of Medicine
Brookfield Health Sciences Complex
University College Cork
College Road
Cork

23rd March 2016

Re: 16.010. Activity systems analysis- exploring clinical learning environments for postgraduate medical education and training

Dear Dr Bennett,

We thank you for attending the Ethics Research Committee meeting held on Tuesday 8th March and for providing further clarification.

The Committee approved your proposal subject to the acceptance of the following amendments:

1. The participant consent form and participant information leaflet should be provided on headed paper.
2. A pathway should be identified whereby serious concerns regarding training or ability identified by study participants might be remedied participants appropriately supported.

We would be grateful if you could forward copy of the amendments above to the Research Office.

Yours sincerely,

Michael Riordan
chairs and signed electronically

Dr Michael Riordan
Medical Secretary Ethics Research Committee
MCRN: 281464

c.c. Department of Research

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Dr Deirdre Bennett
Head of Medical Education Unit
Room 2.53 School of Medicine
Brookfield Health Sciences Complex
University College Cork
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11th April 2016

Re: 16010. Activity systems analysis- exploring clinical learning environments for postgraduate medical education and training.

Dear Dr Bennett,

Thank you for your response to the Ethics Research Committee (ERC). You have successfully addressed the amendments recommended by the Committee in its letter dated the 23rd March. The ERC is now happy to grant final approval for your project.

We wish you every success with your study. The research Office would like to receive a report on completion.

Yours sincerely,

Aoife Carey

Dr Aoife Carey
Research Manager
ERC Member

THIS NOTEPAPER MUST NOT BE USED FOR PRESCRIPTIONS OR INVOICING PURPOSES

THE ADELAIDE & MEATH HOSPITAL, DUBLIN
INCORPORATING
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4th February 2016

RE: Activity Systems Analysis – Exploring Clinical Learning Environments for Postgraduate Medical Education and Training

REC Reference: 2016 - 02 Chairman's action (1)
(Please quote reference on all correspondence)

Dear Dr. Bennett,

Thank you for your recent application to SJH/AMNCH Research Ethics Committee in which you requested ethical approval for the above named study.

The Chairman, Dr. Peter Lavin, on behalf of the Research Ethics Committee, has reviewed this application and grants ethical approval.

Yours sincerely,

Claire Hartin
Secretary
SJH/AMNCH Research Ethics Committee

The SJH/AMNCH Joint Research and Ethics Committee operates in compliance with and is constituted in accordance with the European Communities (Clinical Trials on Medicinal Products for Human Use) Regulations 2004 & ICH GCP guidelines.

Appendix B – GCM journal publication

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BMC Medical Education

RESEARCH ARTICLE Open Access

A national stakeholder consensus study of challenges and priorities for clinical learning environments in postgraduate medical education

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Abstract

Background: High quality clinical learning environments (CLE) are critical to postgraduate medical education (PGME). The understaffed and overcrowded environments in which many residents work present a significant challenge to learning. The purpose of this study was to develop a national expert group consensus amongst stakeholders in PGME to; (i) identify important barriers and facilitators of learning in CLEs and (ii) indicate priority areas for improvement. Our objective was to provide information to focus efforts to provide high quality CLEs.

Methods: Group Concept Mapping (GCM) is an integrated mixed methods approach to generating expert group consensus. A multi-disciplinary group of experts were invited to participate in the GCM process via an online platform. Multi-dimensional scaling and hierarchical cluster analysis were used to analyse participant inputs in regard to barriers, facilitators and priorities.

Results: Participants identified facilitators and barriers in ten domains within clinical learning environments. Domains rated most important were those which related to residents' connection to and engagement with more senior doctors. *Organisation and conditions of work* and *Time to learn with senior doctors during patient care* were rated as the most difficult areas in which to make improvements.

Conclusions: High quality PGME requires that residents engage and connect with senior doctors during patient care, and that they are valued and supported both as learners and service providers. Academic medicine and health service managers must work together to protect these elements of CLEs, which not only shape learning, but impact quality of care and patient safety.

Keywords: Graduate medical education, Postgraduate medical education, Clinical learning environment, European working time directive, Duty hours regulations, Group concept mapping

Background

The *Clinical Learning Environment* (CLE) has been described as '*the foundation of graduate medical education*' [1] and refers to the social, cultural and material context in which residents learn while they work [2]. Social theories of learning emphasise the importance of environment for workplace learning [3–7]. Supportive clinical learning environments should afford residents access to supervised participation in patient care, coaching, assessment and feedback, deliberate practice, teamwork, peer collaboration and observable models of practice [8, 9]. Learners' engagement with the affordances of the CLE leads to acquisition of practical knowledge, skills and attitudes as well as to the development of professional identity [10–17]. Supportive clinical learning environments for postgraduate medical education (PGME) contribute to better patient care through these directs effects on residents and their current and future practice

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[18, 19]. Regulatory bodies internationally have promoted and mandated the quality assurance of clinical learning environments, signalling their importance [20–23]. High quality clinical learning environments matter because they impact both workplace learning and the quality and safety of clinical care.

Many residents work, learn and develop their professional identities in underfunded [24–26], understaffed [27], uncontrolled and overcrowded clinical environments [28–30]. This presents a significant challenge for learning and for patient safety. The UK General Medical Council (GMC), has stated that *'Patient safety is inseparable from a good learning environment and culture that values and supports learners and educators'* [31]. The GMC annual training survey report 2016 [32] acknowledged the difficulties created by increased demand and short-staffing. One in three supervisors reported that they did not have enough time to fulfil their role. Self-reported heavy workloads in that survey were associated with a greater likelihood of residents feeling forced to work beyond their competence and having patient safety concerns [32]. Intern and resident learning has been reported to decline once a critical level of workload is exceeded [33]. These conditions are associated with doctor burnout [34, 35], lower levels of staff engagement, health and wellbeing [27, 36, 37], all of which negatively impact learning, as well as lower levels of patient satisfaction, poorer standards of patient care [38] and higher mortality [27]. In addition to the issue of excessive workload, the effects of duty hours restrictions, in place in North America and Europe, on learning, patient safety and workload remain uncertain [39–42]. Both the Accreditation Council for Graduate Medical Education (ACGME) [43] and GMC [31] have explicitly linked CLE with quality of patient care and there have been calls for the greater alignment of educational and patient outcomes [44].

Provision of high quality clinical learning environments is critical to the overlapping missions of postgraduate medical education and the wider medical profession. In the UK and the Republic of Ireland, where national health services are under strain, low morale and deep dissatisfaction amongst residents about their working conditions has led to strike action [45, 46]. An exodus of medical graduates and difficulty in recruitment to residencies in both countries [47, 48] send a stark message that change is needed and raise the question; what can academic medicine do to enhance clinical learning environments?

Strategic planning to protect and enhance clinical learning environments is essential in order to mitigate the negative effects of the wider social, economic and political climate. Prioritisation of the most important facilitators and identification of 'easy wins' are important steps in this process. The purpose of this study was to develop a national expert group consensus amongst a range of relevant stakeholders; senior doctors, residents, patients, allied healthcare professionals and healthcare managers allowing us to; (i) identify important barriers and facilitators of learning in clinical environments and (ii) indicate priority areas for improvement. Our overarching objective was to provide information to guide policy makers and those tasked with the delivery of graduate medical education in tackling the provision of high quality clinical learning environments in challenging times.

Methods

Ethical approval for this study was granted by the Clinical Research Ethics Committee of the Cork University Hospitals, Ireland.

Conceptual orientation

This is an integrated mixed methods study which has been conducted from a pragmatic epistemological stance. This position emphasises the utility of both quantitative and qualitative research approaches to answer a research question, over any epistemological or ontological discordance between them. Within this perspective the interpretative elements of our study have been conducted from a sociocultural stance, which holds that learning takes place during social interaction in cultural and historical settings [49].

Setting

This national study was conducted in the Republic of Ireland, which has a comprehensive, government funded public healthcare system. On completion of a medical degree programme graduates spend a year as an intern before becoming fully registered medical practitioners. Those entering hospital specialties then spend 6–8 years in training programmes which are similar to UK Foundation, Core and Specialist training and broadly analogous to North American residencies and fellowships. A variety of terms are used, both internationally and nationally, to describe doctors in postgraduate medical education, these include; junior doctors, trainees, doctors-in-training, non-consultant hospital doctors and residents. Similarly, terms to describe senior doctors include consultants, attending physicians, supervisors and trainers. The latter two terms suggesting a formal educational role. In this paper we will use the terms resident and senior doctor unless directly quoting participants.

This study is part of a larger project funded by the Health Research Board, Ireland. The research team is a multi-disciplinary group including residents, senior doctors, medical educators, experts in organisational behaviour, and representatives of nursing and allied healthcare professions as well as patient representation.

Recruitment and participation

We issued an invitation via email to experts and stakeholders in postgraduate medical education nationally to participate in a consensus building process. We purposively selected attending physicians, residents, health service managers, allied healthcare professionals and patient representatives, on the basis of their expertise and experience of clinical learning environments. Doctors with senior roles in postgraduate medical education were targeted, as were clinicians who supervise trainees daily in the workplace. A range of allied healthcare professionals were targeted in a similar manner. Each of the stakeholder groups included interfaces with postgraduate training 'on the ground' in the clinical environment and/or contributes to the policy and structures which govern training. We hypothesised that they might provide unique perspectives in respect of our research questions.

Data collection

Group Concept Mapping (GCM) is a novel integrated mixed method approach to identify an expert group's understanding about a topic. GCM builds on the strengths of other structured consensus building methods, such the Delphi method, mitigating some of their weaknesses [50]. The aim of GCM is to depict unique ideas on a particular topic by converting complex qualitative data into conceptual maps [51] showing how individual ideas are related to each other, and generating rating data relating to the relative importance of an idea, and its perceived achievability [51].

GCM consists of five phases:

Phase 1: Brainstorming & Pruning: We provided participants with a web-based link to an online platform for data collection [52]. Participants completed a short demographic questionnaire and identified facilitators and/or barriers to learning in clinical environments in response to the following prompt:

> *One specific barrier or facilitator to trainee doctors learning within the clinical environment is...'*

Participants could provide as many statements as they wished and we asked for a minimum of five from each. The second step was idea pruning, a data cleaning process undertaken by the research team. We reviewed the initial list of statements for any repetition, ambiguity or more than one idea. We deleted, re-worded or split statements as required.

Phases 2 & 3: Sorting & Rating: In keeping with the GCM method, a subgroup of the original participants was selected to sort the edited list of statements into groups, based on similarity of the ideas therein. These participants were then asked to rate each statement for *importance* using the following prompt;

> *'Rate the relative importance of each statement as a facilitator or a barrier to trainee doctors' learning within the clinical environment using a scale ranging from 1 (relatively unimportant) to 5 (extremely important).'*

The process was then repeated for each statement regarding *'ease to address'*.

Phase 4: Data Analysis: Concept System Global software was used for the quantitative data analysis. Multidimensional scaling produced a point map of the statements based on the principle that statements which participants had more frequently grouped together during the sorting process on the basis of their similarity, appear close to each other on the point map [53]. A bridging value was calculated for each statement. This is a statistic ranging from 0 to 1 which indicates how often a statement is grouped with others adjacent to it on the concept map, and whether participants have grouped it with others further away.

Hierarchical cluster analysis embedded in GCM initially treats each individual idea as a separate cluster, and continues to merge ideas until it arrives at one cluster [54]. Mean bridging value for a cluster is calculated on the individual bridging values of statements composing that cluster [55]. A lower bridging value indicates that a statement has greater cohesion with others in that cluster. Lower mean bridging value for a cluster corresponds to a greater level of agreement on the content of that cluster [55].

Mean rating scores for importance and ease to address for each statement and cluster were calculated. The clusters and ratings produced by doctors were compared with those produced by the other participants.

Phase 5: Interpretation of the results: The GCM software generated an initial cluster solution and offered a sequence of cluster merges which could be undertaken if there was sufficient conceptual similarity between clusters to do so. This qualitative element of the mixed methods analysis is underpinned by researcher interpretation and judgement [53]. DB, AW and CK co-constructed a thematic interpretation of the statements in each cluster during a series of meetings. Judgements to merge clusters or not were based on similarity of meaning of the statements therein. Once merges were agreed, DB, AW and CK proposed meaningful labels for the final clusters, informed by our orientation towards social theories of learning e.g. Communities of Practice. These were labels were debated and finalised with the wider multiprofessional research team.

Results

Fifty-five participants contributed to the first phase of the GCM, brainstorming. All stakeholder groups were represented. Sixty-five percent of participants were female. Table 1 shows their distribution by category.

Two hundred and six statements relating to facilitators and barriers to learning in clinical environments were generated. Following pruning, 97 unique ideas remained; 78 were barriers to learning and 19 were facilitators. Twenty-seven participants contributed to the sorting and rating phase.

Following review as outlined above, a 10 cluster solution describing key domains of clinical learning environments, shown in Fig. 1, was determined. This decision was based on the conceptual sense of merging clusters based on the themes of the statements within them.

Clusters were named as shown in Table 2 and Fig. 1. Mean cluster bridging values (BV), which are an indicator of the coherence of the cluster, are shown in Table 2. The lower the bridging value the more cohesive the cluster. Sample statements from each cluster are also presented.

Figure 1 shows the relationship of the clusters to each other; proximity representing domains which are more closely related to each other and distance vice versa. *The role of patients in doctors' learning* can be seen to be relatively distant from the remaining 9 clusters indicating that it is conceptually more distinct. *Work place culture* is at the centre of the map and is immediately adjacent to 7 of the 9 remaining clusters which suggests that most key aspects of clinical learning environments are linked to culture. *Time to learn with senior doctors during patient care* is relatively distant from *Content, assessment and continuity of training* and *Trainer (Senior doctor) skill and support* and these appear to represent two distinct aspects of clinical learning environments; the informal learning that happens while delivering patient care, and way in which that learning is structured, organised and resourced as part of a residency programme.

Rating

All clusters were rated as important to address, with mean ratings ranging from 3.42 to 3.96 on a scale from 1 to 5. There was a wider spread of mean ratings of clusters on ease to address (2.37–3.68). We compared the ratings provided by doctors ($n = 19$) and non-doctors ($n = 8$) and found that these were highly correlated, $r = 0.7$ for importance and $r = 0.99$ for ease to address. The non-doctor group rated *Time to learn with senior doctors during patient care* and *Organisation and conditions of work* as relatively less important, third and sixth out of ten respectively, compared with doctors, who rated these the top two most important domains. Both groups rated *The role of patients in doctors' training, Content, assessment and continuity of training*, and *Trainer (senior doctor) skill and support* as least important, in that order Table 3.

