Medicines-related harm in the elderly post-hospital discharge

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Awareness of the risks of medicines-related harm in the elderly can enhance medicines safety in vulnerable patients. This article examines the risk factors for medicines-related harm and the recommended strategies to reduce these risks.

SPL

Medicines-related harm (MRH) is a global health challenge, caused by unsafe medication practices and medication errors.[1] MRH has recently been announced as the third global patient safety challenge by the World Health Organization (WHO).[2] Medicines are the most common form of health intervention used today.[3] However, medicines can cause harm if they are not taken correctly, are insufficiently monitored, or as a result of errors.[4]

In a recent UK study, it was estimated that post-discharge MRH in older people incurs an annual cost of £400 million to the NHS.[5] MRH in the global population has been estimated to lead to a $42 billion burden on healthcare costs annually.[1]

The common types of medicines-related harm

MRH is more likely to occur in the older population or in the presence of co-morbidity and polypharmacy.[6,7] In older people following hospital discharge, a large-scale multicentre UK study found that the most prevalent forms of MRH were: adverse drug reactions (ADRs) (72.9%), non-adherence (10.9%) and medication errors (3.4%).[5] Around 13% of patients in the study experienced more than one type of harm (see Figure 1). The authors described an example in which a study participant experienced a gastric bleed associated with an antiplatelet treatment due to non-adherence to their proton-pump inhibitor (*ie* an ADR and non-adherence).[5] These common MRH types are explored in more detail below.

Adverse drug reaction

An ADR is "an undesirable effect of a drug that goes beyond its intended therapeutic use".[8] ADRs are a huge clinical burden and account for nearly 6% of all hospital admissions[8] and 20% of readmissions.[9] A European review identified that the rate of ADRs on admission and during inpatient care in hospital is significant, but there were a limited number of studies conducted in the primary care setting.[10] More importantly, ADRs are difficult to identify in older populations as presenting symptoms are very similar to those in people with multimorbidity and frailty, such as dizziness, delirium or falls.[11]

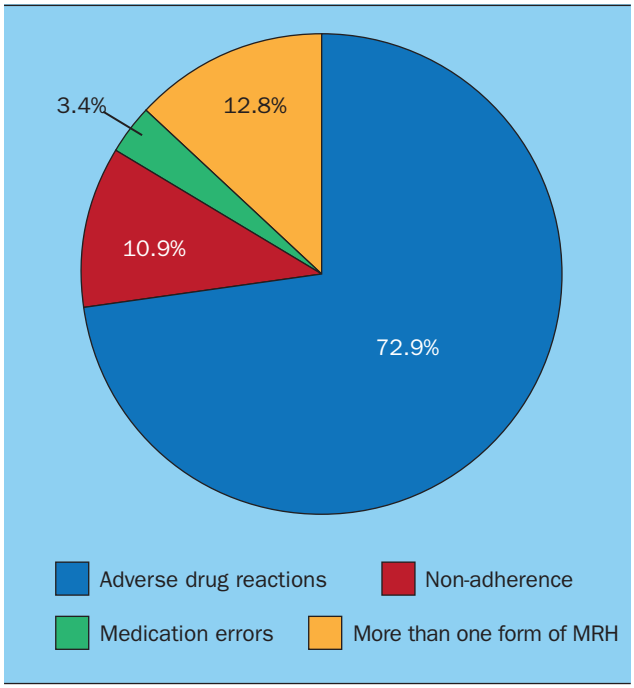

Figure 1. Forms of medicines-related harm (MRH) in older people following hospital discharge, as reported by Parekh *et al*, 2018[5]

Non-adherence

The rate of medication non-adherence globally has been consistently reported to be between 20% and 50%.[12] Non-adherence is one of the biggest obstacles in prescribing as it can negatively affect health outcomes, clinician-patient relationships and the health budget. It is commonly associated with newly prescribed medications to treat chronic conditions such as hypertension, hyperlipidaemia and diabetes.[13]

Non-adherence can be categorised into intentional or unintentional.[14] Studies have shown that non-adherence to discharge medicines after leaving hospital is mainly unintentional.[15-17] However, reasons for intentional non-adherence include lack of understanding of the benefits/risks of the medicines, health beliefs and health literacy.[18] Other studies have shown that patient counselling before discharge can improve adherence.[19-22] This counselling can be specifically aimed at improving patients' knowledge of their medicines as well as how to manage their medication when they leave hospital.

