REVIEW

Drug-related problems in older people after hospital discharge and interventions to reduce them

MARTA GARCIA-CABALLOS1,2, FRANCISCO RAMOS-DIAZ1,3, JOSÉ JUAN JIMENEZ-MOLEON2,4, AURORA BUENO-CAVANILLAS2,4,5

1Primary Care Health Center La Chana, Granada, Andalusian Health Service, Spain
2Department of Preventive Medicine and Public Health, University of Granada, Spain
3Department of Medicine, University of Granada, Spain
4Cyber Epidemiology and Public Health, Spain
5Service of Preventive Medicine, University Hospital San Cecilio, Granada, Spain

Address correspondence to: M. Garcia-Caballos. Tel: (+34) 655 438810; Fax: (+34) 958 246118. Email: martagc81@hotmail.com

Abstract

Drug-related problems in older people during care transitions have become a major public health problem since they threaten patient safety. The objective of our paper is to investigate the extent and frequency of drug-related problems (discontinuity, adherence, errors, interactions and adverse events) after hospital discharge and the efficacy of interventions intended to reduce them. We included 20 studies in the review. All of them underlined the high frequency and complexity of drug-related problems in older people after hospital discharge. Interventions proposed to improve care transitions led to diverse and sometimes contradictory results, but the findings suggested that combining hospital discharge measures with home follow-up strategies is of value. We conclude that it is not possible to estimate the frequency of drug-related problem through a review of selected articles or to evaluate the efficacy of the proposed interventions. More research is needed in this field to reduce uncertainty and generate evidence-based recommendations for physicians.

Keywords: drug-related problems, aged, discharge planning, medication errors, elderly

Background

Drug-related problems (DRP) are events or circumstances involving drug therapy that actually or potentially interfere with desired health outcomes [1]. When suffered by older adults after hospital discharge, they pose a complex situation—presumably a common one, although it is not possible to estimate the frequency from published studies. There are several classifications of DRP [1, 2] that are summarised in Table 1. In 2004 the World Health Organization launched the World Alliance for Patient Safety [3, 4], one of whose initiatives is to assure medication accuracy at transitions of care by means of medication reconciliation, a powerful strategy to reduce DRP in patients moving through settings of care.

Older people are a vulnerable population group because of their increased prevalence of chronic diseases and drug consumption. The association of these factors with metabolic changes predisposes older people to suffer interactions and adverse drug events, especially as they generally have more hospital admissions and discharges [5, 6]. During these care transitions some risks may appear, essentially DRP and care fragmentation [7]. DRP can be manifested in several ways. Discharge reports usually include new drugs, but sometimes also reflect discontinuities of chronic treatment taken before hospital admission, or medication errors [8, 9]. Once at home, adherence problems may appear due to inadequate knowledge about the treatment, lack of understanding or excessive complexity. Medication errors may as well produce interactions and adverse drug events [10, 11]. In addition, low-quality care transitions might also lead to unnecessary readmissions, to inappropriate use of emergency services and to patient or carer dissatisfaction [12, 13].
Several interventions have been proposed to improve this situation. In-hospital protocols of medication reconciliation have been developed, and discharge planning, including pre-discharge patient interviews, has also been tried [14–16]. Domiciliary measures consist of telephone follow-up or home visits intended to help the patient with the problems that may appear when arriving home, as well as to reinforce compliance with the treatment plan [17]. Both approaches require the involvement of different professionals (e.g. doctors, pharmacists, nurses, etc.) [18].

At the moment it is difficult to undertake a global view of DRP and the interventions proposed so far to improve this situation. Accordingly, the aims of this review were twofold. Firstly, we wished to estimate the extent, frequency and types of DRP suffered by older adults after hospital discharge. Secondly, we hoped to assess the quality, validity and outcomes of the proposed interventions and draw conclusions that could help improve the quality of care transitions and prevent DRP associated with these transitions.