Table 1 Participants by category

Participant Category	n	%
Resident	10	18%
Senior doctor / supervisor	9	16%
Senior Strategic Role in RGMET	10	18%
Patient Representative	4	7%
Allied Healthcare Professional	13	24%
Health Services Management	9	16%
Total	55	100%

Individual statements

Ratings for individual statements identified some very specific areas which participants viewed both important and relatively easy to address. Feedback was most prominent amongst these;

> *Gaining good regular feedback on their performance by those in the immediate clinical environment is a facilitator to learning (Importance 4.56, Ease to address 4.33).*

> *Patient feedback to the young doctor is beneficial and should be encouraged, especially in how they have interacted with the patient (Importance 4.12, Ease to address 4.04).*

Protected time for teaching and learning was a second prominent theme;

> *Protected time being allocated to both senior doctors and residents to facilitate tutorials (Importance 4.0, Ease to address 3.42).*

> *Bleep free educational sessions are still aspirational in most hospitals (Importance 3.8, Ease to address 3.54).*

Discussion

At the outset of this study we aimed to provide information to guide policy makers and those tasked with the delivery of postgraduate medical education in tackling the provision of high quality clinical learning environments in challenging times. We have done so by reporting stakeholders' consensus on the most important domains in CLEs, and the most important barriers/facilitators to learning within them. We have also reported stakeholders' perceptions of the relative ease with which these issues can be addressed. These findings can

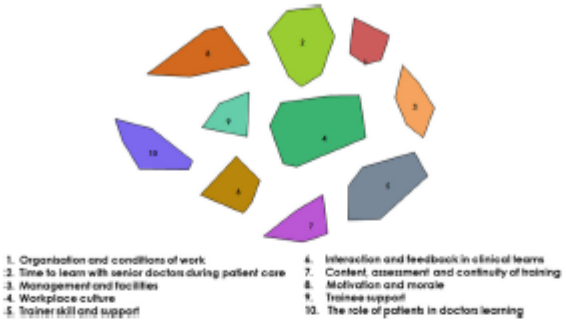

Fig. 1 10 cluster solution with domain names

contribute to targeted improvements to clinical learning environments.

Principal findings

In this study stakeholders identified ten distinct domains within clinical learning environments. These domains were mapped to provide a visual representation of their relationships. *Workplace culture* lay in a central position on the cluster map (Fig. 1), directly adjacent to 7 of the other clusters, suggesting that most aspects of clinical learning environments are culturally embedded. There was consensus amongst doctors and other participants

Table 2 Ten clusters with names, definitions and sample statements for each

	Title and Definition	Mean BV	Sample Statement	BV
1	Organisation and conditions of work – *relating to the tension between providing service in busy environments and needing time to reflect and learn*	0.19	Barrier: Clinical areas are too busy and this acts as a barrier to residents' learning.	0.05
2	Time to learn with senior doctors during patient care - *relating to the way that residents learn from work alongside senior doctors as they follow the patient pathway*	0.23	Barrier: Time pressure at work has meant that the mentorship/ apprenticeship role is lost and residents no longer have the time/opportunity to discuss a case in-depth with a Senior Doctor.	0.11
3	Management and facilities - *relating to the way in which hospital management values and facilitates training and the provision of facilities to support training at hospital sites*	0.46	Barrier: A lack of commitment by hospital management teams to training. Management support for the training element of the workplace is inadequate - seen as very secondary to workload.	0.4
4	Workplace culture - *referring to the way in which learning and residents are valued in the workplace*	0.23	Facilitator: Culture of the clinical site values residents, listens to their views and takes appropriate action in response.	0.07
5	Trainer (Senior doctor) skill and support - *referring to who does the training and how they are supported*	0.39	Barrier: There is an unwillingness to accept that education and training programmes can be delivered by people other than full time attendings.	0.2
6	Interaction and feedback in clinical teams- *relating to team dynamics including the provision of feedback to the resident while working together*	0.55	Facilitator: Residents learn best when they are challenged to state what they should do with regard to patient management and are affirmed and supported in their choices.	0.39
7	Content, assessment and continuity of training - *relating to learning and assessment rooted in clinical practice with effective communication between senior doctors about performance*	0.48	Barrier: Poor communication between supervisors for different clinical placements.	0.46
8	Motivation and morale- *relating to morale within the healthcare system and its impact on the motivation and attitude of learners and other staff*	0.75	Barrier: Low morale amongst all staff as they are over worked and leading to stress and tense staff.	0.41
9	Resident support - *referring to reception of the doctor-in-training into team, collegiality, respect and support to work within scope of practice and to challenge constructively.*	0.36	Facilitator: The resident is encouraged to work within his/her scope of practice to safely develop skills under supervision.	0.34
10	The role of patients in doctors' learning - *referring to patient expectations of care, willingness and provision of feedback*	0.44	Facilitator: Patients more informed in relation to care provision and willing to challenge those delivering care.	0.22

Table 3 Cluster ratings for *Importance* and *Ease to Address*

Most to least	Importance (5 = Very Important)	Mean cluster rating importance	Ease to Address (5 = Very Easy)	Mean cluster rating ease to address
1	Cluster 9: Resident support	3.96	Cluster 7: Content, assessment and continuity of training	3.68
2	Cluster 2: Time to learn with senior doctors during patient care	3.90	Cluster 5: Trainer skill and support	3.56
3	Cluster 6: Interaction and feedback in clinical teams	3.89	Cluster 10: The role of patients in doctors' training	3.35
4	Cluster 1: Organisation & conditions of work	3.81	Cluster 3: Management & facilities	3.20
5	Cluster 3: Management & facilities	3.73	Cluster 9: Resident support	3.19
6	Cluster 4: Workplace culture	3.72	Cluster 4: Workplace culture	3.01
7	Cluster 8: Motivation and morale	3.63	Cluster 6: Interaction and feedback in clinical teams	3.01
8	Cluster 10: The role of patients in doctors' training	3.59	Cluster 8: Motivation and morale	2.55
9	Cluster 5: Trainer skill and support	3.51	Cluster 1: Organisation and Conditions of Work	2.51
10	Cluster 7: Content, assessment and continuity of training	3.42	Cluster 2: Time to learn with senior doctors during patient care	2.37

that all of the domains identified are important to address to enhance resident learning; however, some domains were rated more important than others.

Domains rated most important were those which related to residents' connection to and engagement with more senior doctors and other members of the clinical team (*Resident Support, Time to Learn with Senior Doctors during Patient Care and Interaction and Feedback in Clinical Teams*). This is in keeping with social learning theory, for example Communities of Practice theory [3], which emphasises the importance for newcomers to a community to learn by working alongside more senior members. Learning, through observation, role modelling, discussion and feedback all takes place in this context. Participants identified shorter working hours, subsequent to the implementation of the European Working Time Directive (EWTD), as disrupting learning through a reduction in time spent with senior doctors and a disintegration of clinical teams. Under the EWTD residents work no more than 48 h per week in total. Participant statements indicated that less time spent in the clinical environment reduces opportunities to learn through clinical work, to benefit from mentorship and to follow the patient pathway, compounding the challenges of learning in a healthcare system under strain. These perspectives are consistent with some of the literature examining the effects of restricted duty hours [56]; however, published data on the impact of EWTD on training has been mixed [40], perhaps due to the influence of local differences in how the regulations are implemented. In keeping with the GMC national training survey report [57] our findings suggest that poor rota design and scheduling has a negative impact on learning.

Organisation and conditions of work was a strongly coherent and relatively more important domain also identified by participants. Barriers in this domain referred to busyness, service pressure and overcrowding. This emphasises the dual purpose of clinical environments; supporting both patient care and learning, and confirms that service pressures impact opportunities to learn, resulting in cognitive overload, limiting time to reflect and discuss [33], and through constraints on physical space.

Domains relating to the structure and organisation of residency programmes, such as *Content, assessment and continuity of training*, and *Trainer (senior doctor) skill and support* were viewed as somewhat less important. When mapped (Fig. 1), it was also apparent that these domains, and that of *Management and facilities*, were grouped together, distant from *Time to learn with senior doctors during patient care, Trainee support* and *Motivation and morale*. The former group of domains can be conceptualised as the imprint of training programmes and management, on the historically, socially and culturally constructed practice of patient care; the formal versus the informal aspects of postgraduate training. Participants identified these formal areas as relatively easy to address, in keeping with fact that improvements and innovations in postgraduate training typically involve changes to content, format and organisation [58–60]. The impact of such changes on day to day learning and supervision has been questioned [59, 61]. Dijkstra et al. [13] found the influence of structural changes on trainees' learning was mediated by 'on the ground' features of the

clinical learning environment. It has been suggested that local approaches to cultural change may be effective [59, 62] in improving clinical learning environments. Our findings suggest that our participants recognised a separation between daily practice and externally determined format and organisation. Programme directors and policymakers need to recognise the limitations of approaches which focus on the latter.

Organisation and conditions of work and *Time to learn with senior doctors during patient care* were rated as the most difficult areas in which to make improvements. The consensus amongst our participants the combination of heavy clinical workload and duty hour restrictions would be challenging to address may arise from the fact that both are seen as beyond the sphere of influence of academic medicine and healthcare management, but rather the consequences of national economic recession and European legislation. None the less, it is clear that regulators expect those 'on the ground' to deal with these challenges. The General Medical Council (UK) places responsibility for adequate staffing, workload and rota design to support learning on Local Education Providers within the NHS [31] and the Medical Council of Ireland has identified the need for an integrated approach at clinical sites, joining up corporate areas within the health service with responsibility for patient safety and quality of clinical care and those responsible for management of the clinical learning environment [63].

Trainee Support was identified as the most important area to address. This domain refers to reception into the clinical team, collegiality, respect and support to work within scope of practice and to challenge constructively. Participants rated this aspect as moderately easy to address, perhaps because it is within the control of individuals to be welcoming, supportive and respectful of residents. Bullying, and rude, dismissive and aggressive communication are features of healthcare environments internationally [64]. Workload and workplace stress have been shown to trigger such behaviour. Junior members of staff are more likely to be on the receiving end of such communication and it has a negative impact on mental health [64, 65].

Implications for practice

The link between clinical learning environments and the quality and safety of patient care is a strong driver for stakeholders in postgraduate medical education and health service delivery to work together to strengthen both. Our findings point to the relatively greater importance of the informal over formal aspects of workplace learning and a need to prioritise the preservation of residents' opportunities to learn and work alongside senior doctors when service delivery is being planned and structured. There is some evidence that the manner in which restricted duty hours are implemented can mitigate the impact on learning [66]. It has been suggested that affording training programmes flexibility [67] and undertaking precise workload analysis might be helpful [66]. Such an approach would enable learning to be taken into account and optimised in the implementation of compliant rotas and schedules. This approach was recommended in Sir John Temple's 2010 report into the impact of EWTD in the UK [56]; however, there is very little published literature describing innovative ways to comply with duty hours regulations while maximising learning. Further research should focus on exploring the implementation of duty hours' regulations in the full range of training contexts.

A continual focus on residents as learners, in need of and deserving of support from all in the healthcare environment, is essential. Faculty development has been flagged as a key element of high quality postgraduate medical education and provides a means to enhance the value placed on learning and learners in clinical environments [59]. It could also contribute to the 'easy win' identified by participants of ensuring that resident receive more high quality feedback. Culturally embedded negative behaviours towards residents present a significant challenge. Illing et al. [68] make recommendations arising from their review of the literature on bullying which emphasise the importance of senior leadership in initiating culture change. Exploration of other means to generate cultural change with meaningful impact on CLEs and the learning experience of residents is needed [62].

Strengths and limitations

A strength of this study is that it is a national study which included a wide range of stakeholders in postgraduate medical education and used a rigorous methodological approach to describe their consensus. These are individuals at the frontline of medical training as well as those with more strategic roles; therefore, our findings are rooted in both practice and policy. A limitation of the study is that it was undertaken in the context of the Irish healthcare system and may not be fully transferable to other contexts.

Conclusions

High quality graduate medical education requires that residents have time to engage and connect with senior doctors during patient care, and that they are valued and supported as both learners and service providers. Academic medicine and health service managers must work together to protect these key elements of clinical learning environments which not only shape learning, but impact patient safety and the quality of patient care.

Abbreviations
ACGME: Accreditation Council for Graduate Medical Education; CLE: Clinical Learning Environment; EWTD: European Working Time Directive; GCM: Group Concept Mapping; GMC: General Medical Council; NHS: National Health Service; PGME: Postgraduate Medical Education

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Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors' contributions
DB conceived the study. CK, AW, MH, DS, CB, SS and DB designed the study. CK, AW, DB, AH, GOK, CB, LP and MH recruited participants to the study. CK, AW, DB and SS collected the data and conducted the initial analysis. All authors contributed to the interpretation of the findings. DB, CK and AW wrote a draft paper, which has been reviewed and revised critically by all authors. All authors approved the final version to be published and agree to be accountable for all aspects of the work.

Ethical approval and consent to participate
Ethical approval for this study was granted by the Clinical Research Ethics Committee of the Cork University Hospitals. The work was conducted in accordance with the Declaration of Helsinki. All participants were provided with information on the study gave consent.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Appendix C – Realist Review protocol

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Systematic Reviews

PROTOCOL Open Access

Protocol for a realist review of workplace learning in postgraduate medical education and training

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Abstract

Background: Postgraduate medical education and training (PGMET) is a complex social process which happens predominantly during the delivery of patient care. The clinical learning environment (CLE), the context for PGMET, shapes the development of the doctors who learn and work within it, ultimately impacting the quality and safety of patient care. Clinical workplaces are complex, dynamic systems in which learning emerges from non-linear interactions within a network of related factors and activities. Those tasked with the design and delivery of postgraduate medical education and training need to understand the relationship between the processes of medical workplace learning and these contextual elements in order to optimise conditions for learning. We propose to conduct a realist synthesis of the literature to address the overarching questions; how, why and in what circumstances do doctors learn in clinical environments? This review is part of a funded projected with the overall aim of producing guidelines and recommendations for the design of high quality clinical learning environments for postgraduate medical education and training.

