**SUPPLEMENTARY DATA**

**PubMed Search Strategy**

Inappropriate prescribing OR potentially inappropriate prescribing OR inappropriate prescription\* OR overprescribing OR underprescribing OR inappropriate polypharmacy OR inappropriate medicine\* OR inappropriate medication\* OR inappropriate drug\* OR optimize prescribing OR improve appropriateness of prescribing

AND

aged OR elder\* OR geriatric OR older person\* OR older patient\* OR older adult\*

AND

Computer\* OR software OR software intervention OR clinical decision support OR CDSS OR CDS

Note: For each of the remaining databases, the search strategy was modified to suit their specific search capabilities if necessary.

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| **Author****Table 3:** Supplementary details about the intervention in the included studies.**Year (Country)** | **Study Design** | **Duration of study**  | **Number of patients**  | **Target Medicines** | **Intervention aimed at** | **Prescriber involved with intervention** | **Intervention** |
| Agostini *et al.*2007 (USA) [18] | Controlled before-after study | Pre- and post-intervention periods were both 12 months | C: 12,356 I: 12,153 Total: 24,509 | The sedative hypnotics diazepam and diphenhydramine. | Patients aged ≥65 years admitted to the adult inpatient service.  | Physician | Computerised reminder in a CPOE system aiming to minimise use of diphenhydramine and diazepam, and directing physicians to either a nonpharmacological sleep protocol or to an alternative medication, such as trazodone or lorazepam.  |
| Boustani *et al.*2012 (USA) [12] | RCT | 21 months | C: 225I: 199Total: 424  | 18 medications with moderate to severe centrally acting anticholinergic properties, selected by an interdisciplinary team (which included a geriatrician, a geriatric nurse practitioner, a pharmacist, a social worker, a physical therapist, an occupational therapist, and an administrative assistant). | English-speaking patients ≥65 years hospitalised on a medical ward, with cognitive impairment at the time of hospital admission. Patients excluded if they had previously been enrolled in the study, were aphasic, or unresponsive at the time of screening. | Physician | If a physician ordered any one of 18 inappropriate anticholinergic medications in a CPOE system, a CDSS interruptive alert recommended to discontinue the medicine, dose modification, or suggested an alternative. |
| Ghibelli *et al.*2013 (Italy) [10] | Controlled before-after study | 2 months for both phases | C: 74I: 60Total: 134  | PIMs according to the 2003 Beers criteria, as these were the explicit criteria in INTERcheck®. | Inpatients ≥65 years – only exclusion criteria were severe malignancy (life expectancy less than 6 months) or terminal illness. | Physician | The physician utilised a computerised prescription support system (INTERcheck®) to identify PIMs and potential drug-drug interactions, as well as aiming to reduce anticholinergic load and adjust doses in patients with renal impairment. |
| Griffey *et al.*2011 (USA) [13] | Interrupted time series | Alternated OFF, ON, OFF, ON. First two blocks were 6 weeks long and last two blocks were 7 weeks long.  | C: 668I: 739 Total 1,407 | Benzodiazepines, NSAIDs, opiates, sedative-hypnotics. These were selected by an expert panel including a geriatrician, a general psychiatrist,a pharmacist, two general internists, and an anaesthesiologistspecialising in pain management, as had previously been done in Peterson *et al* [18]. | All persons aged ≥65 years who had an order for a medication in one of the targeted drug classes during the study period. The study excluded patient orders in which qualifying medication orders were subsequently cancelled and any orders with missing data. | Physician | When one of the study medications was ordered in a CPOE system for patients ≥65 years, a clinical decision support tool modified one or more of the following parameters: medication selection, default dosage, or default frequency. The physician could then choose to accept or override the recommendation. The tool was alternated ‘OFF’ and ‘ON’ in consecutive blocks during the study period.  |
| Lester *et al.*2015 (USA) [16] | Controlled before-after study | 4 years: 2010 to 2013. Results are from the second quarters of each year  | C: 3,259I: 9,591Total: 12,850 | Diphenhydramine, metoclopramide, and all antipsychotics. | Patients aged ≥65 years. | Prescribers – doesn’t specify.  | Informational alerts popped up when a PIM was ordered in the CPOE system. The physician was required to acknowledge the alert, before deciding on whether to cancel their order or continue prescribing the medication.  |
| Mattison *et al.*2010 (USA) [17] | Controlled before-after study | Pre-alert: 6 months Post-alert: 37 months | Number of patients is not stated | A list of Beers 2003 criteria medications selected by a geriatrician and pharmacist, and then revised by the hospital’s Pharmacy and Therapeutics Committee. | All hospitalised inpatients aged ≥65 years. | Physicians  | The CPOE system alerted prescribers when a PIM was ordered by providing a medication-specific warning that advised alternative medication or dose reduction.  |
| Peterson *et al.*2005 (USA) [15] | Interrupted time series | 4 consecutive 6-week study periods. 1st and 3rd were control periods (usual CPOE). 2nd and 4th periods were intervention periods | C: 2,515 patient visitsI: 2,647 patient visitsTotal: 5,162 | 72 psychotropic medications decided on by a panel of experts, including a geriatrician, a geriatric psychiatrist, a pharmacist, 2internists, and an anaesthesiologist specialising in pain management. | All patients ≥65 years prescribed one of the targeted medication and admitted to any of the medical, surgical, neurology, and gynaecology services were evaluated. General ward and intensive care patients were eligible for analysis. Only those patients whose admission was entirely contained within 1 of the 6-week study periods were included. | Physicians | A decision support tool altered the default dose and frequency for psychotropic medications for patients ≥65 years, and suggested an alternative medication when prescribers ordered one of 12 psychotropic medications known to be poorly tolerated in older patients. The support tool was activated for 2 of 4 six-week study periods in an off-on-off-on pattern. |
| Terrell *et al.*2009 (USA) [14] | RCT | 30 months | C: 1,925 I: 1,793 Total: 3,718 | 9 high-use and high impact PIMs, selected by an expert panel consisting of two doctors of pharmacy, two physician information technologyexperts, three geriatricians, and three emergency physicians. | The intervention was aimed at emergency department physicians.I: 32 physiciansC: 31 physicians |  | Physicians in the intervention group were provided decision support when they attempted to prescribe a PIM for patients ≥65 years who were being discharged from the emergency department. The computerised reminder provided recommendations for alternatives which the physician could accept or reject.  |