### Methods

We conducted a review of articles published between January 1998 and December 2009 and indexed in the Scopus database (which includes the whole Medline database), the Cochrane Database of Systematic Reviews, the Cochrane Controlled Trials Database, Embase and Psycinfo. The initial search terms were discharge, elderly, continuity of care, transitional care, health education, compliance, discontinuity, treatment adherence, adverse drug events, medication errors and DRP, and their synonyms. The keywords of the articles included in the review were precisely these search terms initially chosen. Searches were constructed with the following limits: years 1998–2009 inclusive, full text and language of publication (Spanish, English, French, Italian or Portuguese).

Our research topic encompasses a broad area with numerous ramifications and related subjects. Therefore, the initial wide-ranging search obtained through the mentioned keywords had to be refined to centre on descriptions of DRP or description and analysis of proposed interventions to manage them. Subjects were necessarily older adults; although we did not establish a specific age range, we included in the review any report involving a population aged more than 60 years. With regard to the care setting, only hospital discharges were considered, and hospital admissions or discharges from other settings such as retirement homes were excluded. We also searched for intervention effects (main or secondary results) that were related to improvements in medication management, use of health services (especially readmissions or emergency room use) or patient’s and carer’s satisfaction with the discharge process.

Basic exclusion criteria were the following: different setting than hospital discharge and non-elderly participants. The application of these criteria implied the removal from the analysis of 27 articles of the initially selected. Subsequently, we broadened our exclusion criteria with two objectives. Firstly, to exclude from the analysis aspects of the research that made it difficult to generalise the results and secondly, to leave out any topics related to our subject of study but whose approach used a different perspective. In the application of these new broadening exclusion criteria, 36 articles were excluded because they only exposed comments on general problems of care transitions or they tried to explain possible causes of DRP after hospital discharge. Sixteen others were excluded because the setting was limited to a specific hospital department or because the participants were only patients with a specific pathology. There was also a group of 16 excluded articles that were centred in descriptions of patients or caregivers experiences about hospital discharge. Eight articles were not included since they analysed hospitalisations caused by DRP, instead of DRP appearance at hospital discharge. Finally, five articles were discarded because a complete abstract in English was not available.

For each publication included, we reviewed the reference list to locate new articles eligible for inclusion. Books were not considered for inclusion, and expert opinions were not sought. Two authors (M.G.C. and F.R.D.) evaluated all initially retrieved items independently and in a blind manner to determine which should be included in the final sample. Their evaluations were compared and disagreements were resolved by discussion. When necessary a third person was consulted (A.B.C.) to reach a consensus on whether to include or exclude a given item.

Findings of interest from all included studies were tabulated, and quality of the evidence from each study was analysed with the help of a specially-designed checklist of quality criteria. The criteria were representativeness of the sample, justification of sample size, losses of subjects and participation rate explained, variables defined and measured adequately, use of a structured questionnaire, control of information bias, control of confounding bias, results relevant to the objectives, conclusion based on results and limitations explained.

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### Results

We initially identified 130 potentially relevant papers, of which only 23 met all the inclusion criteria: 8 cross-sectional studies, 6 cohort studies, 4 quasi-experimental studies and 5 clinical trials.
Cross-sectional and cohort studies together involved a total of 3,464 participants. Experimental studies included a total of 1,325 patients in the intervention groups and 1,322 patients to the control groups.

Most studies were done in the United States (11), and the final sample of articles included participants from five other countries (United Kingdom, Australia, Spain, Israel and France).

Regarding the year of publication, 5 of the 20 articles were published in 1999, 6 in 2008 and 3 in 2009. With respect to the number of participants in each study, 4 studies involved more than 500 subjects, 5 articles included 300–500 participants and the other 14 articles included fewer than 300 participants. When we searched for associations between the variables ‘year of publication’ and ‘study design’, we failed to find the expected trend toward an increase in the proportion of analytic studies over time. The distribution of study designs throughout the publication period in fact showed no clear trend.

We also tried to find a relationship between ‘total number of participants’ and ‘study design’ but found no association between the sample size and study designs yielding different qualities of evidence.

The articles were published in a variety of journals, mostly in the fields of medicine and pharmacology. There were also articles in nursery and geriatric journals, as well as in multidisciplinary journals (e.g. nursery/pharmacology and geriatrics/pharmacology).