Methods: We have chosen realist synthesis as a methodology because of its suitability for researching complexity and producing answers useful to policymakers and practitioners. This realist synthesis will follow the steps and procedures outlined by Wong et al. in the RAMESES Publication Standards for Realist Synthesis and the Realist Synthesis RAMESES Training Materials. The core research team is a multi-disciplinary group of researchers, clinicians and health professions educators. The wider research group includes experts in organisational behaviour and human resources management as well as the key stakeholders; doctors in training, patient representatives and providers of PGMET.

Discussion: This study will draw from the published literature and programme, and substantive, theories of workplace learning, to describe context, mechanism and outcome configurations for PGMET. This information will be useful to policymakers and practitioners in PGMET, who will be able to apply our findings within their own contexts. Improving the quality of clinical learning environments can improve the performance, humanism and wellbeing of learners and improve the quality and safety of patient care.

Systematic review registration: The review is not registered with the PROSPERO International Prospective Register of Systematic Reviews as the review objectives relate solely to education outcomes.

Keywords: Realist review, Realist synthesis, Postgraduate medical education, Graduate medical education, Workplace learning, Clinical learning environment

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Background

Postgraduate medical education and training (PGMET) is a complex social process which happens predominantly during the delivery of patient care. The social, cultural and material context for PGMET is the clinical learning environment (CLE) [1] which has been described as *'the foundation of graduate medical education'* [2]. There is evidence that learners and learning are shaped by clinical learning environments; their performance [3–7], humanism [8, 9] and psychological health [10–13] are supported in high quality environments. Supportive clinical learning environments can contribute to better patient care through these direct effects on residents, and their current practice. Empirical research has also shown that the hidden and informal curricula of CLEs shape the future practice of residents [14, 15]. It has also been recognised that environments which lead to good patient outcomes are also positive learning environments [16, 17]. These are important drivers to understand how and why doctors' learning is supported in clinical environments.

Complexity in clinical environments

Health care systems internationally are under strain, facing increasing demands with limited resources [18, 19]. Although patients have shorter hospital stays, inpatients are sicker and healthcare has become more complex and expensive [20]. Short staffing and overcrowding are often features of the environments in which doctors learn [21]. Capping of working hours for doctors-in-training, driven by concerns for doctor wellbeing and patient safety, has resulted in a move to shift work and fewer total hours worked, raising concerns about unintended consequences for learning and delivery of care [22]. Clinical workplaces are complex, dynamic systems in which learning emerges from non-linear interactions within a network of related factors and activities [23, 24]. The key components of CLEs include appropriate opportunities to learn through practice, supervision, assessment and feedback, social support in relationships with consultants, peers, nurses and allied healthcare professionals, working hours and conditions, and resources [25, 26]. Delivery of patient care, adherence to working hours legislation, focus on patient safety and resource management are activities which may compete with, as well as generate, learning in clinical workplaces. Learning, clinical environment and working conditions are closely intertwined. Working under poor conditions is linked to trainee stress and burnout, which may impact learning, humanism and professional identity formation [11, 27]. These factors may impact each other in unanticipated ways with unintended consequences. Those tasked with the design and delivery of postgraduate medical education and training need to understand the relationship between the processes of medical workplace learning and these contextual elements in order to optimise conditions for learning. This review aims to produce a detailed description of these relationships grounded in the literature and workplace learning theory.

Researching complexity to inform policy and practice

Researching how learning happens in clinical environments and how we can support it requires the use of an approach which recognises the complexity of the environment and of postgraduate training itself. We have been funded by the Health Research Board (Ireland), the Medical Council of Ireland and the Irish Health Service Executive (National Doctors Training and Planning) to conduct a project comprised of three studies triangulating on the ways in which clinical learning environments shape postgraduate trainees' learning. Our funders have not been involved in the development of the protocol. Our overarching aim is to produce guidelines and recommendations for the design of high quality clinical learning environments for postgraduate medical education and training. As part of this project, we propose to conduct a realist synthesis of the literature to explore the overarching questions; how, why and in what circumstances do doctors learn in clinical environments? Realist review will build and refine a theory of postgraduate medical education and training to address these questions.

Methodology

We have chosen realist synthesis as a methodology because of its suitability for researching complexity and producing answers useful to policymakers and practitioners.

Specific research questions are the following:

1. What are the mechanisms by which postgraduate workplace learning results in its intended outcomes?
2. What are the important contexts which determine whether the different mechanisms produce their intended outcomes?
3. In what circumstances is postgraduate medical workplace learning effective?

Realist review is an interpretative theory-driven narrative summary of the literature describing how, why and in what circumstances complex social interventions work. A complex intervention is one whose outcome is dependent on the interaction between its participants and their context; in this case, doctors in training and the clinical learning environment. Complex interventions 'often have multiple components (which interact in non-linear ways) and outcomes (some intended and some not) and long pathways to the desired outcome(s)'

[28]. Traditional systematic reviews of such interventions tend to have mixed results and do not explain how or why the intervention worked. They generally try to eliminate the effect of context rather than understand its impact. Realist review addresses these shortcomings by producing rich contextual information which policymakers and practitioners can apply to their own circumstances [29].

Realist philosophy holds that outcomes of an intervention are not deterministic or simply linear but are context dependent. Realist synthesis translates the findings of empirical studies into context, mechanism and outcome (CMO) configurations, which state that in a certain context a particular mechanism generates a particular outcome. Social mechanisms refer to the 'underlying entities, processes or (social) structures which operate in particular contexts to generate outcomes of interest' [30]. An intervention may be comprised of multiple mechanisms both planned and unintentional. Identification of CMO configurations is informed by programme theory, or the underlying assumptions of how the intervention is supposed to work, and relevant middle range theories, in this case, theories of workplace learning. Using theory to identify CMO configurations focuses reviewers on the underlying and transferable aspects of programmes described rather than on their specific minutiae [30]. Realist review seeks to identify 'demi-regularities' within the complexity of interventions, based on the expectation that although outcomes will vary in different contexts, that there will be some patterning in CMO configurations [31]. Theory is also generated, tested and refined through this process.

The core research team is a multi-disciplinary group of researchers, clinicians and health professions educators. The wider research group includes the key stakeholders; doctors in training, patient representatives and the Royal College of Physicians of Ireland, the largest postgraduate training body in Ireland, with responsibility for almost half of all postgraduate trainees nationally. The core research team will also undertake training and ongoing consultation with methodological experts during the course of the study.

Procedures

This realist synthesis will follow the steps and procedures outlined RAMESES Publication Standards for Realist Synthesis [28] and associated training materials [30] in an iterative manner. Realist principles will be embedded in all stages of the review process. A PRISMA-P checklist has been completed and is available as an additional file (see Additional file 1).

Defining the scope of the review

Clinical learning environments in postgraduate medical education and training is a broad topic. Initial rough searches of the literature suggest that there is a substantial published literature in this area. Focussing the review question will be an iterative process consisting of exploration of the literature and relevant programme theories as well as consultation with experts and stakeholders. We envisage that focussing of the review will be guided by the evidence as it is discovered and the need to ensure a manageable volume of literature for synthesis.

We will identify programme and substantive workplace learning theories which will support the identification of the key areas on which to focus and the most relevant literature to consider. There are several theories of learning which can inform our understanding of the processes and outcomes of doctors' workplace learning and how clinical environments might impact these. Communities of practice theory [32] emphasises the importance of participation in practice and connection, recognition and belonging within a community. Cognitive apprenticeship theory [33, 34] provides an account of how people learn from each other, through observation, modelling and reflection. The frameworks for workplace learning developed by Billett [35] and Teunissen [36] may also prove relevant to this review. An initial programme theory for workplace learning in postgraduate medical education and training will be developed and expressed in realist terms. This theory will be refined as the review progresses and becomes more focussed.

Regular meetings will be held with the wider project team to discuss and define the key aspects of the review, to ensure consensus on review focus. Additionally, the scope of the review will be informed by another study into clinical learning environment being undertaken by the group. This is a consensus building study which will use group concept mapping to capture the perspectives of multiple stakeholders such as trainers, trainees, allied health professionals and hospital management on priority areas for improvement within clinical learning environments. The findings of this study will help to direct the focus of the realist synthesis.

Search strategy

Unlike the search strategy of traditional systematic reviews, searches in realist synthesis do not aim to uncover every published paper addressing the topic, but rather to balance comprehensiveness with theoretical saturation. Searching is iterative and as synthesis and theory refinement occur further searches may be necessary to test the emerging theory. Initially, we will perform an electronic search in the following databases: Academic Search Complete, Australian Education Index, British Education Index, CINAHL, ERIC, MEDLINE, PsycInfo and SocIndex. Search terms will be developed and trialled iteratively, and in discussion within the wider research team and a librarian. Both MeSH (medical subject headings) and free text will be employed to ensure

breadth and depth of coverage. The search will be adjusted as required in each database. We will supplement searches by reviewing the reference lists of included studies and relevant review articles. We will also search the following journals by hand: *Academic Medicine, Advances in Health Sciences, Graduate Medical Journal, Medical Education, Medical Teacher and Postgraduate Medical Journal*. We will check the validity of our search by contacting experts in the field of workplace learning to identify the key papers. Additional rounds of searching may be added throughout the review process to further explore particular areas of interest. Searching will cease when sufficient evidence has been found to demonstrate the coherence and plausibility of the refined programme theory.

Our core inclusion criteria will be (1) papers related to postgraduate medical education and training in the clinical setting, (2) quantitative, qualitative and mixed-method studies, (3) papers published in English and (4) papers published between 1995 and 2016. Exclusion criteria include (1) non-empirical papers including commentaries, letters, editorials and reviews, (2) papers related to undergraduate medical education and (3) research on simulation or other non-clinical interventions.

Study selection criteria

Titles and abstracts will be imported into EndNote and screened by the core research team using the criteria outlined above. Full texts of articles deemed potentially relevant will be retrieved and evaluated for inclusion in the data extraction stage. Inclusion and exclusion decisions will be based on whether the findings can contribute to theory testing and refinement and whether the methods used to generate findings are credible and trustworthy.

The questions that will guide us selecting papers based on relevance are the following: Does the study relate directly to the clinical learning environment of medical trainees? Is the study rich enough in information on context, mechanism and outcomes? These questions will ensure that the sources identified allow the team to make sense of the subject area, in order to develop, refine and test theories, and to support inferences made about mechanisms. Reasons for exclusion of papers will be thoroughly documented to ensure transparency. Searching will be iterative and will discontinue when sufficient evidence is found that it is reasonable to claim that the programme theory is coherent and plausible.

Quality of the papers selected for data extraction will be assessed, and methodological limitations will be identified and taken into account during the data synthesis phase. Realist synthesis is an interpretative approach to the literature and the RAMESES Realist Synthesis Training Materials do not recommend using a strict checklist approach to quality, as this can lead to exclusion of relevant papers early in the process. Our assessment of quality will involve the use of checklists, for example CASP, as sensitising influences, but will lean towards inclusion of data from relevant studies with some methodological shortcomings.

Data extraction

In realist review, data extraction may include descriptions and explanations of how and why the programme theory may have worked in particular contexts [28]. We will use two approaches to extract data from selected studies. Firstly, an electronic data extraction sheet will be used in order to record study identification details (authors, title, publication, etc.), geographical area in which the study was conducted, specific population and methodology used. Comments on the rigour and trustworthiness of the study will also be included. Secondly, we will import the selected papers into NVivo and code the results and discussions sections in order to identify context, mechanism, outcome configurations in the findings. Three members of the research team will undertake data extraction, and cross checking will be undertaken to identify any inconsistencies, inaccuracies or oversights. Any discrepancies will be discussed and resolved among the core research team with reference to the wider research team if necessary.

Data analysis and synthesis

Analysis and synthesis will proceed in NVivo as we identify recurring relationships between contexts, mechanisms and outcomes in the selected papers. This process will be guided by programme and substantive theories. We will look for predictable patterns (demi-regularities) to determine how similar mechanisms act in different contexts to generate outcomes. Emerging findings will be challenged and contrary examples will be sought in the data and in theory. This process will allow information on outcomes that differ in comparable circumstances, for contradictory outcomes to occur in particular contexts, and for judgements of the strength/weaknesses of research methods to be integrated into the synthesis. These findings will feedback into theory refinement. The following conceptual tools will be applied during this phase [30];

- juxtaposing ("for instance, when one study provides the process data to make sense of the outcome pattern noted in another")
- reconciling (identifying differences which explain apparently contradictory sets of findings)
- adjudicating between studies (based on the quality of research);
- consolidating (building 'multi-faceted explanations of success')
- situating ('this mechanism in context A, that one in context B')

We will adopt an iterative and explanatory approach to synthesis of the data. The findings will be synthesised to be of practical use and will be reported according to the RAMESES reporting standards for realist syntheses [28].

Discussion

This study will draw from the published literature and programme and substantive theories of workplace learning, to describe context, mechanism and outcome configurations for PGMET. Realist synthesis methodology is appropriate to explore a complex intervention such as PGMET, which takes place in complex learning environments, in which learning is not the primary activity. By identifying causal mechanisms in PGMET, it may be possible to design clinical learning environments that are effective for learning, and create satisfactory working conditions for doctors in training. The results of this realist synthesis will be useful to policymakers and practitioners in PGMET, who will be able to apply the findings within their own contexts. Improving the quality of clinical learning environments can improve the performance, humanism and wellbeing of learners and ultimately the quality and safety of patient care.

Additional file

Additional file 1: PRISMA-P checklist realist review: this is the completed PRISMA-P checklist for the review protocol. (DOCX 29 kb)

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Availability of data and materials
Not applicable.

Authors' contributions
DB developed the original idea for this review protocol with CB and MH. AW and CK contributed to the initial design and planning of the review. CB, PF, NF, MH, AH, BM, GOK, LP and DS contributed to the refinement of the review protocol. AW wrote the first draft of the protocol. CB, PF, NF, MH, AH, BM, GOK, LP, CK and DS reviewed and edited the drafts of the protocol and DB finalised the document. All authors agree to be accountable for all aspects of this protocol. DB will be the guarantor of the review.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
Not applicable.

Ethics approval and consent to participate
Not applicable.