C: Control group; I: Intervention group; CI: Confidence interval; RCT: Randomised controlled trial; CPOE: Computerised physician order entry; CDSS: Clinical decision support system; CO: Clinical outcomes; PIM: Potentially inappropriate medicine; ADE: Adverse drug event

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| **Author****(RCTs**\* **and controlled before-after studies)** | **Selection Bias** |  |  |  | **Detection Bias** | **Attrition Bias** | **Reporting Bias** | **Other Bias** | **Overall Risk of Bias** |
| **Random sequence generation** | **Allocation concealment** | **Baseline outcome measurements similar** | **Baseline characteristics similar** | **Free of contamination** | **Outcome assessment**  | **Incomplete data outcomes addressed** |  |  |  |
| Agostini *et al. [18]* |  |  |  |  |  |  |  |  |  |  |
| Boustani *et al. [12]\** |  |  |  |  |  |  |  |  |  |  |
| Ghibelli *et al. [10]* |  |  |  |  |  |  |  |  |  |  |
| Lester *et al. [16]* |  |  |  |  |  |  |  |  |  |  |
| Mattison *et al. [17]* |  |  |  |  |  |  |  |  |  |  |
| Terrell *et al. [14]\** |  |  |  |  |  |  |  |  |  |  |
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| **Author****(Intermittent time series analysis studies)** | **Was the intervention independent of other changes?** | **Was the shape of the intervention effect pre-specified?** | **Was the intervention unlikely to affect data collection?** | **Was the knowledge of the allocated interventions adequately prevented during the study?** | **Were incomplete outcome data adequately addressed?** | **Was the study free from selective reporting?** | **Other risks of bias** | **Overall risk of bias** |
| Griffey *et al. [13]* |  |  |  |  |  |  |  |  |
| Peterson *et al. [15]*\* RCT: Randomised controlled trial |  |  |  |  |  |  |  |  |

**Table 4:** Risk of bias assessments. Review authors’ judgements are categorised as ‘Low Risk’ of bias (+), ‘High Risk’ of bias (-) or ‘Unclear Risk’ of bias (?).

**Table 5:** Studies which assessed clinical outcomes.

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| **Author** | **Description of Clinical Outcomes** |
| Boustani *et al. [12]* | All clinical outcomes with no statistically significant difference (0/9)No statistically significant effects on health outcomes including: * the mean days of hospital stay (intervention: 7.7 days vs usual care: 6.8, *p* = 0.12),
* 30-day mortality rate (intervention: 6% vs usual care: 5.8%, *p* = 0.69),
* home discharge (intervention: 43.2% vs usual care: 36.9%, *p* = 0.13),
* 30-day readmission rates (intervention: 18.6% vs usual care: 16.4%, *p* = 0.53),
* hospital-acquired complications (intervention: 47.2% vs usual care: 44.9%, *p* = 0.94).

The hospital-acquired complications included: * incidence of delirium (intervention: 33.7% vs usual care: 31.1%, *p* = 0.78),
* the presence of ICD-9 codes of pressure ulcer at discharge (intervention: 12.1% vs usual care: 11.1%, *p* = 0.77),
* the presence of ICD-9 code for fall or injury at discharge (intervention: 4.5% vs usual care: 4.9%, *p* = 0.88),
* orders for physical restraints or patients observed to be physically restrained (intervention: 11.1% vs usual care: 7.6%, *p* = 0.54).
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| Griffey *et al. [13]* | One clinical outcome with statistically significant difference\* (1/5)No significant differences were observed in: admission rate, reversal drug administration, number of 10-fold orders, or emergency department length of stay.\*ADEs: There were 39 ADEs identified, distributed as 8/237 patients (3%; 95% CI 1% to 6%) during ON periods and 31/436 patients (7%; 95% CI 5% to 9%) during OFF periods (*p* = 0.02). |
| Peterson *et al. [15]* | One clinical outcome with statistically significant difference† (1/3)No difference between control and intervention for length of stay or altered mental status.†The rate of falls continued to be significantly less (0.28 vs 0.64 falls per 100 patient-days; *p* = 0.001) |

ICD: International Classification of Diseases; ADE: adverse drug event; CI: Confidence Interval.