The criteria we used to evaluate the quality of evidence in the articles are summarised in Table 2. In general, selection bias was present in most articles due to their small sample size, and only 56.5% of the articles chose a representative sample of the studied population. The quality criterion from our checklist that was most frequently fulfilled was adequate definition and measurement of variables (91.3% of the papers) and also relevance of the results to the stated objectives (78.2%). In contrast, few articles justified the sample size for a certain statistical significance or confidence interval (only 21.7%). The best-quality articles were clinical trials (they fulfilled 82% of the quality criteria), followed by cohort studies that fulfilled 70% of them.

Details about the extent, frequency and types of DRP in older adults after hospital discharge are presented in Table 3. The outcome measures were heterogeneous and therefore difficult to compare. Only four cohort studies estimated incidence measures, and duration of post-discharge follow-up differed in each study. Incidences of DRP ranged from 18.4% (over-adherence to medication in a 2-week period following hospital discharge) to 37.5% (medication regimen modifications in a 1-month post-discharge period). Cross-sectional studies gave information about prevalence. The results from the most powerful studies (603, 375 and 342 participants) showed a 52.7% prevalence of suffering at least one medication reconciliation error at discharge, a 14.1% prevalence of post-hospital medication discrepancies and a 46% prevalence of non-compliance during the same period.

Regarding the classifications of DRP, discrepancies among studies were frequent. Some articles reported the classic types of DRP (adverse reactions, drug choice problems, dosing problems, drug use problems, interactions). Two of them agreed that the most frequent DRP at hospital discharge was the addition of a new drug or dose change but two other articles stated that the most frequent DRP was drug discontinuation/omission. A number of articles focussed on whether the causes of DRP were patient-associated or system-associated, but did not agree on the results. Two studies used a DRP classification that distinguished between possible, probable and definite DRP, but the results of these two studies were again discrepant. Finally, only one of the articles reviewed here dealt with the important issue of the potential preventability of adverse drug reactions. This article claimed that more than one-third of these reactions could have been prevented.

Table 4 shows the outcomes in the eight articles that dealt with interventions to improve care transitions. Four of them focussed on planning the discharge process, often proposing the figure of the pharmacist as transition co-ordinator. All of these planning interventions achieved good results compared to the control groups in some of the measured outcomes, e.g. discrepancy-related adverse drug reactions, drug knowledge and compliance and medication use across health sectors.

Two other interventions were based on follow-up, and the results of these studies were not conclusive. There were also three studies of interventions that combined discharge planning and follow-up. Two of them obtained good results.
### Table 3. Frequency and types of drug-related problems in different studies (results from articles that did not report drug-related problems were not included)