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Appendix D – Realist Review search strategy

Electronic Database Search

Databases:

1) Academic Search Complete
2) Australian Ed Index
3) British Education Index
4) Cinahl
5) ERIC
6) Psychinfo
7) Medline
8) SocIndex

Limitations:

Year of publication 1995- Aug 2017

English Language

General Search

1) AB Graduate
2) AB Postgraduate
3) Medical education
4) Medical training
5) AB Residency
6) AB Internship
7) 1 OR 2 (Postgraduate OR graduate)
8) 3 OR 4 (Medical education OR medical training)
9) 5 OR 6 (Residency OR internship)
10) 7 AND 8
11) 8 AND 9
12) 10 OR 11
13) Clinical
14) Learning
15) Environment
16) Work place
17) Workplace
18) 13 AND 14 (Clinical AND Learning)
19) 15 AND 18
20) 16 OR 17
21) 14 AND 20
22) 19 OR 21
23) 12 AND 22

MeSH terms for general search

- **Education, Graduate**
- **Education, Medical, Graduate**
- **Education, Medical**

- **Preceptorship**
- **Internship and Residency**
- **'clinical learning environment' and 'workplace learning'- no MeSH terms**

Specific search: **EWTD**

1) AB Graduate
2) AB Postgraduate
3) Medical education
4) Medical training
5) AB Residency
6) AB Internship
7) 1 OR 2 (Postgraduate OR graduate)
8) 3 OR 4 (Medical education OR medical training)
9) 5 OR 6 (Residency OR internship)
10) 7 AND 8
11) 8 AND 9
12) 10 OR 11
13) European working time directive
14) EWTD
15) Duty hours
16) 13 OR 14
17) 15 OR 16
18) 12 AND 17

Specific search: Role modelling

1) AB Graduate
2) AB Postgraduate
3) Medical education
4) Medical training
5) AB Residency
6) AB Internship
7) 1 OR 2 (Postgraduate OR graduate)
8) 3 OR 4 (Medical education OR medical training)
9) 5 OR 6 (Residency OR internship)
10) 7 AND 8
11) 8 AND 9
12) 10 OR 11
13) Role model*
14) 12 AND 13

Specific search: Career Choice

1) AB Graduate
2) AB Postgraduate
3) Medical education
4) Medical training
5) AB Residency

6) AB Internship
7) 1 OR 2 (Postgraduate OR graduate)
8) 3 OR 4 (Medical education OR medical training)
9) 5 OR 6 (Residency OR internship)
10) 7 AND 8
11) 8 AND 9
12) 10 OR 11
13) Career
14) Choice
15) 13 AND 14
16) 12 AND 15

Specific search: Supervision

1) AB Graduate
2) AB Postgraduate
3) Medical education
4) Medical training
5) AB Residency
6) AB Internship
7) 1 OR 2 (Postgraduate OR graduate)
8) 3 OR 4 (Medical education OR medical training)
9) 5 OR 6 (Residency OR internship)
10) 7 AND 8
11) 8 AND 9
12) 10 OR 11
13) AB supervis*
14) 12 AND 13

Journal Hand Search

- Academic Medicine
- Advances in Health Sciences
- Graduate Medical Journal
- Medical Education
- Medical Teacher
- Postgraduate Medical Journal

Appendix E – Realist Review Data extraction form

Realist Review Data Extraction Form

Title

Your answer

First Author

Your answer

Year

Your answer

Journal

Your answer

Researcher Country

Your answer

Research Questions / Aims

Your answer

Research design

- ○ Qualitative
- ○ Quantitative
- ○ Mixed Methods

Research Methods

Your answer

Population

Your answer

Brief Summary of Findings

Your answer

SUBMIT

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Appendix F – Realist Review Citation table

	Citation	Country	Research Aims & Design	Summary of Findings
1	Apker, J. and S. Eggly (2004). "Communicating professional identity in medical socialization: Considering the ideological discourse of morning report." Qualitative Health Research 14(3): 411-429.	USA	To investigate how medical ideology and physician professional identity are socially constructed during morning report. Qualitative; Observation; internal medicine residents and their clinical teams	Findings indicate how, in a socialization context uniquely focused on discourse, communication functions to construct a professional identity grounded in the principles of the biomedical model. Although medical residents deviate from traditional ideology by articulating the voice of the lifeworld, faculty physicians counter these moves by asserting the voice of medicine. The authors draw conclusions regarding identity formation and the socialization practices of medical education.
2	Apramian, T., et al. (2015). "Thresholds of Principle and Preference: Exploring Procedural Variation in Postgraduate Surgical Education." Academic Medicine 90(11 suppl): S70-S76.	Canada	To explore how residents make sense of, and behave in relation to, the procedural variations of faculty surgeons. Qualitative; Constructivist grounded theory; observation and interviews; surgical residents	The core category of the constructed theory was called thresholds of principle and preference and it captured how faculty members position some procedural variations as negotiable and others not. The term thresholding was coined to describe residents' daily experiences of spotting, mapping, and negotiating their faculty members' thresholds and defending their own emerging thresholds. Thresholds of principle and preference play a key role in workplace-based medical education. Postgraduate medical learners are occupied on a day-to-day level with thresholding and attempting to make sense of the procedural variations of faculty.
3	Apramian, T., et al. (2016). ""They have to adapt to learn": Surgeons' perspectives on the role of procedural variation in surgical education." J Surg Educ 73(2).	Canada	To explore surgeons'' perspectives regarding the influence of intersurgeon procedural variation on the teaching and learning of surgical residents.	Surgeons endorsed the use of intersurgeon procedural variations to teach residents about adapting to the complexity of surgical practice and the norms of surgical culture. Surgeons suggested that residents' efforts to identify thresholds of principle and preference are crucial to professional development. Principles that emerged from the study included the following: (1) knowing what comes next, (2) choosing the right plane, (3) handling tissue appropriately, (4) recognizing the abnormal, and (5) making safe progress. Surgeons suggested that learning to follow these principles while maintaining key aspects of surgical culture, like autonomy and individuality, are important social processes in surgical education.
4	Apramian Tavis, C. S., Watling Chris, Ott Michael, Lingard Lorelei (2016). "'Staying in the game': How procedural	Canada	To explore how thresholds of principle and preference shaped surgeons' intraoperative judgments of resident competence.	The core category of the study, called staying in the game, describes how surgeons make moment-to-moment judgments to allow residents to retain their role as operators.

	Citation	Country	Research Aims & Design	Summary of Findings
	variation shapes competence judgements in surgical education." Academic Medicine 91(11).		Qualitative; grounded theory; observation and interviews; Surgical residents and surgeons	Surgeons emphasized the role of principles in making these decisions, while residents suggested that working with surgeons' preferences also played an important role in such intraoperative assessment.
5	Balmer, D. (2007). "Learning behind the scenes: Perceptions and observations of role modeling in pediatric residents' continuity experience." Ambulatory Pediatrics 7(2): 176-181.	USA	To analyse what and how pediatric residents learn through role modelling during their continuity experience. Qualitative; observation and interviews; pediatric residents and continuity clinic preceptors	From the residents' perspective, role modelling was an implicit and intentional learning strategy that was linked to routine clinical practice in continuity clinic. Residents learned, though modelling their CCPs, "how to talk" and "how to think things through". Residents did not directly report modelling professional behaviour. For residents, learning through modelling was not contingent on CCPs awareness of being a role model.
6	Balmer, D. F., et al. (2008). "Understanding paediatric resident−continuity preceptor relationships through the lens of apprenticeship learning." Med Educ 42(9): 923-929.	USA	To explore the paediatric resident-continuity preceptor relationships through the lens of apprenticeship learning. Qualitative; ethnographic case study; observation and interviews, paediatric residents and primary care paediatricians	The authors observations and reports of resident learning trajectories fit well with the concept of legitimate peripheral participation. Residents learned the everyday practice of primary care as they worked alongside experienced paediatricians in the continuity clinic. Although the direction of learning was towards central participation in patient care, residents learned during transient shifts to the periphery of practice. as a function of residents' increased participation, preceptors moved into more supportive roles. Residents were not only learners; at times, they were teachers who facilitated preceptors' learning.
7	Balmer Dorene, M. C., Richards Boyd, Serwint Janet, Giardino Angelo (2010). "An ethnographic study of attending rounds in general paediatrics: understanding the ritual." Med Educ 44.	USA	To investigate teaching in general paediatrics as a social phenomenon and to explore change over time in both the meaning of rounds and the context in which rounds take place. Qualitative; ethnographic case study; observation; paediatric medical teams	Four themes emerged from the data: (i) attending rounds are a pervasive and routine part of clinical education; (ii) interns, senior residents and attending physicians hold assumptions about what should happen on rounds; (iii) tension exists between interns', senior residents' and attending physicians' assumptions about bedside teaching during rounds and the reality imposed by contextual factors, and (iv) bedside teaching during rounds is impacted, but not prohibited, by contextual factors.
8	Balmer, D. (2012). "The dance between attending physicians and senior residents as teachers and supervisors." Pediatrics 129(5): 910-915.	USA	To examine how attending physicians and senior residents negotiated shared responsibilities for teaching and supervising on clinical work rounds. Qualitative; ethnography; observation; paediatric medical teams	Like a traditional dance with a priori choreography, and consistent with the traditional premise in graduate medical education, attending physicians frequently "stood back" and senior residents, accordingly, "stepped up" and took on teaching and supervising responsibilities. Less often, both attending physicians and

	Citation	Country	Research Aims & Design	Summary of Findings
				senior residents assumed the lead, or attending physicians stepped up rather than entrust senior residents. The complex clinical context sometimes changed the choreography. Attending physicians and senior residents understood their mutual responsibilities but were not bound by them; they improvised to maintain high-quality patient care.
9	Balmer, D. F. P., et al. (2015). "Learning Across the Explicit, Implicit, and Extra-Curricula: An Exploratory Study of the Relative Proportions of Residents' Perceived Learning in Clinical Areas at Three Pediatric Residency Programs." Academic Medicine 90(11): 1547-1552.	USA	To investigate relative proportions of residents' perceived learning across the explicit, implicit, and extra-curricula for six clinical learning environment review (CLER) focus areas. Qualitative; interviews; paediatric residents	Residents perceived learning to occur most often in the implicit curriculum for five of the six CLER focus areas; the one exception being health care quality, which predominantly took place in the explicit curriculum. In the implicit curriculum, role modelling and "learning by doing" were frequently reported modes of learning. The explicit curriculum was perceived as an important baseline for understanding clinical areas. Relatively less learning was perceived to occur in the extra-curriculum.
10	Bernabeo, E. C. M. P. H., et al. (2011). "Lost in Transition: The Experience and Impact of Frequent Changes in the Inpatient Learning Environment." Academic Medicine 86(5): 591-598.	USA	To explore the experience and impact of frequent transitions on residents. Qualitative; focus groups; internal medicine residents, faculty, nurses and ancillary staff	Perceived benefits of transitions included the ability to adapts to new environments and practice styles, improved organisation and triage skills, increased comfort with stressful situations, and flexibility. Residents primarily relied on each other to cope with and prepare for transitions, with little support from the program or faculty level. Several potentially problematic workarounds were described within the context of transitions, including shortened progress notes, avoiding pages, hiding information, and sidestepping critical situations. Nearly all residents acknowledged that frequent transitions contributed to a lack of ownership and other potentially harmful effects for patient care.
11	Bhutta, M., et al. (2016). "A survey of how and why medical students and junior doctors choose a career in ENT surgery." The Journal of Laryngology & Otology 130(11): 1054-1058.	UK	To ascertain determinants of an interest in a career in ENT surgery through a survey of medical students and junior doctors. Quantitative; survey; surgical foundation doctors and medical students	The most important factors that encourage ENT as a career included: the variety of operative procedures, work-life balance, inherent interest in this clinical area and inspirational senior role models. Exposure to ENT in undergraduate or postgraduate training is critical in deciding to pursue this specialty.
12	Bing-You, R. G., et al. (1997). "Feedback falling on deaf ears: Resident's receptivity to feedback tempered by sender credibility." Medical Teacher 19(1).	USA	To characterize residents' perceptions of effective feedback and aspects of the sender causing residents to discount such feedback. Qualitative; interviews; internal medicine residents	Well-timed, private and verbal feedback that fostered development of an action plan are examples of residents' perceptions of effective feedback. Sender credibility, and subsequent resident receptivity to feedback, was influenced by the

	Citation	Country	Research Aims & Design	Summary of Findings
				method of feedback delivery, the content of the feedback and the residents' perceptions of sender characteristics, and their observation of sender behaviours.
13	Biondi, E. A. M. D., et al. (2015). "Discordance Between Resident and Faculty Perceptions of Resident Autonomy: Can Self-Determination Theory Help Interpret Differences and Guide Strategies for Bridging the Divide?" Academic Medicine 90(4): 462-471.	USA	To identify and interpret differences between resident and faculty perceptions of resident autonomy and of faculty support of resident autonomy. Mixed methods; survey and qualitative analysis of written comments; paediatric residents and faculty	The groups differed significantly on 15 of 17 parallel items but agreed that faculty sometimes provided too much direction. Written comments suggested that self-determination theory constructs were closely interrelated in residency training. Residents expressed frustration that their care plans were changed without explanation. Faculty reported reluctance to give "passive" residents autonomy in patient care unless stakes were low. Many reported granting more independence to residents who displayed motivation and competence. Some described working to overcome residents' passivity by clarifying and reinforcing expectations.
14	Bradley, V., et al. (2015). "Sticks and stones: Investigating rude, dismissive and aggressive communication between doctors." Clinical Medicine 15(6): 541-545.	UK	To describe the extent of rude, dismissive and aggressive (RDA) communication between doctors, its context and subsequent impact.	31% of doctors described being subject to RDA communication multiple times per week or more often, with junior and registrar doctors affected twice as often as consultants. Rudeness was more commonly experienced from specific specialties: radiology, general surgery, neurosurgery and cardiology. 40% of respondents described that RDA moderately or severely affected their working day. The context for RDA communication was described in five themes: workload, lack of support, patient safety, hierarchy and culture. Impact of RDA communication was described as personal, including emotional distress and substance abuse, and professional, including demotivation.
15	Chadaga, A. R., et al. (2016). "Bullying in the American graduate education system: A national cross-sectional survey." PLoS ONE 11(3).	USA	To deliver an estimate of bullying among residents and fellows in the United States graduate medical system and to explore its prevalence within unique subgroups.	Almost half of the respondents (48%) reported being subjected to bullying although both those subjected and not subjected reported experiencing ≥ 1 bullying behaviours (95% and 39% respectively). Attendings (29%) and nurses (27%) were the most frequently identified source of bullying, followed by patients, peers, consultants and staff. Attempts to belittle and undermine work and unjustified criticism and monitoring of work were the most frequently reported bullying behaviours (44% each), followed by destructive