Medication error

A medication error can be defined as "a preventable event that may lead to inappropriate medication use or patient harm".[23] Medication errors can include prescribing, dispensing, administration and monitoring errors. Medication errors can result in ADRs, drug-drug interactions, suboptimal patient adherence and therapeutic effect, and poor patient experience. However, medication errors may or may not result in ADRs or harm. There is currently no consensus on the rate of medication errors that result in harm.[24] A recent review[7] estimated that around 237 million medication errors occur at some point in the medication process in England per year. However, around 72% have little or no potential for harm.

Medication errors and related problems are common in primary care prescribing[7,25] and have the potential to cause patient harm. This may be because of the size of the patient population in primary care, leading to high burden of errors.[7] Medication errors were also found to be common in the care home sector,[7,26] where most of the errors occurred at the administration stage. Medication errors in primary care were most likely to occur at the stages of repeat prescribing reviews, interface communication and patient adherence.[25]

In their systematic review, Garfield *et al.*[25] mapped out the problems associated with medicines administration when a patient moves from primary to secondary care and back to primary care. An abridged version of this is presented in Figure 2, depicting the patient pathway from hospital admission to post-hospital discharge, and the types of medication error that can occur.

The WHO's Medication Without Harm global patient safety initiative[1] concentrates on three priority areas: high-risk situations, polypharmacy and transitions of care. MRH affects approximately 65% of patients post-discharge[27] and is most prevalent at the prescribing, monitoring and administration stages.[18,27-30] MRH associated with post-discharge prescribing is commonly due to discharge summary processing in general practice,[18] where medication changes were not implemented in 17% of cases.

Poor-quality discharge communication is a major contributing factor in MRH,[15,30-32] where legibility, inaccurate content, layout and ambiguous wording on discharge summaries are all thought to increase MRH risks. Another factor is delayed or misplaced discharge summaries. These factors can be particularly prevalent during weekend and public holiday discharges.[33] An audit found that even if discharge summaries were of good quality, 6% of patients in primary care had at least one incorrectly actioned change.[32] GPs predominantly conducted medicines reconciliation post-discharge; however, it was found that a proportion was completed by various other team members, from pharmacists to reception staff.[32]

The risk of failure to make changes on discharge summaries is highest with newly-started medicines.[18] Prescribing errors such as incorrect dosages, medication duplication and drug interactions have been shown to account for 24% of MRH.[16,27] Monitoring and follow-up advice on discharge summaries are often not completed in primary care, increasing the risk of MRH.[18] Failure to carry out appropriate drug monitoring has been implicated in adverse drug events.[34] It is often unclear which sector or healthcare professional is responsible for post-discharge monitoring, which can lead to a lack of action.[30]

Patient-related risk factors such as lack of knowledge of medicines,[27] non-adherence, age and cognitive impairment[15,35] contribute to a large proportion of MRH. A recent Dutch study illustrated the need for patient education at the point of discharge on both medicines information (60.1%) and medication management (37.2%).[36]

Polypharmacy is also a risk factor for MRH. Polypharmacy is common among older people, and is associated with

increased drug-drug interactions, adherence and the likelihood of patient-induced medication errors.[37] One study found that the risk of ADRs increases and a positive correlation is shown in patients on nine or more medications.[38] Deprescribing initiatives and regular medication reviews can help to identify medication problems and reduce medication regimen complexities.[39]

Patients who are taking high-risk medicines have an increased risk of experiencing MRH. High-risk medicines include those with narrow therapeutic index such as digoxin, warfarin and disease-modifying anti-rheumatic drugs (DMARDs), which require closer monitoring post-discharge. Other medicines likely to cause ADRs should also be closely monitored, such as opiates, antibiotics, benzodiazepines,[5] antiplatelet drugs and loop diuretics (bleeding and renal impairment are common ADRs causing readmission).[9]

The risk factors for MRH in primary care are summarised in Table 1.

Strategies to reduce medicines-related harm

In a UK study, ADRs occurred more commonly in the first week post-discharge,[5] highlighting the need for a strong focus on empowering patients and their informal carers to self-monitor for ADRs post-discharge and to improve medicines adherence as well as a greater understanding of medicines information and management.[36] Self-monitoring and reporting of ADRs by patients can be useful, especially as patients and their family members are often the first to observe any ADRs.[40]

Previous studies have also shown that the quality of self-identified ADRs by patients was as accurate as those identified by clinicians.[41] However, it has also been shown that only 54% of patients who experienced and subsequently recognised potential ADRs reported them to their doctor.[42] In addition, only 23% of the symptoms relating to ADRs that patients claimed to have reported to their doctors were documented in their primary care records.[42] It is therefore valuable that self-reported ADRs are investigated and recorded to avoid non-reporting of potentially serious ADRs and the repeat prescribing of medicines causing harm.[40] Crucially, if a patient has stopped taking a medicine, the emphasis should be on why, rather than focusing on promoting adherence, as it may be due to an ADR.