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Design</th>
<th>Sample</th>
<th>Aims</th>
<th>Evaluation of incidence</th>
<th>Types/causes of problems</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boockvar et al. (2004)</td>
<td>Cross-sectional</td>
<td>122 nursing home residents admitted to hospital</td>
<td>Changes during transfer between hospital and nursing home, and resulting ADEs</td>
<td>No</td>
<td>57% discontinuations, 21% dose changes, 7% substitutions for medications in the same class</td>
<td>For 64% of the transfers, at least one medication was altered. As for the medications, 1.41% was altered at the transfer. ADE attributable to medication changes occurred during 20% of the changes. The overall risk of ADE per drug alteration was 4.4%</td>
</tr>
<tr>
<td>Castellano-Muñoz et al. (2008)</td>
<td>Cross-sectional</td>
<td>70 discharged patients &gt;65 years, self-sufficient regarding treatment management</td>
<td>Prevalence of treatment adherence and associated factors</td>
<td>No</td>
<td></td>
<td>8.6% of patients complied with the recommended treatment. 85% of drugs were taken incorrectly: 67% in excess, 33% less than prescribed, and 54% without following recommendations.</td>
</tr>
<tr>
<td>Coleman et al. (2005)</td>
<td>Cross-sectional</td>
<td>375 community-dwelling adults ≥65 years admitted to hospital</td>
<td>Prevalence and contributing factors associated with post-hospital medication discrepancies</td>
<td>No</td>
<td>50.8% patient-associated, 49.2% system-associated</td>
<td>Prevalence of discrepancies: 14.1% of patients</td>
</tr>
<tr>
<td>Delgado et al. (2009)</td>
<td>Cohort</td>
<td>603 discharged patients ≥65 years, prescribed four or more items</td>
<td>Prevalence of reconciliation errors (unjustified discrepancies in medication between chronic treatment and the treatment prescribed in the hospital)</td>
<td>No</td>
<td>58% omission, 18% changes in dosage, 12% prescription of drugs not available in the Hospital Guides, 6% incomplete prescription, 3% unnecessary drug, 1% wrong drug</td>
<td>52.7% patients suffered at least one reconciliation error. From a total of 3,991 medications registered, 59% showed no discrepancies, 24% had justified discrepancies and 16% not justified discrepancies.</td>
</tr>
<tr>
<td>Enguidanos and Brumley (2005)</td>
<td>Cross-sectional</td>
<td>104 discharged patients &gt;65 years</td>
<td>Discrepancies between number of medications reported by the patient and the number listed in the medication chart</td>
<td>No</td>
<td>No</td>
<td>Prevalence of discrepancies: 94.2% cases. The average number of medications listed in the hospital record was 4.31 as compared to 6.33 reported by the patient.</td>
</tr>
<tr>
<td>Foucher et al. (2009)</td>
<td>Cross-sectional</td>
<td>116 discharged patients &gt;60 years</td>
<td>Discrepancies between medication prescriptions at hospital admission and discharge</td>
<td>No</td>
<td>No</td>
<td>The average number of drugs per patient was 6.4 at admission and 6.7 at discharge. No significant evolution of number of prescriptions.</td>
</tr>
<tr>
<td>Gray et al. (1999)</td>
<td>Cohort</td>
<td>256 discharged patients &gt;65 years receiving home health services</td>
<td>To describe the incidence and types of adverse drug effects in the month following hospital discharge</td>
<td>IR5 of ADE (1 month): 20%</td>
<td>36% of ADE were possible, 57.8% probable and 6% definitive</td>
<td>In the month following hospital discharge incidence of adverse drug events was 20%, and 20.3% participants reported at least one ADE.</td>
</tr>
<tr>
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<tr>
<td>Gray et al. (2001)</td>
<td>Cohort</td>
<td>147 discharged patients &gt;65 years receiving home health services</td>
<td>To assess prevalence of medication under- and over-adherence in a 2-week period following hospital discharge</td>
<td>IR of under-adherence (2 weeks): 30.6%; IR of over-adherence (2 weeks): 18.4%</td>
<td>No</td>
<td>In a 2-week period following hospital discharge 30.6% of patients were under-adherent (&lt;70% adherence) and 18.4% over-adherent (&gt;120% adherence) with at least one medication.</td>
</tr>
<tr>
<td>Hanlon et al. (2006)</td>
<td>Cohort</td>
<td>808 frail patients &gt;65 years discharged from a hospital to outpatient care, after &gt;48-hour hospitalisation</td>
<td>Incidence and predictors of all and preventable ADR after hospital discharge</td>
<td>Incidence density per 1,000 person-days⁻¹ of follow-up: all ADR 1.92, preventable ADR 0.71</td>
<td>60% of all ADR were possible, 36.8% probable and 3.2% definite. 37.6% of all ADR were preventable.</td>
<td>33% of patients had one or more ADR for a rate of 1.92 per 1,000 person-days⁻¹ of follow-up. 16% of patients had one or more preventable ADR for a rate of 0.71 per 1,000 person-days⁻¹ of follow-up.</td>
</tr>
<tr>
<td>Mansur et al. (2008)</td>
<td>Cohort</td>
<td>198 patients aged ≥65 years receiving long-term medication and discharged from hospital</td>
<td>Extent of 1-month post-discharge drug regimen modification and type of modifications</td>
<td>IR of medication regimen modifications (1 month): 37.5 ± 25.4%</td>
<td>50% addition of a drug or increase in dosage, 26% cancelling, 16% omission and 8% switching within the same medication type. 70% modifications based on specialists’ recommendations or secondary to a change in the patients’ medical state, 13% result of poor adherence, 8% adverse effects, 3% administrative restrictions and 6% other causes</td>
<td>At 1 month post-discharge the average medication regimen modification rate was 37.5 ± 25.4%. 36.7% of patient medications had been modified compared with the discharge prescription.</td>
</tr>
<tr>
<td>Mansur et al. (2009)</td>
<td>Cohort</td>
<td>186 discharged patients ≥65 years</td>
<td>Use of inappropriate prescription drugs (IPD) and adherence problems 1 month post-discharge</td>
<td>No</td>
<td>No</td>
<td>At 1 month post-discharge the average number of IPD was 0.60 ± 0.81, the prevalence of IPD use was 44.4% and 29.2% patients were non-adherent (23.3% under-adherent, 3% over-adherent and 3% with both types of non-adherence). Prevalence of errors: 85% patients and 19% medications. 57% patients had a DRP 2 weeks after discharge. 46% of patients were mal-compliant, 23% patients omitted taking one or more of the prescribed medications.</td>
</tr>
<tr>
<td>Midlöv et al. (2005)</td>
<td>Cross-sectional</td>
<td>69 discharged patients &gt;65 years</td>
<td>% medication errors at hospital discharge</td>
<td>No</td>
<td>Most frequent inaccuracy: medication erroneously added</td>
<td></td>
</tr>
<tr>
<td>Sexton and Brown (1999)</td>
<td>Cross-sectional</td>
<td>68 elderly patients at discharge</td>
<td>Prevalence of DRP⁴ appearing 2 weeks after hospital discharge</td>
<td>No</td>
<td>Many DRP are caused by failings in the health care system.</td>
<td></td>
</tr>
<tr>
<td>Stewart and Pearson (1999)</td>
<td>Cross-sectional</td>
<td>342 chronically ill patients discharged from acute hospital care</td>
<td>Extent of suboptimal use of prescribed medication</td>
<td>No</td>
<td>No</td>
<td></td>
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</tbody>
</table>