	Citation	Country	Research Aims & Design	Summary of Findings
				innuendo and sarcasm (37%) and attempts to humiliate (32%).
16	Cho, C. S., et al. (2014). "Resident perspectives on professionalism lack common consensus." Annals of Emergency Medicine 63(1): 61-67.	USA	To characterize and understand the residents' perspective on how professionalism develops through paediatric emergency medicine experiences. Qualitative; interviews; emergency medicine and paediatric residents	Common words associated with professionalism were "respect", "compassion", "empathy", and "integrity"; however, residents did not share a common consensus. The framework for how residents described the development of their professionalism includes observations, interactions, and environment. Examples include resident observation of role models; interactions with patients, families, and co-workers; self-reflection; and the unique environment of the emergency department. Residents believed that role modelling was the most influential factor. Few reported receiving sufficient observation by attending physicians during their interactions with patients and most reported receiving little direct feedback on their professionalism. Residents descriptions of professionalism crossed multiple Accreditation Council for Graduate Medical Education (AGCME) competencies.
17	Choo Kevin, A. V., Barach Paul, Johnson Julie, Farnan Jeanne (2014). "How do supervising physicians decide to entrust residents with unsupervised tasks? A qualitative analysis." Journal of Hospital Medicine 9(3).	USA	To describe the factors that influence how attending and resident perceptions of trust impact decision making. Qualitative; interviews; internal medicine residents and attending physicians	The analysis yielded 535 discrete mentions of entrusting factors that were mapped to the following domains deductively, with inductively derived subthemes: trainee factors (e.g. confidence, specialty plans), supervisor factors (e.g. approachability), task factors (e.g. situational characteristics) and systems factors (e.g. workload).
18	Claridge, A. (2011). "What is the educational value of ward rounds? A learner and teacher perspective." Clin Med 11(6): 558-562.	UK	To investigate the impact on the educational value of ward rounds following the introduction of the European working time directive and foundation programme. Quantitative; survey; foundation year doctors	Eighteen percent of foundation year doctor learning occurs on ward rounds. Hindrances to learning and teaching include lack of time, increasing patient numbers and an absence of team consistency.
19	Connolly, M. T., et al. (2003). "Variation and predictors of primary career choice by year and stage of training." Journal of General Internal Medicine 18: 159-169.	USA	To examine how role models, encouragement, and personal characteristics affect career choice at different stages (medical school vs residency) and periods (1994 vs 1997) of training. Quantitative; survey; medical students and residents	Having a primary care role model was a stronger predictor of primary care career choice for residents than for students. Likewise, peer encouragement was more predictive for residents than for students. Orientation to the emotional aspects of care was consistently associated with primary care career choice across stages and years of training.
20	Cope, A. C., et al. (2015). "'You see?' Teaching and learning how to interpret	UK	To explore how trainees learn visual cue	Visual cue interpretation was a recurrent feature of trainer-trainee interactions and was achieved largely

	Citation	Country	Research Aims & Design	Summary of Findings
	visual cues during surgery." Med Educ 49(11): 1103-1116.		interpretation in the operating room. Qualitative; multiple case study; observation; surgical trainees and their trainers	through the pedagogic mechanism of co-construction. Co-construction was a dialogic sequence between trainer and trainee in which they explored what they were looking at together to identify and name structures or pathology. Co-construction took two forms: 'guided co-construction', in which the trainer steered the trainee to see what the trainer was seeing, and 'authentic co-construction', in which neither trainer or trainee appeared certain of what they were seeing and pieced together the information collaboratively. Whether the co-construction activity was guided or authentic appeared to be influenced by case difficulty and trainee seniority. Co-construction was shown to occur verbally, through discussion, and also through non-verbal exchanges in which gestures made with laparoscopic instruments contributed to the co-construction discourse.
21	Cope, A., et al. (2017). "What Attitudes and Values Are Incorporated Into Self as Part of Professional Identity Construction When Becoming a Surgeon?" Academic Medicine: Journal Of The Association Of American Medical Colleges 92(4): 544-549.	UK	To make explicit the attitudes and values of a community of surgeons, with the aim of understanding professional identity construction within a specific group of residents. Qualitative; grounded theory; interviews; surgeons	Participating surgeons described learning personal values or attitudes that they regarded as core to "becoming a surgeon" and key to professional identity construction. They described learning to be a perfectionist, to be accountable, and to self-manage and be resilient. They discussed learning to be self-critical, sometimes with the unintended consequence of seeming neurotic. They described learning effective teamwork as well as learning to take initiative and be innovative, which enabled them to demonstrate leadership and drive actions and agendas forward within the health care organization where they worked.
22	Cote Luc, L. H. (2000). "How clinical teachers perceive the doctor-patient relationship and themselves as role-models." Academic Medicine 75(11).	Canada	To describe how clinicians who teach clerks and residents represent the doctor-patient relationship and how they see themselves as role models for this relationship. Qualitative; interviews; clinical teachers	The clinical teachers identified competencies associated with the doctor-patient relationship that differed in complexity and specificity. Paramount among these competencies were the ability to conduct interviews effectively and politely, the ability to understand and involve the patient, and, in some cases, the ability to handle emotionally-charged situations. The clinical teachers tended to demand more of their students in doctor-patient relationships than they did of themselves. Lack of time and a negative attitude toward the doctor-patient relationship, on the part of

	Citation	Country	Research Aims & Design	Summary of Findings
				both teachers and students, were obstacles to teaching and learning this essential competency, even to the point of making it difficult for teachers to demonstrate and supervise these competencies during their daily clinical activities.
23	Cote, L. and P.-A. Laughrea (2014). "Preceptors' Understanding and Use of Role Modeling to Develop the CanMEDS Competencies in Residents." Academic Medicine 89(6): 934-939.	Canada	To describe how preceptors understand and use role modelling to develop CanMEDS competencies in residents. Qualitative; interviews; preceptors	Most participants highlighted the importance of role modelling to support residents' development of the CanMEDS competencies, particularly communication, collaboration, and professionalism, which preceptors perceived as "less scientific" and the most difficult to teach. Although most participants reported using an implicit, unstructured role modelling process, some described more explicit strategies. Eight types of educational challenges in role modelling the CanMEDS competencies were identified, including encouraging reflective practice, understanding the competencies and their importance in one's specialty, and being aware of one's strengths and weaknesses as a clinical teacher.
24	Crebbin, W., et al. (2015). "Prevalence of bullying, discrimination and sexual harassment in surgery in Australasia." ANZ J Surg 85(12): 905-909.	Australia & New Zealand	To describe the prevalence of inappropriate behaviours in surgical practice and training. Quantitative; survey; surgical fellows, trainees, surgeons and surgical consultants	Almost half the respondents indicated that they had experienced one or more of the behaviours. This proportion was consistent across every specialty. Male surgical consultants were identified as the most likely perpetrators. More than 70% of the hospitals reported that they had instances in their organisation of discrimination, bullying or sexual harassment by a surgeon within the last 5 years. Surgical directors or surgical consultants were by far the most frequently reported perpetrators in 50% of hospitals.
25	Derrick, S., et al. (2006). "The training/service continuum: exploring the training/service balance of senior house officer activities." Med Educ **40**(4): 355-362.	UK	To explore senior house officers' (SHOs) perception of services and training, with reference to where they place activities along the training/service continuum, and the factors that lead them to classify these activities in the way they do. Mixed methods; survey and focus groups; senior house officers.	Analysis of the quantitative data allowed the construction of the training/service continuum diagram. Identified factors affecting the perceived training/service balance of SHO activities included: frequency, time, type and nature of work, number of patients, supervision, interaction, other commitments, purpose and focus of the activity, the individual trainee and trainer, and experience and competence.
26	Dijksterhuis, M. G. K., et al. (2009). "Assessment of competence and progressive independence in postgraduate clinical	Netherlands	To explore current opinions of supervisors and trainees about how to determine when a trainee is competent to perform a clinical	Two higher-order themes emerged: factors that determine the level of competence of a trainee in a clinical procedure, and factors that determine the level of independence

	Citation	Country	Research Aims & Design	Summary of Findings
	training." Med Educ 43(12): 1156-1165.		procedure and the role of formal assessment in this process. Qualitative; focus groups; obstetrics and gynaecology trainees and supervisors	granted to a trainee or acceptable to a trainee. From this study, it is evident that both determining the level of competence of a trainee for a certain professional activity and making decisions about the degree of independence entrusted to a trainee are complex, multi-factorial processes, which are not always transparent. Competence achieved in a certain clinical procedure does not automatically translate into more independent practice.
27	Dijksterhuis, M. G. K., et al. (2013). A qualitative study on trainees' and supervisors' perceptions of assessment for learning in postgraduate medical education. United Kingdom. 35: e1396-1402.	Netherlands	To explore trainees' and supervisors' perceptions of what factors determine active engagement in formative assessment. Qualitative; focus groups; trainees and supervisors in obstetrics and gynaecology	Three higher order themes emerged: individual perspectives on feedback, supportiveness of the learning environment and the credibility of feedback and/or feedback giver. Engaging in formative assessment with a genuine impact on learning is complex and quite a challenge to both trainees and supervisors. Individual perspectives on feedback, a supportive learning environment and credibility of feedback are all important in this process. Every one of these should be taken into account when the utility of formative assessment in postgraduate medical training is evaluated.
28	Dunkley, L., et al. (2008). "Why do we choose rheumatology? Implications for future recruitment - results of 2006 UK trainee survey." Rheumatology 47: 901-906.	UK	To explore critical factors in choice of rheumatology as a specialty, and what factors might govern choices of prospective trainees. Quantitative; survey; rheumatology specialist registrars	The top four ranked factors influencing choice of rheumatology were senior house officer experience, subject matter, inspirational consultants and lifestyle aspects. Factors felt to be negatively influencing future trainees came under three key themes: poor student or postgraduate exposure, employment and service delivery issues and perceived poor profile of rheumatology. Factors positively influencing future candidates were subject matter, work/life balance, and prior exposure to the specialty.
29	Ende, J., et al. (1995). "Preceptors' strategies for correcting residents in an ambulatory care medicine settings: a qualitative analysis." Academic Medicine 70(3).	USA	To understand the interactional strategies preceptors use as they relate to and occasionally correct interns in a general internal medicine teaching clinic. Qualitative; observation; interns and faculty preceptors in general internal medicine	The strategies the preceptors used to correct the interns were complicated and quite indirect, and tended to minimize exposing the interns'' errors. These strategies revealed the dilemmas inherent in being a preceptor and also the beliefs the preceptors brought to their task. The preceptors' strategies demonstrated their high regard for maintaining the inters' self-esteem and sense of responsibility, as well as the preceptors' willingness to forego, at least for the moment, correctional strategies that might have been more explicit and direct.

	Citation	Country	Research Aims & Design	Summary of Findings
30	Engel, K. G. M. D., et al. (2006). "Residents' Responses to Medical Error: Coping, Learning, and Change." Academic Medicine 81(1): 86-93.	USA	To explore the significant emotional challenges facing resident physicians in the setting of medical mishaps, as well as their approaches to coping with these difficult experiences. Qualitative; interviews; resident physicians	Residents expressed intense emotional responses to error events. Poor patient outcomes and greater perceived personal responsibility were associated with more intense reactions and greater personal anguish. For the great majority of residents, their ability to cope with these events was dependent on a combination of reassurance and opportunities for learning. Interactions with medical colleagues and supervisory physicians were critical to this coping process.
31	Eva, K., et al. (2012). "Factors influencing responsiveness to feedback: on the interplay between fear, confidence, and reasoning processes." Advances in Health Sciences Education 17(1): 15-26.	Multiple	To understand the processes used by learners and physicians to interpret, accept and use data to inform their perceptions of their clinical performance, and to understand the factors believed to influence interpretation of feedback. Qualitative; focus groups; undergraduate learners, postgraduate learners and physicians	Multiple influences appear to impact upon the interpretation and uptake of feedback. These include confidence, experience, and fear of not appearing knowledgeable. Importantly, however, each could have a paradoxical effect of both increasing and decreasing receptivity. Less prevalent but nonetheless important themes suggested mechanisms through which cognitive reasoning processes might impede growth from formative feedback.
32	Farnan, J., et al. (2009). "On-call supervision and resident autonomy: From micromanager to absentee attending." The American Journal Of Medicine 122(8): 784-788.	USA	To describe clinical supervision preferences for attending physicians and residents during times of critical clinical decision-making, specifically during the on-call period; identify clinical scenarios that residents and attending physicians perceive as those requiring supervision; and provide physician in-training descriptions of the attributes of effective clinical supervisors. Mixed methods; survey and interviews; internal medicine residents and attending physicians	Findings suggest that the clinical supervision currently provided to on-call internal medicine residents is variable and highlight some strategies for improving clinical supervision during this period. Attending physicians may use ineffective and extreme strategies to supervise. For example, micromanaging attending physicians might prevent residents from fully developing their own clinical skills.
33	Friedman, S. M., et al. (2010). "Perceptions of emergency medicine residents and fellows regarding competence, adverse events and reporting to supervisors: a national survey." CJEM: Canadian Journal of Emergency Medicine 12(6): 491-499.	Canada	To characterize the perceptions of emergency medicine residents and fellows of their clinical and procedural competence, as well as their attitudes, practices and perceived barriers to reporting these perceptions to their supervisors. Quantitative; survey; emergency medicine residents and fellows	Response rates varied slightly by question; 30.5% agreed with the statement, “I sometimes feel unsafe or unqualified with undertaking unsupervised responsibilities or procedures, but I do not report this to my senior physician” and 39.5% had felt this within the past 6 months. Moreover, 41.5% reported their lack of competence to a supervisor half the time or less. Trainees reported worry about loss of trust, autonomy or respect or reputation. Nights on-call, admission decisions, and central line insertion