Changes to medication frequently occur during hospitalisa-

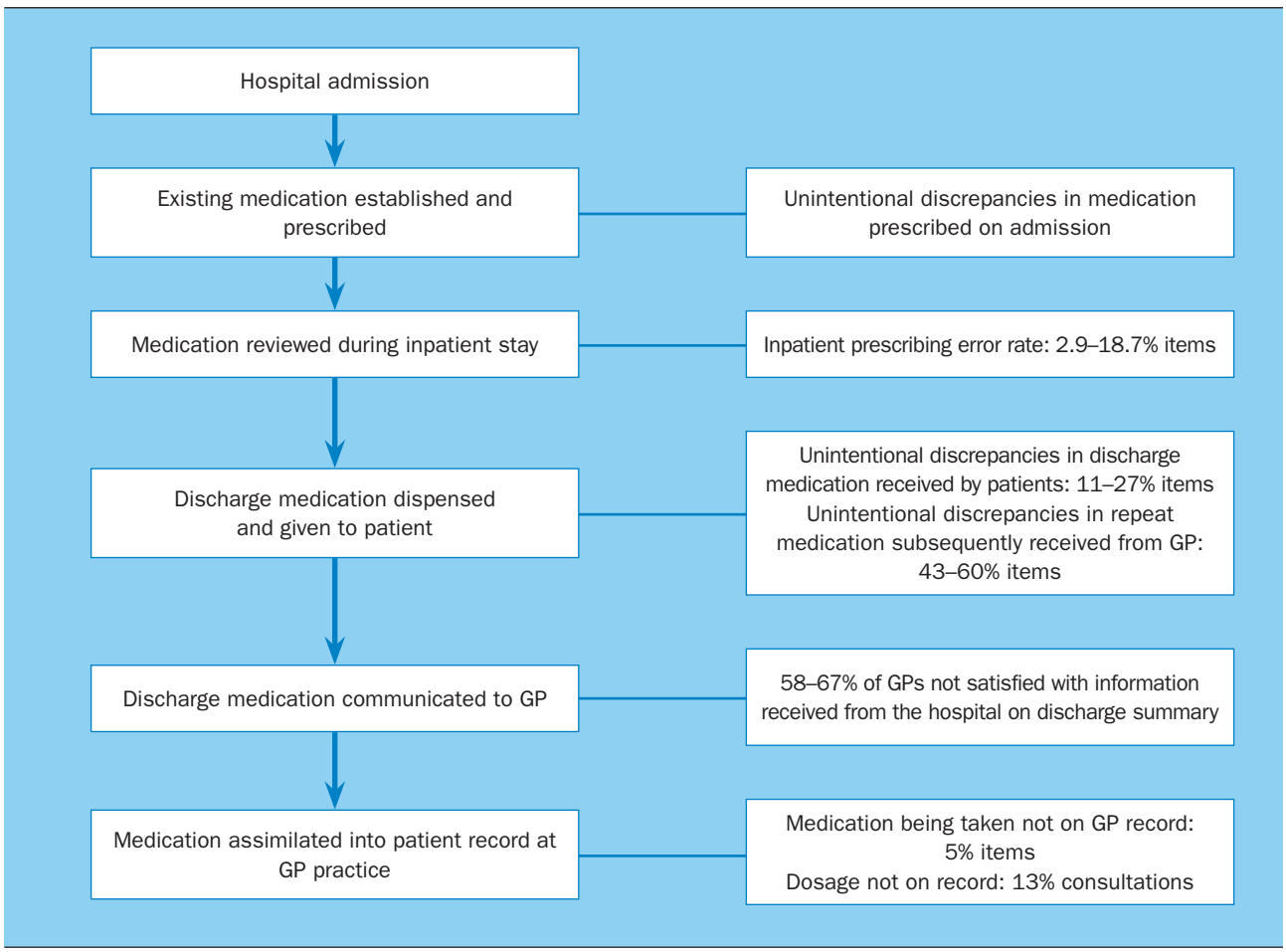

Figure 2. Patient journey from hospital admission to post-discharge and the type and scale of medication error during the journey. Adapted from Garfield *et al*, 2009[25]