**Notes:**

- ADE, adverse drug events.
- IR, incidence risk.
- ADR, adverse drug reaction.
- DRP, drug-related problem.

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Table 4. Outcomes of different interventions in different studies

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Design</th>
<th>Type of intervention</th>
<th>Sample</th>
<th>Intervention</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Rashed et al. (2002)</td>
<td>Quasi-experiment</td>
<td>Planning</td>
<td>83 patients aged &gt;65 years, prescribed four or more regular items, discharged to their own home and with an abbreviated mental score &gt;7 out of 10 (43 int, 40 ctrl)</td>
<td>Inpatient pharmaceutical counselling prior to discharge</td>
<td>At visit 1 (2–3 weeks after discharge), drug knowledge ($P &lt; 0.01$) and compliance ($P &lt; 0.001$) were better in the study group. At visit 2 (3 months post-discharge), compliance had improved in the study group ($P &lt; 0.001$). At both visits the intervention reduced unplanned visits to the doctor and readmissions.</td>
</tr>
<tr>
<td>Boockvar et al. (2006)</td>
<td>Quasi-experiment</td>
<td>Planning</td>
<td>168 nursing home residents who were admitted to referral hospital, stayed at least 24 h and returned to the nursing home (postinterv 87, preinterv 81)</td>
<td>Pharmacist-conducted medication reconciliation programme and communication with physicians</td>
<td>The intervention reduced discrepancy-related adverse drug events ($OR, 0.11; 95% CI, 0.01–1.0; P = 0.05$).</td>
</tr>
<tr>
<td>Crotty et al. (2004)</td>
<td>Clinical trial</td>
<td>Planning</td>
<td>110 older adults undergoing first-time transfer from a hospital to a long-term care facility (56 int/54 ctrl)</td>
<td>Pharmacist transition co-ordinator</td>
<td>In the intervention group, improvement of medication use across health sectors, with higher Medication Appropriateness Index: mean [95% CI] control group 2.5 [1.4 ± 3.7] vs intervention group 6.5 [3.9 ± 9.1]; ($P &lt; 0.007$). No differences regarding adverse events.</td>
</tr>
</tbody>
</table>
| Koehler et al. (2009)    | (Pilot) clinical trial | Planning and follow-up | 41 patients aged ≥70 years, with ≥5 regular medications, and ≥3 chronic co-morbid conditions (20 int/21 ctrl) | Targeted care bundle provided by a care co-ordinator and a clinical pharmacist | In the intervention group, readmission/ED 