	Citation	Country	Research Aims & Design	Summary of Findings
				were reported to be frequently undertaken despite not feeling competent. Suggestions to improve reporting included encouragement to report without penalty and a less judgemental environment.
34	Goldszmidt, M., et al. (2015). "Attending physician variability: A model of four supervisory styles." Academic Medicine 90(11): 1541-1546.	Canada	To understand variability by considering how different attendings configured and rationalised direct patient care, trainee oversights, and teaching activities. Qualitative; grounded theory; interviews; attending physicians	Four supervisory styles were identified: direct care, empowerment, mixed practice, and minimalist. Driven by concerns for patient safety, direct care involves delegating minimal patient care responsibility to trainees. Focused on supporting trainees' progressive independence, empowerment uses teaching and oversight strategies to ensure quality of care. In mixed practice, patient care is privileged over teaching and is adjusted on the basis of trainee competence and contextual features such as patient volume. Minimalist style involves a high degree of trust in senior residents, delegating most patient care, and teaching to them. Attendings rarely discussed the styles with the team.
35	Gonzalo, J. D. M. D. M., et al. (2014). "Identifying and Overcoming the Barriers to Bedside Rounds: A Multicenter Qualitative Study." Academic Medicine 89(2): 326-334.	USA	To identify reasons for the decrease in bedside rounds, actual barriers to bedside rounds, methods to overcome trainee apprehensions, and proposed strategies to educate faculty. Qualitative; interviews; attending physicians	Primary reasons for the perceived decline in bedside rounds were physician- and systems related, although actual barriers encountered related to systems, time, and physician-specific issues. To address resident apprehensions, six themes were identified: build partnerships, create safe learning environments, overcome with experience, make bedside rounds educationally worthwhile, respect trainee time, and highlight positive impact on patient care. Potential strategies for educating faculty were identified, most commonly faculty development initiative, divisional/departmental culture change, and one-on-one shadowing opportunities.
36	Harrison, R. and E. Allen (2006). "Teaching Internal Medicine Residents in the New Era: Inpatient Attending with Duty-Hour Regulations." JGIM: Journal of General Internal Medicine 21(5): 447-452.	USA	To provide descriptive information on the effect of resident duty-hour regulations on attendings and the educational environment. Qualitative; focus groups and survey; residents in internal medicine	Attending physicians report performing more clinical work, teaching less, using more focused teaching methods, and experiencing an increased perception of intensity. Residents observed attending physicians performing increased clinical work, being more time aware, delivering more focused teaching, and having less time to teach. Participants noted changes in autonomy and professionalism.
37	Hauer, K. E., et al. (2015). "How clinical supervisors develop trust in their trainees: a qualitative	USA	To determine how supervisors develop and experience trust in resident	Supervisors characterised the meaning of trust from the perspectives of trainee competence and leadership or from their own

	Citation	Country	Research Aims & Design	Summary of Findings
	study." Med Educ 49(8): 783-795.		trainees in the clinical workplace. Qualitative; interviews; internal medicine supervisors	perspective of needing to provide more or less supervision. Supervisors initially considered trust to be usually independent of prior knowledge of the resident, and then used sources of information about trust to develop their judgements of trust. Sources, which incorporated inference, included supervisors' comparisons with a standard, direct observation of the trainee as a team leader or care provider, and stakeholder input from team members, patients and families. Barriers against and accelerators to trust formation related to the resident, supervisor, resident-supervisor relationship, context and task. Trust formation had implications for supervisors' roles, residents' increasingly independent provision of care, and team functioning.
38	Hoffman, K. and J. Donaldson (2004). "Contextual tensions of the clinical environment and their influence on teaching and learning." Med Educ 38(4): 448-454.	USA	To characterise how context influences clinical teaching. Qualitative; multiple case study; observation and interviews; internal medicine in-patient teams	Three tensions influenced clinical teaching: 1, patient census; 2, time sensitivity of the context; and 3, the multiple and conflicting commitments of participants. Patient census exhibited the greatest influence and was the catalyst for teaching, learning, and the allocation of total time. Time functioned as an important element influencing the pace of action, reflective and interpretative cognitive processes of the team, time available for action, and the general fatigue of the team. Conflicts among the multiple roles of ward team members disrupted individual and team teaching and learning.
39	Kendall, M. L., et al. (2005). "The learning environment for junior doctor training—what hinders, what helps." Medical Teacher 27(7): 619-624.	UK	To explore trainees perception of trainee development during their first year of training. Qualitative; interviews; trainees	Data generated focused not only on learning outcomes, but also on important process issues. Dissatisfaction was expressed with formal and informal teaching and learning opportunities. Factors that enhance the learning environment were identified. These included being supported, a feeling of being a valued member of the team, being stretched but not over stretched, having a broad range of experiences, knowing the system, having a clear remit and being well organised. Factors inhibiting the learning environment included fractured working patterns, insufficient time with patients and seniors, as well as the converse of many of the enhancing factors.

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40	Kennedy, T. and L. Lingard (2007). "Questioning competence: A discourse analysis of attending physicians' use of questions to assess trainee competence." Academic Medicine 82(10).	Canada	To explore, through discourse analysis of case presentations, the process of competence assessment for case-specific clinical independence. Qualitative; discourse analysis; observation; emergency medicine case presentations	Questioning strategies involved clarifying questions (to ensure attendings' understanding of the case), probing questions (to probe trainees' understanding of a case or their underlying knowledge), and challenging questions (to challenge presuppositions). Case-related probing questions and challenging questions were found to be linguistic features of attendings' assessment of trainee's competence.
41	Kennedy, T. J. T. et al. (2007). "Clinical oversight: conceptualizing the relationship between supervision and safety." Journal of General Internal Medicine 22(8): 1080-1085.	Canada	To develop a conceptual model of clinical supervision to inform and guide policy and research. Qualitative; observation and interviews; emergency department and general internal medicine in-patient wards; physicians, residents, medical students and nurses	The term "clinical oversight" was developed to describe patient care activities performed by supervisors to ensure quality of care. "Routine oversight" (preplanned monitoring of trainees' clinical work) can expose supervisors to concerns that trigger "responsive oversight" (a double-check or elaboration of trainees' clinical work). Supervisors sometimes engage in "backstage oversight" (oversight of which the trainee is not directly aware). When supervisors encounter a situation that exceeds a trainee's competence, they move beyond clinical oversight to "direct patient care".
42	Kennedy, T., et al. (2008). "Point-of-care assessment of medical trainee competence for independent clinical work." Academic Medicine 83(10).	Canada	To explore context-specific assessments of trainees' competence for independent clinical work. Qualitative; observation and interviews; internal and emergency medicine teaching team members	Supervisors' assessment of trainee trustworthiness for independent clinical work involved consideration of four dimensions: knowledge/skill, discernment of limitations, truthfulness, and conscientiousness. Supervisors' reliance on language cues as a source of trustworthiness data was revealed.
43	Kennedy, T. J. T., et al. (2009). "It's a cultural expectation... 'The pressure on medical trainees to work independently in clinical practice." Med Educ 43(7): 645-653.	Canada	To develop a theoretical exploration of the pressure on medical trainees to be independent and to generate theory-based approaches to the implications for patient safety of this pressure towards independent working. Qualitative; grounded theory observation and interviews; teaching teams from internal and emergency medicine	Participants conceived that the pressure towards independence in clinical work originated in trainees' desire to lay claim to the identity of a doctor (as a member of a group of autonomous high achievers), and in organisational issues such as heavy workloads and constant evaluations.
44	Kennedy, T. J. T., et al. (2009). "Preserving professional credibility: grounded theory study of medical trainees' requests for clinical support." BMJ 338(b128).	Canada	To develop a conceptual framework of the influences on medical trainees' decisions regarding requests for clinical support from a supervisor.	Trainees' decisions about whether or not to seek clinical support were influenced by three issues: the clinical question (clinical importance, scope of practice), supervisor factors (availability, approachability), and trainee factors (skill, desire for

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			Qualitative; grounded theory; observation and interviews; teaching teams in internal and emergency medicine	independence, evaluation). Trainees perceived that requesting frequent/inappropriate support threatened their credibility and used rhetorical strategies to preserve credibility. These strategies included building a case for the importance of requests, saving requests for opportune moments, making a plan before requesting support, and targeting requests to specific team members.
45	Kisiel, J., et al. (2010). "Resident physicians' perspectives on effective outpatient teaching: a qualitative study." Advances in Health Sciences Education 15(3): 357-368.	USA	To understand residents' perspectives of effective outpatient teaching. Qualitative; focus groups; internal medicine residents	Leading themes were "kindness" and "teacher-learner relationships". Junior residents were sensitive to faculty who were brusque, harsh, and degrading. Senior residents respected faculty who were humble, collaborative, and allowed residents to co-manage teaching encounters. Seniors emphasised the importance of faculty role-modelling and preferentially staffed with experts to "gain wisdom from experience". Overall, residents expressed that effective learning requires grounded teacher-learner relationships.
46	Kroll, L., et al. (2008). "Learning not to take it seriously: junior doctors' accounts of error." Med Educ 42(10): 982-990.	UK	To investigate experiences of, and responses to, medical error amongst junior doctors and to examine the challenges junior doctors face and the support they receive. Qualitative; interviews; pre-registration house officers.	Errors were common and sometimes serious. In relation to disclosure and learning from error, four main themes emerged: a norm of selective disclosure; the effects of the team; individualised blame and responsibility, and the 'learning moment'. Trainees reported disclosing errors informally, particularly when teams were seen as supportive, but were reluctant to criticise colleagues. Formal reports and disclosure to patients were very rare. Patient care was compromised when juniors did not access senior help, often when working outside their usual team environment. Lack of cooperation between teams and poor continuity of care also contributed to error. Learning was maximised when errors were formally discussed and constructive feedback offered. However, both blame and the prioritisation of reassurance over learning and structured feedback appeared to inhibit reflection on the experience of error.
47	LaDonna, K., et al. (2017). "Staging a performance: learners' perceptions about direct observation during residency." Med Educ 51(5): 498-510.	Canada	To explore learners' experiences with direct observation during their residency training. Qualitative; grounded theory; interviews; residents	Direct observation was widely endorsed as an important educational strategy, albeit one that created significant anxiety. Opaque expectations exacerbated participants' discomfort, and participants described that being

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				observed felt like being assessed. Consequently, participants exchanged their 'usual' practice for a 'textbook' approach; alterations to performance generated uncertainty about their role, and raised questions about whether observers saw an authentic portrayal of their knowledge and skill.
48	Larsson, J., et al. (2006). "Being a young and inexperienced trainee anesthetist: A phenomenological study on tough working conditions." Acta Anaesthesiologica Scandinavica 50: 653-658.	Sweden	To investigate what difficulties trainee anaesthetists experience at work. Phenomenology; interviews; trainees	All trainees had experienced considerable, sometimes extreme demands at work. Most of them often felt insufficient and inadequate and had problems with the professional role. Support from consultants was sometimes lacking. Some trainees expressed deep feelings of loneliness and helplessness in difficult clinical situations.
49	Lingard Lorelei, R. R., Espin Sherry, Regehr Glenn, DeVito Isabella (2002). "Team communications in the operating room: Talk patterns, sites of tension and implications for novices." Academic Medicine 77(3).	Canada	To explore the nature of communications among operating room team members from surgery, nursing, and anaesthesia to identify common communicative patterns, sites of tension, and their impact on novices. Qualitative; observation and interviews; surgical teams	Patterns of communication were complex and socially motivated. Dominant themes were time, safety and sterility, resource, roles, and situation. Communicative tensions arose regularly in relation to these themes. Each procedure had on to four "higher-tension" events, which often had a ripple effect, spreading tension to other participants and contexts. Surgical trainees responded to tension by withdrawing from the communication or mimicking the senior staff surgeon.
50	Loo, L., et al. (2012). "'Page Me if You Need Me": The Hidden Curriculum of Attending-Resident Communication." J Grad Med Educ 4(3): 340-345.	USA	To characterize discrepancies and the types of mixed messages that are communicated to residents, as well as to assess their potential effect on resident supervision and patient safety. Quantitative; survey; internal medicine residents and attending physicians	There were clear and substantial differences between the perceptions of resident and attending physicians about when the supervising attending physician should be notified in each of the 6 vignettes. For example, 85% of attending physicians reported they wanted to be notified of an unexpected pneumothorax that required chest tube placement, but only 31% of resident physicians said they would call their attending physician during those circumstances. Common phrases such as "page me if you need me", resulted in approximately 50% of residents reporting they would 'rarely' or 'never' call and another 41% reporting they would only 'sometimes' call their attending physicians.
51	Lorin, S., et al. (2005). "Attitudes and perception of internal medicine residents regarding pulmonary and critical care subspecialty	USA	To evaluate the attitudes and perceptions of internal medicine residents regarding pulmonary and critical care medicine (PCCM) training.	Key factors associated with a higher resident interest in PCCM subspecialty training included more weeks in the ICU, more role models in PCCM, and resident observations of a greater sense of satisfaction among PCCM faculty. The five most

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	training." Chest 127: 630-636.		Quantitative; survey; internal medicine residents	commonly cited attributes of PCCM fellowship that would attract residents to the field included intellectual stimulation, opportunities to manage critically ill patients, application of complex physiologic principles, number of procedures performed, and academically challenging rounds. The five most commonly cited attributes of PCCM that would dissuade residents from the field included overly demanding responsibilities with lack of leisure time, stress among faculty and fellows, management responsibilities for chronically ill patients, poor match of career with resident personality, and treatment of pulmonary diseases.
52	Martinez, W. M. D. M. S., et al. (2014). "Role-Modelling and Medical Error Disclosure: A National Survey of Trainees." Academic Medicine 89(3): 482-489.	USA	To measure trainees' exposure to negative and positive role-modelling for responding to medical errors and to examine the association between that exposure and trainees' attitudes and behaviours regarding error disclosure. Quantitative; survey; residents and medical students.	The response rate was 55% (884/1,622). Training on how to respond to errors had the largest independent, positive effect on attitudes (standardized effect estimate, 0.32, P < .001); negative role-modelling had the largest independent, negative effect (standardized effect estimate, −0.26, P < .001). Positive role-modelling had a positive effect on attitudes (standardized effect estimate, 0.26, P < .001). Exposure to negative role-modelling was independently associated with an increased likelihood of trainees' nontransparent behaviour in response to an error (OR 1.37, 95% CI 1.15–1.64; P < .001).
53	Moulton, C. A., et al. (2010). "Operating from the other side of the table: control dynamics and the surgeon educator." J Am Coll Surg **210**(1).	USA	To explore how academic surgeons manage and balance the often competing responsibilities of patient safety and education during the slowing-down moments. Qualitative; grounded theory; interviews; academic surgeons	An interesting control dynamic emerged as surgeons discussed the need to maintain a sense of control of an operation regardless of how much manual control they had. A dual responsibility to education and patient safety was apparent, with surgeons describing and demonstrating numerous strategies for negotiating manual control with the trainee during the critical slowing-down moments. An assessment of the trainee was implicit in the negotiation process. Numerous complications of control were identified ("bargaining", "skidding") as a product of this control dynamic.
54	Musselman, L. J., et al. (2005). ""You learn better under the gun": Intimidation and harassment in surgical	Canada	To compare how teachers and learners define intimidation and harassment, and to examine the impact of intimidating and harassing behaviours on	Interviewees acknowledged the existence of intimidation and harassment, while at the same time rationalising its occurrence. This paradox was encapsulated in participant descriptions using terms