tion of older adults,[43] and there is a need for careful reconciliation and prompt review within primary care following discharge. Older patients are more vulnerable to MRH during the 30-day period after hospital discharge.[5] In view of the high risk of MRH in older people during this short period post-discharge, clinicians and prescribers should closely monitor patients, particularly those at high risk or those taking high-risk medicines. To date, there is no validated risk prediction tool to help identify patients at high risk of MRH post-discharge. There is a clear need for this, as clinicians' predictions or 'gut instinct' is not a tool with high sensitivity or specificity.[44]

As polypharmacy is a risk factor for MRH in older people, useful deprescribing guidelines and tools are available to reduce the prescribing of inappropriate medicines in this patient group, such as those from deprescribing.org, the STOPP/START[45] and STOPPFrail[46] tools. While it remains unclear if medication review on its own reduces MRH in older adults, multi-component interventions incorporating patient education have demonstrated success during transitions of care.[47]

Effective communication, either between hospital and primary care clinicians or between clinicians and patients, is crucial in reducing MRH during transitions of care. Several initiatives have been designed to try to overcome these issues, such as effective medicines reconciliation following admission and discharge from hospital, and the use of summary care records. Primary care clinicians have an important role in ensuring that a clear and up-to-date medication record is maintained to enable effective medicines reconciliation post-hospital discharge. Pharmacists' completion of medicines reconciliation in the community post-discharge has been proven to help identify and resolve medication discrepancies.[48] Closer monitoring of high-risk patients on high-risk medications requires proactive management in primary care. This can be done by ensuring there is a system in place at GP surgeries to flag up discharges that require a quicker follow-up or discharges that are higher risk, so any gaps in communication can be addressed.

Last but not least, close liaison and involvement with patients and their family members is crucial in the post-discharge phase, with active engagement to empower the self-management and self-monitoring of medicines post-discharge. NHS England's initiative to embed clinical pharmacists into general practices provides opportunities for these medicines experts to take a lead on improving shared decision-making about medicines, as well as improving medication monitoring and review.[49]

KEY POINTS

- Medicines-related harm (MRH) is prevalent in the NHS, which leads to poorer patient outcomes and increased economic burden
- MRH commonly occurs in primary care, especially immediately post-discharge
- Older patients with multimorbidity and polypharmacy are more vulnerable to MRH and therefore warrant closer monitoring and follow-up post-discharge
- There are various strategies available to primary care clinicians to help reduce post-discharge MRH

Transitions of care Discharge summary processing: • Newly initiated medicines • Non-clinical staff involvement • Poor-quality discharge summaries • Weekend, evening and bank holiday discharges • Incorrect dosages, medication duplication and drug interactions • Follow-up and monitoring recommendations not actioned • High-risk period immediate post-discharge: - 7 days (adverse drug reactions) - 30 days (MRH)
Patient-related factors • Lack of knowledge of medicines, non-adherence (both intentional and unintentional) • Age • Cognitive impairment • Polypharmacy • Frailty • Residing in a care home
High-risk medicines • Narrow therapeutic index, *eg* digoxin, warfarin, DMARDs • Drugs likely to cause adverse drug reactions, *eg* antiplatelet drugs causing bleeding, loop diuretics causing renal impairment, opiates resulting in gastrointestinal and CNS symptoms, anti-hypertensives resulting in peripheral oedema and dizziness

Table 1. Risk factors for medicines-related harm (MRH) in primary care

Conclusion

MRH is prevalent in older people, especially in the primary care and transition settings, leading to poor patient outcomes and increased economic burden. There is scope for primary care clinicians to identify high-risk patients and monitor them closely in the 7- to 30-day post-discharge period. Better quality discharge communication and liaison with secondary care colleagues is vital to reduce MRH, alongside reinforcement of patient education after discharge.