$A^{*}$ visit rates were reduced at 30 days compared to the control group (10.0 versus 38.1\%, $P = 0.04$), but not at 60 days (30.0 versus 42.9\%, $P = 0.52$). For those patients who suffered an event, the time interval to a readmission was longer in the intervention group compared to usual care (36.2 versus 15.7 days, $P = 0.05$). No evaluation of drug-related problems. |
<p>| Lim et al. (2003)        | Clinical trial       | Planning and follow-up | 598 patients aged ≥65 years who required community services after discharge (311 int/287 ctrl) | Post-acute care programme | In the post-acute care, programme group had better quality-of-life scores at 1-month follow-up, lower costs (mean difference, $$1,545; 95% CI, $$11–$3,078) and significantly fewer hospital bed-days in the 6 months after discharge (mean, 3.0 days; 95% CI, 2.1–3.9) than control patients (5.2 days; 95% CI, 3.8–6.7). No difference in mortality (both 6%) or unplanned readmissions. No evaluation of drug-related problems. |
| Midlöv et al. (2008)     | Quasi-experiment     | Follow-up            | 427 discharged patients aged ≥65 years with at least one definite medication error (248 int/179 ctrl) | Medication report | In the intervention group, 32% patients had at least one medication error, and 15% patients had errors that were considered to have a moderate–high risk of clinical consequences, compared with 66% and 32% patients, respectively, in the control group. The differences were statistically significant ($P &lt; 0.001$). |</p>
<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Naylor et al. (1999)</td>
<td>Clinical trial</td>
<td>Planning and follow-up</td>
<td>363 hospitalised patients aged ≥65 years (177 int/186 ctrl)</td>
<td>Comprehensive discharge planning and home follow-up protocol</td>
<td>The intervention group had fewer readmissions (20.3 vs 37.1%; ( P &lt; 0.001 )), longer time between discharge and readmission and lower costs. No evaluation of drug-related problems.</td>
</tr>
<tr>
<td>Nazareth et al. (2001)</td>
<td>Clinical trial</td>
<td>Follow-up</td>
<td>362 patients aged ≥75 years, discharged on four or more medicines (181 int/181 ctrl)</td>
<td>Pharmacy discharge plan (co-ordinated between hospital and community pharmacy)</td>
<td>No evidence that the intervention influences outcomes: readmissions (mean difference in proportions between groups [95% CI]: 0.18 [-10.6 to 10.2%] at 3 months and 0.54 [-11 to 9.9%] at 6 months), knowledge of medication (mean difference: 0% at 3 months and at 6 months) and adherence to prescribed medication (mean difference: 0.07 [-0.032 to 0.173%] at 3 months and 0.01 [-0.106 to 0.126%] at 6 months).</td>
</tr>
<tr>
<td>Rosswurm and Lanham (1998)</td>
<td>Quasi-experiment</td>
<td>Planning</td>
<td>507 hospitalised patients aged ≥65 years (202 int/373 ctrl)</td>
<td>Co-ordination of the discharge planning process by nurse/social worker teams using an adapted form of the Discharge Planning Questionnaire to identify the patients’ home care needs</td>
<td>Lack of significant differences between both groups in the use of acute health care resources: rehospitalisation (21.2% in the control group vs 21.6% in the experimental group, ( P = 0.0236 )), unexplained MD b visit (12.9 vs 12.9%), and unexplained ER c visit (18.2 vs 19.5%, ( P = 0.0389 )). No evaluation of DRP.</td>
</tr>
</tbody>
</table>

aED, Emergency Department.
bMD, Medical Doctor.
cER, Emergency Room.
regarding lower costs and other two reported a reduction of unplanned readmissions (although in one case this reduction was only present at the first visit—day 30—and disappeared at the second visit—day 60). We emphasise that the intervention of the most powerful clinical trial (in terms of number of participants) achieved good results only in terms of quality of life and lower costs, but not in the main outcome measures (mortality and unplanned admissions).