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	education." Med Educ 39(9): 926-934.		the learning environment and socialisation of surgeons in training. Qualitative; interviews; surgical faculty and residents	such as 'good intimidation'. Our examination of the data helped us to understand that participants sustained the paradox of beneficial intimidation and harassment by rationalising questionable behaviours on 3 specific dimensions, namely: whether an acceptable purpose could be attributed to the perpetrator; whether positive effects of the behaviour existed, and whether there was a perceived necessity for the behaviour.
55	Myers, J. S., et al. (2006). "Internal medicine and general surgery residents' attitudes about the ACGME duty hours regulations: a multicenter study." Academic Medicine 81(12): 1052-1058.	USA	To assess internal medicine and general surgery residents' attitudes about the effects of the Accreditation Council for Graduate Medical Education duty hours regulations on medical errors, quality of patient care, and residency experiences. Quantitative; survey; internal medicine and general surgical residents	Residents reported that whereas fatigue-related errors decreased slightly, errors related to reduced continuity of care significantly increased. Additionally, duty hours regulations somewhat decreased opportunities for formal education, bedside learning, and procedures, but there was no consensus that graduates would be less well trained after duty hours reform. Residents, particularly surgical trainees, reported improvements in quality of life and reduced burnout.
56	Olmos-Vega, F. M., et al. (2017). "Dealing with the tension: how residents seek autonomy and participation in the workplace." Med Educ 51(7): 699-707.	Colombia	To understanding how residents act on different affordances in the workplace is of paramount importance, as it influences their learning. Qualitative; focus groups and interviews; residents	Residents reported that the autonomy and practice opportunities given by their supervisors were either excessive or too limited, and both were perceived as tensions. When in excess, trainees enlisted the help of their supervisor or peers, depending on how safe they recognised the learning environment to be. When practice opportunities were curtailed, trainees tried to negotiate more if they felt the learning environment was safe. When they did not, trainees became passive observers. Learning from each engagement was subject to the extent of intersubjectivity achieved between the actors involved.
57	Park, J., et al. (2010). "Observation, reflection, and reinforcement: Surgery faculty members' and residents' perceptions of how they learned professionalism." Academic Medicine **85**(1): 134-139.	Canada	To explore perceptions of how professionalism is learned in the current academic environment. Qualitative; interviews; surgery residents and faculty	Faculty members' and residents' perceptions of how they learned professionalism reflected four major themes: (1) personal values and upbringing, including premedical education experiences, (2) learning by example from professional role models, (3) the structure of the surgery residency, and (4) formal instruction on professionalism. Of these, role modelling was the dominant theme: Participants identified observation, reflection, and reinforcement as playing key roles in their learning from role models and in distinguishing the sometimes blurred boundary

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				between positive and negative role models.
58	Pimmer, C., et al. (2012). "Learning through inter- and intradisciplinary problem solving: Using cognitive apprenticeship to analyse doctor-to-doctor consultation." Advances in Health Sciences Education 17: 759-778.	Switzerland	To analyse the learning and teaching practices of interdisciplinary cooperation. Qualitative; multiple case study; interviews; residents and attending physicians	The research contributes to three debates: (1) socio-cognitive and situated learning, (2) intra- and interdisciplinary learning in clinical settings, and (3), more generally, to cooperation and problem solving. Patient cases, which necessitate the cooperation of doctors in consults across boundaries of clinical specialisms, trigger intra- as well as interdisciplinary learning and offer numerous and varied opportunities for learning by requesting doctors as well as for on-call doctors, in particular those in residence. The relevance of consults for learning can also be verified from the perspective of CA which is commonly used by experts, albeit in varying forms, degrees of frequency and quality, and valued by learners. Through data analysis a model for collaborative problem-solving and help-seeking was developed which shows the interplay of pedagogical 'methods' of CA in informal clinical learning contexts.
59	Pimmer, C., et al. (2013). "Contextual dynamics in clinical workplaces: learning from doctor–doctor consultations." Med Educ 47(5): 463-475.	Switzerland	To explore the relationship between context and competence development in more loosely framed, day-to-day practices such as doctor-doctor consultations. Qualitative; interviews; residents and attending physicians	The framework illustrates how different situational, personal and organisational factors interact in every learning situation. The interplay manifests in three different roles that doctors assume in highly dynamic ways: doctors learn as 'actors' (being responsible), as 'participants' (being involved) and as 'students' (being taught); contextual influences also impact on the quality of learning within these roles.
60	Ramani, S., et al. (2017). "“It's Just Not the Culture”: A Qualitative Study Exploring Residents' Perceptions of the Impact of Institutional Culture on Feedback." Teaching & Learning in Medicine **29**(2): 153-161.	USA	To examine residents' perspectives on institutional factors that affect the quality of feedback, factors that influence receptivity to feedback, and quality and impact of faculty feedback Qualitative; focus groups; residents	Identified five key themes, dominated by resident perceptions regarding the influence of institutional feedback culture. The theme labels are taken from direct participant quotes: the cultural norm lacks clear expectations and messages around feedback, the prevailing culture of niceness does not facilitate honest feedback, bidirectional feedback is not part of the culture, faculty–resident relationships impact credibility and receptivity to feedback, and there is a need to establish a culture of longitudinal professional growth. Institutional culture could play a key role in influencing the quality, credibility, and acceptability of feedback. A polite culture promotes

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				a positive learning environment but can be a barrier to honest feedback.
61	Reddy, S. T., et al. (2015). "Barriers and Facilitators to Effective Feedback: A Qualitative Analysis of Data From Multispecialty Resident Focus Groups." J Grad Med Educ 7(2): 214-219.	USA	To explore barriers and facilitators that residents in anaesthesiology, emergency medicine, obstetrics and gynaecology, and surgery experience with giving and receiving feedback during their clinical training Qualitative; focus groups	Five major themes related to feedback were identified: teacher factors, learner factors, feedback process, feedback content, and educational context. Unapproachable attendings, time pressures due to clinical work, and discomfort with giving negative feedback were cited as major barriers in the feedback process. Learner engagement in the process was a major facilitator in the feedback process.
62	Sabri, N., et al. (2015). "The Perceived Effect of Duty Hour Restrictions on Learning Opportunities in the Intensive Care Unit." J Grad Med Educ 7(1): 48-52.	Canada	To evaluate residents' perceptions of their current learning opportunities in a context of reduced duty hours, and to explore the perceived change in resident learning opportunities after call length was reduced from 24 continuous hours to 16 hours. Quantitative; survey; residents rotating through intensive care units	The majority of respondents (83%) reported that didactic teaching sessions held by ICU staff physicians were useful. However, of the residents trained in both approaches to overnight call, 44% reported a reduction in learner attendance at didactic teaching sessions, 48% reported a reduction in attendance at midday hospital rounds, and 40% reported a perceived reduction in self-directed reading.
63	Sheehan, D. M., et al. (2005). "Interns' Participation and Learning in Clinical Environments in a New Zealand Hospital." Academic Medicine 80(3): 302-308.	New Zealand	To explore factors that encourage interns to participate actively within clinical rotations. Qualitative; interviews and focus groups; interns	The findings resulted in a model for participation in clinical settings where two critical components were identified: the tasks of patient care and engagement with the clinical team. These two components are further divided into two aspects: initiation and maintenance. The outcome of all four factors working well is a reinforcing cycle of activities that promote and encourage effective participation and learning.
64	Sheu, L., et al. (2017). "How supervisor experience influences trust, supervision, and trainee learning: a qualitative study." Academic Medicine 92(9): 1320-1327.	USA	To investigate how supervisor experience influences trust, supervision, and subsequently trainee learning. Qualitative; interviews; internal medicine residents and attending supervisors	Early supervisors were detail oriented and determined trust depending on task completion, were rule based, drew on their experiences as trainees to guide supervision, and felt less confident clinically compared with more experienced supervisors. Experienced supervisors determined trust holistically, checked key aspects of patient care selectively and covertly, reflected on individual experiences supervising, and felt comfortable managing clinical problems and gauging trainee abilities. Trainees felt the exemplars reflected their experiences, described their preferences and learning needs shifting over time, and emphasized the importance of supervisor flexibility to match their learning needs.

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65	Smith, A., et al. (2003). "Expertise in practice: An ethnographic study exploring acquisition and use of knowledge in anaesthesia." Br J Anaesth 91(3): 319-328.	UK	To describe and explore the way different types of knowledge are learned and used in anaesthetic practice. Qualitative; ethnography; observation and interviews; anaesthetic staff	The development of expertise in anaesthesia rests on the ability to reconcile and interpret many sources of knowledge - clinical, social, electronic, and experiential - and formal theoretical learning. Experts have mastered technical skills but are also able to understand the dynamic and uncertain condition of the anaesthetized patient and respond to changes in it. This expertise is acquired by working with colleagues, and, importantly, by working independently, to develop personal routines. Routines mark the successful incorporation of new knowledge but also function as a defence against the inherent uncertainty of anaesthetic practice. The habits seen in experts' routines are preferred ways of working chosen from a larger repertoire of techniques which can also be mobilized as changing circumstances demand.
66	Stegeman, J. H., et al. (2013). "Knowing and acting in the clinical workplace: trainees' perspectives on modelling and feedback." Advances in Health Sciences Education 18(4): 597-615.	Netherlands	To explore modelling and feedback in two disparate clinical disciplines, surgery and paediatrics. Qualitative; interviews; surgery and paediatric trainees	Modelling is a dynamic and fragmented process reflecting discipline bound characteristics and working styles. On feedback it is: 'feedback' serves as vehicle for three distinctive forms of commenting on performance, each holding a specific power of expression for learning. We propose to view clinical workplace learning as: an interactive master-apprenticeship model encompassing modelling and feedback as natural educational routes. We conceptualise modelling and feedback as 'function' of interaction. Modelling function and feedback function may serve to study these routes as didactical components of ongoing interaction between trainer and trainee rather than an educator-driven series of unrelated events.
67	Sterkenburg, A., et al. (2010). "When do supervising physicians decide to entrust residents with unsupervised tasks?" Academic Medicine 85(9): 1408-1417.	Netherlands	To investigate factors guiding clinical supervisors' decisions to trust residents with critical patient-care tasks. Mixed methods; survey and interviews; anaesthetic residents and attending anaesthetists	Attendings varied in their opinions regarding how much independence to give residents, particularly postgraduate year (PGY) 2, 3, and 4 residents. PGY1 residents reported working above their expected level of competence but estimate their own ability as sufficient, whereas PGY5 residents reported working below their expected level of competence. The authors classified factors that determine entrustment into four groups: characteristics of the resident, the attending, the clinical context, and the critical task.

	Citation	Country	Research Aims & Design	Summary of Findings
68	Sternszus, R. M., et al. (2016). "Resident Role Modeling: "It Just Happens"." Academic Medicine 91(3): 427-432.	Canada	To understand residents' perceptions of themselves as role models, describe how residents learn about role modelling, and identify ways to improve resident role modelling. Qualitative; interviews; residents in internal medicine, general surgery, and paediatrics	Four primary themes were identified through data analysis: residents perceived role modelling as the demonstration of "good" behaviours in the clinical context; residents believed that learning from their role modelling "just happens" as long as learners are "watching"; residents did not equate role modelling with being a role model; and residents learned about role modelling from watching their positive and negative role models.
69	Stewart, J. (2008). "To call or not to call: a judgement of risk by pre-registration house officers." Med Educ 42(9): 938-944.	UK	To explore what influences a junior doctors' response to a judgement call within a clinical setting and to describe the relationships between these influences. Qualitative; grounded theory; interviews; pre-registration house officers	The data demonstrated a number of influences on whether junior doctors chose to seek senior assistance. These included the upholding and balancing of tenets that were necessary for ensuring safe practice, and estimating the chance and severity of potential negative consequences to patients, themselves and their teams. In order to make these judgements, junior doctors drew on different forms of knowledge, especially knowledge gained from previous clinical experiences. In judging whether or not to contact a senior, pre-registration house officers were practising essential clinical attributes, that of independent yet co-operative and discerning practitioners who are able to balance multiple considerations while ensuring patient care.
70	Tallentire, V. R., et al. (2011). "Understanding the behaviour of newly qualified doctors in acute care contexts." Med Educ 45(10): 995-1005.	UK	To investigate the factors that influence the behaviour of junior doctors and to develop a framework that promotes understanding of this important area. Qualitative; grounded theory; focus groups; specialist registrar, foundation year 1 and 2 doctors	Six main themes, grouped under three broad headings, emerged from the data: 'transferring knowledge into practice' and 'decision making and uncertainty'; 'acts and omissions' and 'identity and expectations' (roles and responsibilities), and, finally, 'the medical hierarchy' and 'performing under stress' (environmental factors). The framework presented within this paper illustrates the complex relationships between these factors.
71	Taylor, C., et al. (2009). "The influence of mentorship and role modeling on developing physician-leaders: Views of aspiring and established physician-leaders." Journal of General Internal Medicine 24(10).	USA	To understand the role and functions of mentoring and role-modelling in developing physician-leaders as experienced by aspiring and established physician-leaders. Qualitative; interviews; faculty	Three themes emerged: 1. Role modelling was differentiated as a valued experience separate from mentoring, with respondents describing the significant influence of purely observational learning and "watching leaders-in-action". 2. Many respondents favoured a series of "strategic" interactions with various individuals about specific professional issues rather than traditional, longitudinal mentoring