References

1. World Health Organization. WHO launches global effort to halve medication-related errors in 5 years. News release. March 2017. Available from: https://www.who.int/news-room/detail/29-03-2017-who-launches-global-effort-to-halve-medication-related-errors-in-5-years
2. Sheikh A, *et al*. The third global patient safety challenge: tackling medication-related harm. *Bulletin of the World Health Organization* 2017;95(8):546–546A.
3. NHS Digital. *Prescriptions dispensed in the community. Statistics*

for England, 2000–2010. July 2011. Available from: *https://digital.nhs.uk/data-and-information/publications/statistical/prescriptions-dispensed-in-the-community/prescriptions-dispensed-in-the-community-statistics-for-england-2000-2010*
4. National Institute for Health and Care Excellence. *Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes*. NG5. March 2015. Available from: https://www.nice.org.uk/guidance/ng5
5. Parekh N, *et al*. Incidence and cost of medication harm in older adults following hospital discharge: A multicentre prospective study in the UK. *Br J Clin Pharmacol* 2018;84:1789–97.
6. Avery AJ, *et al*. The prevalence and nature of prescribing and monitoring errors in English general practice: a retrospective case note review. *Br J Gen Pract* 2013;63(613):e543–53.
7. Elliott R, *et al*. Prevalence and economic burden of medication errors in the NHS in England. Rapid evidence synthesis and economic analysis of the prevalence and burden of medication error in the UK. Policy Research Unit in Economic Evaluation of Health and Care Interventions. Universities of Sheffield and York, 2018. Available from: http://www.eepru.org.uk/prevalence-and-economic-burden-of-medication-errors-in-the-nhs-in-england-2/
8. Pirmohamed M, *et al*. Adverse drug reactions as cause of admission to hospital: prospective analysis of 18 820 patients. *BMJ* 2004;329(7456):15–9.
9. Davies EC, *et al*. Emergency re-admissions to hospital due to adverse drug reactions within 1 year of the index admission. *Br J Clin Pharmacol* 2010;70(5):749–55.
10. Bouvy JC, et al. Epidemiology of adverse drug reactions in Europe: a review of recent observational studies. *Drug Safety* 2015;38(5):437–53.
11. Davies EA, O'Mahony MS. Adverse drug reactions in special populations – the elderly. *Br J Clin Pharmacol* 2015;80(4):796–807.
12. Mitchell B, et al. Medication adherence 1 month after hospital discharge in medical inpatients. *Intern Med J* 2016;46(2):185–92.
13. Fischer MA, *et al*. Primary medication non-adherence: analysis of 195,930 electronic prescriptions. *J Gen Intern Med* 2010;25(4):284–90.
14. Haynes RB, *et al*. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* 2008;2:CD000011.
15. Coleman EA, *et al*. Posthospital medication discrepancies: prevalence and contributing factors. *Arch Intern Med* 2005;165(16):1842–7.
16. Downes JM, *et al*. Identifying opportunities to improve medication management in transitions of care. *Am J Health Syst Pharm* 2015;72(17 Suppl. 2):S58–69.
17. Eassey D, *et al*. Consumer perspectives of medication-related problems following discharge from hospital in Australia: a quantitative study. *Int J Qual Health Care* 2016;28(3):391–7.
18. Spencer RA, *et al*. Processing of discharge summaries in general practice: a retrospective record review. *Br J Gen Pract* 2018;68(673):e576–85.
19. Schnipper JL, *et al*. Role of pharmacist counseling in preventing adverse drug events after hospitalization. *Arch Intern Med* 2006;166(5):565–71.
20. Smith L, *et al.* An investigation of hospital generated pharmaceutical care when patients are discharged home from hospital. *Br J Clin Pharmacol* 1997;44(2):163–5.
21. Al-Rashed S, *et al*. The value of inpatient pharmaceutical counselling to elderly patients prior to discharge. *Br J Clin Pharmacol* 2002;54(6):657–64.
22. Lipton HL, Bird JA. The impact of clinical pharmacists' consultations on geriatric patients' compliance and medical care use: a randomized controlled trial. *Gerontologist* 1994;34(3):307–15.
23. National Coordinating Council for Medication Error Reporting and Prevention. What is a medication error? Available from: https://www.nccmerp.org/about-medication-errors
24. Walsh EK, *et al*. Economic impact of medication error: a systematic review. *Pharmacoepidemiol Drug Saf* 2017;26(5):481–97.
25. Garfield S, *et al*. Quality of medication use in primary care - mapping the problem, working to a solution: a systematic review of the literature. *BMC Med* 2009;7(1):50.
26. Barber N, *et al*. Care homes' use of medicines study: prevalence, causes and potential harm of medication errors in care homes for older people. *Qual Saf Health Care* 2009;18(5):341–6.
27. Paulino EI, *et al*. Drug related problems identified by European community pharmacists in patients discharged from hospital. *Pharm World Sci* 2004;26(6):353–60.
28. Kanaan AO, *et al*. Adverse drug events after hospital discharge in older adults: types, severity, and involvement of Beers criteria medications. *J Am Geriatr Soc* 2013;61(11):1894–9.
29. Forster AJ, *et al*. Adverse drug events occurring following hospital discharge. *J Gen Intern Med* 2005;20(4):317–23.
30. Williams H, *et al*. Harms from discharge to primary care: mixed methods analysis of incident reports. *Br J Gen Pract* 2015;65(641):e829–37.
31. Avery A, *et al*. Investigating the prevalence and causes of prescribing errors in general practice: The PRACtICe Study (PRevalence And Causes of prescrIbing errors in general practiCe). A report for the GMC. May 2012. Available from: https://www.gmc-uk.org/about/what-we-do-and-why/data-and-research/research-and-insight-archive/investigating-the-prevalence-and-causes-of-prescribing-errors-in-general-practice
32. Shah C, *et al*. Collaborative audit across England on the quality of medication related information provided when transferring patients from secondary care to primary care and the subsequent medicines reconciliation in primary care. NHS Specialist Pharmacy Service. November 2015. Available from: https://www.sps.nhs.uk/wp-content/uploads/2015/11/Medicines_Reconciliation_Collaborative_Audit_Report.pdf
33. Williams H, *et al.* Harms from discharge to primary care: mixed methods analysis of incident reports. *Br J Gen Pract* 2015;65(641):e829–37.
34. Forster AJ, *et al*. Adverse events among medical patients after discharge from hospital. *Can Med Assoc J* 2004;170(3):345–9.
35. Sorensen L, *et al*. Medication management at home: medication-related risk factors associated with poor health outcomes. *Age and Ageing* 2005;34(6):626–32.
36. Ensing HT, *et al*. Problems with continuity of care identified by community pharmacists post-discharge. *J Clin Pharmacy Therap* 2017;42(2):170–7.
37. Lavan AH, Gallagher P. Predicting risk of adverse drug reactions in older adults. *Therap Adv Drug Saf* 2016;7(1):11–22.
38. Nguyen JK, *et al.* Polypharmacy as a risk factor for adverse drug reactions in geriatric nursing home residents. *Am J Geriatr Pharmacother* 2006;4(1):36–41.
39. Tannenbaum C, *et al.* An ecological approach to reducing potentially inappropriate medication use: Canadian Deprescribing Network. *Can J Aging* 2017;36(1):97–107.
40. Britten N. Medication errors: the role of the patient. *Br J Clin Pharmacol* 2009;67(6):646–50.
41. Blenkinsopp A, *et al*. Patient reporting of suspected adverse drug reactions: a review of published literature and international experience. *Br J Clin Pharmacol* 2007;63(2):148–56.
42. Jarernsiripornkul N, *et al.* Adverse drug reaction monitoring: com-