Discussion

In recent years patient safety has become a major concern for health providers, and medication management is one of its more relevant aspects. Many articles dealing with this topic and related subjects have been published, which reflect both the relevance of the issue and the many questions that remain unanswered at this time [17].

It is difficult to draw definitive conclusions from our review due to the heterogeneity of study designs, the DRP investigated, the interventions tested and their possible effects, although we tried to reduce this heterogeneity by developing narrow exclusion criteria. One of the limits of our investigation is precisely due to these exclusion criteria. Some investigations were held at very particular settings (e.g. cardiology or neurology) and others included only patients with a specific pathology. We excluded both of them in order to reduce the diversity of the study populations, although in some cases the interventions proposed to reduce DRP could be of interest.

Most of the studies included in the present review were marred by selection and information biases that make caution necessary in interpreting results. Moreover, the variety of settings, each involving a different health system, limits the external validity of our conclusions.

We found no review articles that sought to estimate the extent and importance for older adults of DRP associated with transfers between different care settings. This situation, together with our finding of large differences in the prevalence of DRP (ranging from 14.1 to 46%), may reflect the fact that the articles we reviewed are not readily comparable because of differences in setting, characteristics of the participants and the measures used.

There have been previous attempts to search for a figure that could act as a care transition co-ordinator, such as the community pharmacist or the ‘link nurse’.

Several systematic reviews have been published in the last decade [18, 19] to assess the effects of supporting discharge from hospital to home in people of all ages. Their findings showed that there was uncertainty about the effect of this support on hospital admissions, functional status or patient and carer satisfaction but that some interventions may have a positive impact, particularly those that combine planning and support [20, 21]. The evidence was very limited, as in our case.

We emphasise that some articles attempted to distinguish between non-intentional and intentional discontinuities. Non-intentional discontinuities due to lack of knowledge of the pre-admission treatment or to medication errors should be detected and corrected in the pursuit of patient safety. In this connection, both non-intentional discontinuities and medication errors may lead to adverse drug effects. Several studies have focussed on distinguishing between preventable errors and unavoidable errors. Once detected, measures could be developed to prevent at least some medication errors.

An important issue that should be considered is why DRP appear after hospital discharge in older adults. One possible explanation may be that the actual tendency is to shorten hospital stays which makes it difficult for the health care team to adequately prepare the discharge process [21, 22]. Other authors [23] suggest that the inappropriateness of the communication between in-hospital and community caregivers may be also in the origin of these DRP.

We believe these are interesting research lines that would allow progress to be made toward a scientific consensus about the potential preventability of medication errors. This consensus should ideally be multidisciplinary, as the problem has been tackled in journals from different fields such as nursing, internal medicine, pharmacy and geriatrics [8, 9, 16, 17].

Conclusions

DRP are common among older people after hospital discharge, but so far they have not been systematically studied. Therefore we are unable to offer precise information about prevalence and incidence or about the most frequent DRP. The interventions tested thus far have not yielded conclusive results, and the findings cannot be extrapolated to different care settings. However, the most efficient interventions seem to be those that focus on discharge planning, and their effectiveness probably improves further when they are combined with home follow-up strategies.

Key points

- DRP are common among older people after hospital discharge and are relevant since they threaten patient safety.
- Articles published to date are unable to offer precise information about the frequency of DRP.
- The interventions tested thus far to prevent or mitigate DRP have not yielded conclusive results.

Supplementary data

Supplementary data mentioned in the text is available to subscribers in *Age and Ageing* online.
Acknowledgement

We thank K. Shashok for improving the use of English in the manuscript.

Conflicts of interest

There is no conflict of interests in our investigation.

References

The full list of references of the articles included in the review is available at Age and Ageing online as Appendix 1.


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