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				experiences. 3. Emotional and psychological support was considered the most valued type of interventional activity.
72	Teman, N. R., et al. (2014). "Entrustment of general surgery residents in the operating room: Factors contributing to provision of resident autonomy." J Am Coll Surg 219(4).	USA	To determine the factors contributing to faculty decisions to grant residents autonomy in the operating room, the barriers to granting this autonomy, and the factors that facilitate entrustment. Quantitative; survey; attending surgeons	Factors most important to increasing resident responsibility and autonomy in the operating room were the residents observed clinical skill and the attending surgeon's confidence level with the operation. Factors believed to prevent awarding graduated responsibility and autonomy in the operating room included an increased focus on patient outcomes, a desire to increase efficiency and finish operations earlier, and expectations of attending surgeon involvement by the hospital and patients. Fourteen percent pointed to a change to a shift-work mentality and decreased ownership of responsibility for patients by residents; 13% described a lack of resident autonomy due to increased supervision requirements.
73	Ten Cate, O., et al. (2016). "Entrustment decision making in clinical training." Academic Medicine 91(2): 191-198.	Netherlands	To explore the entrustment decision-making process in health care training. Qualitative; focus groups	The authors discuss theoretical backgrounds and terminology of trust and entrustment in the clinical workplace. The competency-based movement and the introduction of entrustable professional activities force educators to rethink the grounds for assessment in the workplace. Anticipating a decision to grant autonomy at a designated level of supervision appears to align better with health care practice than do most current assessment practices. The authors distinguish different modes of trust and entrustment decisions and elaborate five categories, each with related factors, that determine when decisions to trust trainees are made: the trainee, supervisor, situation, task, and the relationship between trainee and supervisor. The authors' aim in this article is to lay a theoretical foundation for a new approach to workplace training and assessment.
74	Teunissen, P., et al. (2007). "Attending doctors' perspectives on how residents learn." Med Educ 41: 1050-1058.	Netherlands	To develop a theoretical framework of learning in the clinical workplace by adding the perspective of attending doctors. Qualitative; grounded theory; interviews; attending doctors in obstetrics and gynaecology	Three related themes emerged. The first concerned the central role of participation in work-related activities: according to attending doctors, residents learn by tackling the everyday challenges of clinical work. The second involved the ways in which attending doctors influence what residents learn from work-related activities. The final theme focused on attending doctors' views

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				of the essential characteristics of residents and their development during residency.
75	Teunissen, P. W., et al. (2007). "How residents learn: qualitative evidence for the pivotal role of clinical activities." Med Educ 41(8): 763-770	Netherlands	To seek insight into the intricate process of how residents learn in the clinical workplace. Qualitative; grounded theory; focus groups; obstetrics and gynaecology residents	An underlying theoretical framework emerged from the data, which clarified what happens when residents learn by doing in the clinical workplace. This framework shows that work-related activities are the starting point for learning. The subsequent processes of 'interpretation' and 'construction of meaning' lead to refinement and expansion of residents' knowledge and skills. Interaction plays an important role in the learning process.
76	Teunissen, P. W. M. D., et al. (2009). "Who Wants Feedback? An Investigation of the Variables Influencing Residents' Feedback-Seeking Behavior in Relation to Night Shifts." Academic Medicine 84(7): 910-917.	Netherlands	To investigate what individual and situational variables influence residents' feedback-seeking behaviour on night shifts. Quantitative; survey; obstetrics and gynaecology residents	The response rate was 76.5%. Results showed that residents who perceive more feedback benefits report a higher frequency of feedback inquiry and monitoring. More perceived feedback costs result mainly in more feedback monitoring. Residents with a higher learning goal orientation perceive more feedback benefits and fewer costs. Residents with a higher performance goal orientation perceive more feedback costs. Supportive physicians lead residents to perceive more feedback benefits and fewer costs.
77	Tilburt, J. C., et al. (2007). "How do doctors use information in real-time? A qualitative study of internal medicine resident precepting." J Eval Clin Pract 13(5): 772-780.	USA	To describe information exchange behaviour by internal medicine residents and attendings in ambulatory resident clinic precepting rooms. Qualitative; observation; internal medicine residents and attendings	Four themes of information exchange behaviour emerged: (i) questioning behaviours that were used as part of the communication process in which the resident and attending doctor could reason together; (ii) searching behaviour of non-human knowledge sources occurred in a minority of precepting interactions; (iii) unsolicited knowledge offering and (iv) answering behaviours were important means of exchanging information.
78	Tiyyagura, G., et al. (2014). "The greater good: How supervising physicians make entrusment decisions in the pediatric emergency deparment." Acad Pediatr 14(6).	USA	To understand how supervisors determine the level of procedural supervision to provide a resident, taking into consideration simulation performance; to understand factors that affect supervisors' transparency to parents about residents' procedural experience. Qualitative; interviews; supervisors in paediatrics	Five factors influenced supervisors' entrustment decisions: 1) resident characteristics that include self-reported confidence, seniority, and prior interactions with the resident; 2) supervisor style; 3) nature of the procedure/characteristics of the patient; 4) environmental factors; and 5) parental preferences. Supervisors thought that task-based simulators provided practice opportunities but that simulated performance did not provide evidence for entrustment. Supervisors reported selectively omitting details about a resident's

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				experience level to families to optimize experiential learning for residents they entrusted to perform a procedure.
79	Tsouroufli, M. and H. Payne (2008). "Consultant medical trainers, modernising medical careers (MMC) and the European time directive (EWTD): tensions and challenges in a changing medical education context." BMC Med Educ 8: 31-31.	UK	To explore consultant trainers' views on postgraduate medical education and the implications of cultural changes, resulting from MMC and EWTD, aiming to identify impediments in the successful implementation of MMC, within a context of reduced working hours. Qualitative; interviews; hospital consultants	Consultant Trainers felt that new working patterns resulting from the EWTD and MMC have changed the nature of medical education. Loss of continuity of care, reduced clinical exposure of medical trainees and loss of the popular apprenticeship model were seen as detrimental for the quality of medical training and patient care. Consultant Trainers' perceptions of medical education were embedded in a traditional medical education culture, which expected long hours' availability, personal sacrifices and learning without formal educational support and supervision.
80	Wallenburg, I., et al. (2013). "Learning to doctor: tinkering with visibility in residency training." Sociology of Health & Illness 35(4): 544-559.	Netherlands	To explore the coexistence of multiple practices of residents' visibility in daily clinical routines. Qualitative; ethnography; obstetrics and gynaecology wards	The article lists four visibilities: staging residents, negotiating supervision, playing the invisibility game and filming surgical operations. The article shows how attending physicians and medical residents tinker with these visibilities in daily clinical work to provide good care while enacting learning space, highlighting the increasing importance of visualising technologies in clinical work. Moreover, the article contributes to traditional sociological accounts on medical education, shifting the focus from medical education as a social institution to the practices of medical training itself. Such a focus on practice helps to gain an understanding of how the current reform challenges clinicians' educational activities.
81	Watling, C., et al. (2012). "Learning from clinical work: the roles of learning cues and credibility judgements." Med Educ 46(2): 192-200.	Canada	To explore experiences considered by doctors to be influential in their learning in order to better understand this process. Qualitative; grounded theory; interviews; academic doctors	A model of clinical learning emerged in which the clinical work itself is central. As they observe and participate in clinical work, learners can attend to a variety of sources of information that facilitate the interpretation of the experience and the construction of knowledge from it. These 'learning cues' include feedback, role models, clinical outcomes, patient or family responses, and comparisons with peers. The integration of a cue depends on the learner's judgement of its credibility. Certain cues, such as clinical outcomes or feedback from patients, are seen as innately credible, whereas other cues, particularly feedback from

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				supervisors, are subjected to critical judgement.
82	Watling, C., et al. (2016). "'Sometimes the work just needs to be done': socio-cultural influences on direct observation in medical training." Med Educ 50(10): 1054-1064.	Canada	To explore the influence of professional culture on the use of direct observation within medical education. Qualitative; grounded theory; interviews; residents	Observation was used selectively; specialties tended to observe the clinical acts that they valued most. Despite these differences, we found two cultural values that consistently challenged the ready implementation of direct observation across specialties: (i) autonomy in learning and (ii) efficiency in health care provision. Furthermore, we found that direct observation was a primarily learner driven activity, which left learners caught in the middle, wanting observation but also wanting to appear independent and efficient.
83	Wear, D. and J. Skillicorn (2009). "Hidden in plain sight: the formal, informal, and hidden curricula of a psychiatry clerkship." Academic Medicine 84(4): 451-458.	USA	To examine perceptions of the formal, informal, and hidden curricula in psychiatry as they are observed and experienced by (1) attending physicians who have teaching responsibilities for residents and medical students, (2) residents who are taught by those same physicians and who have teaching responsibilities for medical students, and (3) medical students who are taught by attendings and residents during their psychiatry rotation. Qualitative; focus groups; attendings, residents and students	All three groups offered a similar belief that the knowledge, skills, and values of the formal curriculum focused on building relationships. Similarly, all three suggested that elements of the informal and hidden curricula were expressed primarily as the values arising from attendings' role modelling, as the nature and amount of time attendings spend with patients, and as attendings' advice arising from experience and intuition versus "textbook learning." Whereas students and residents offered negative values arising from the informal and hidden curricula, attendings did not, offering instead the more positive values they intended to encourage through the informal and hidden curricula.
84	Weissmann, P. F. M. D., et al. (2006). "Role Modeling Humanistic Behavior: Learning Bedside Manner from the Experts." Academic Medicine 81(7): 661-667.	USA	To study how excellent clinical teachers impart the behaviours and attitudes consistent with humanistic care to their learners. Qualitative; observation; clinical faculty	Clinical teachers taught primarily by role modelling. Although they were highly aware of their significance as role models, they did not typically address the human dimensions of care overtly. Despite the common themes of role modelling identified, each clinical teacher exhibited unique teaching strategies. These clinical teachers identified self-reflection as the primary method by which they developed and refined their teaching strategies.
85	Wright, S. (1996). "Examining what residents look for in their role models." Academic Medicine 71(3): 290-292.	USA	To determine which characteristics were deemed most important by residents regarding their physician role models. Quantitative; survey; residents	A total of 195 residents (85%) responded. Most of the residents (74%) were satisfied with the proportions of positive role models in their current residency training programmes. Clinical skills, personality, and teaching ability were rated the three most important factors in selecting a staff physician as a role model. When the residents

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				were asked to recall the positive role models encountered while in medical school, attending physicians in internal medicine received the highest scores.
86	Wright, S. M., et al. (1998). "Attributes of excellent attending-physician role models." The New England Journal of Medicine 339(27): 1986-1993.	USA	To identify attributes that distinguish excellent role models from their colleagues. Quantitative; survey; physicians	Of the 341 attending physicians who responded, 144 (42 percent) had been identified as excellent role models. Having greater assigned teaching responsibilities was strongly associated with being identified as an excellent role model. In the multivariate analysis, five attributes were independently associated with being named as an excellent role model: spending more than 25 percent of one's time teaching (odds ratio, 5.12; 95 percent confidence interval, 1.81 to 14.47), spending 25 or more hours per week teaching and conducting rounds when serving as an attending physician (odds ratio, 2.48; 95 percent confidence interval, 1.15 to 5.37), stressing the importance of the doctor–patient relationship in one's teaching (odds ratio, 2.58; 95 percent confidence interval, 1.03 to 6.43), teaching the psychosocial aspects of medicine (odds ratio, 2.31; 95 percent confidence interval, 1.23 to 4.35), and having served as a chief resident (odds ratio, 2.07; 95 percent confidence interval, 1.07 to 3.98).
87	Wright, S. and J. A. Carrese (2001). "Which values do attending physicians try to pass on to house officers?" Med Educ 35(10): 941-945.	USA	To determine the values and attitudes which attending physicians try to pass on to residents in order to encourage their professional development. Quantitative; survey; attending physicians	Of the 341 attending physicians who returned a completed questionnaire, 265 (78%) shared the single value or attitude they try to pass on to residents. The four main categories into which more than 95% of responses could be categorized were: (i) caring, (ii) respect, (iii) communication and (iv) integrity. There were no statistically significant differences between the responses given by attending physicians who had been named as excellent role models and their colleagues who had not been so named.
88	Wright, S. and J. A. Carrese (2002). "Excellence in role modelling: Insight and perspectives from the pros." JAMC **167**(6).	USA	To better understand role modelling by examining the insights of respected physician role models. Qualitative; interviews; internal medicine attending physicians	The informants identified specific characteristics related to role modelling. Subcategories under the domain of personal qualities included interpersonal skills, a positive outlook, a commitment to excellence and growth, integrity and leadership. Under the domain of teaching, the subcategories were establishing rapport with learners, developing specific teaching philosophies and methods, and being committed to the growth of learners.

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				Subjects thought there was some overlap between teaching and role modelling, but felt that the latter was more implicit and more encompassing. Being a strong clinician was regarded as necessary but not sufficient for being an exemplary physician role model. Perceived barriers to effective role modelling included being impatient and overly opinionated, being quiet, being overextended, and having difficulty remembering names and faces. Physician role models described role modelling consciousness, in that they specifically think about being role models when interacting with learners. Subjects believed that medical learners should emulate multiple role models.
89	Wyber, R. and T. Egan (2007). "For better or worse: role models for New Zealand house officers." The New Zealand Medical Journal 120(1253).	New Zealand	To examine the positive and negative role modelling experiences of New Zealand house officers. Qualitative; interviews; house officers	The interviews revealed three broad relationships that house officers consider important for identifying their role models: the relationship between house officer and the model; the model's relationship with patients; and the model's relationship with medicine. Clinical skills are excluded from this discussion because they are generally a poor demarcation between positive and negative role models.
90	Yazigi, A., et al. (2006). "Clinical teachers as role models: Perceptions of interns and residents in a Lebanese medical school." Med Educ **40**: 654-661.	Lebanon	To identify the characteristics and learning impact of role models as perceived by interns and residents. Quantitative; survey; interns and residents	A total of 88 responders (97%) had positive role models and 87 responders (96%) had negative role models in their current training programme. Characteristics identified most frequently and ranked most highly by the trainees were related to clinical skills in positive role models and to inadequate humanistic and collaborative attitudes in negative models. Role modelling had a positive impact on the achievement of clinical skills for 55% of the responders, and on the acquisition of humanistic and collaborative attitudes for 30% of them. Thirty-eight per cent of the trainees were influenced by their role models in the choice of their specialities. Responses were generally comparable between levels of training and between medical and surgical specialities.