paring doctor and patient reporting for new drugs. *Pharmacoepidemiol Drug Saf* 2009;18(3):240–5.
43. Mixon AS, *et al.* Care transitions: a leverage point for safe and effective medication use in older adults – a mini-review. *Gerontology* 2015;61(1):32–40.
44. Parekh N, *et al*, and on behalf of the PRIME study group. Can doctors identify older patients at risk of medication harm following hospital discharge? A multicentre prospective study in the UK. *Br J Clin Pharmacol* 2018;84:2344–51.
45. Gallagher P, *et al*. STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. *Int J Clin Pharmacol Ther* 2008;46(2):72–83.
46. Lavan AH, *et al*. STOPPFrail (Screening Tool of Older Person's Prescriptions in Frail adults with limited life expectancy): consensus validation. *Age and Ageing* 2017;46(4):600–7.
47. Gray SL, *et al*. Meta-analysis of interventions to reduce adverse drug reactions in older adults. *J Am Geriatr Soc* 2018;66(2):282–8.
48. McNab D, *et al*. Systematic review and meta-analysis of the effectiveness of pharmacist-led medication reconciliation in the community after hospital discharge. *BMJ Qual Saf* 2018;27(4):308–20.
49. Mann C, *et al*. *Clinical pharmacists in general practice: pilot scheme. Independent evaluation report: full report.* University of Nottingham. June 2018. Available from: https://www.nottingham.ac.uk/pharmacy/documents/generalpracticeyearfwdrev/clinical-pharmacists-in-general-practice-pilot-scheme-full-report.pdf

Declarations of interest

None to declare.

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