Drugs & Aging (2020) 37:635–655
https://doi.org/10.1007/s40266-020-00780-z

SYSTEMATIC REVIEW

Medication Counselling in Older Patients Prior to Hospital Discharge: A Systematic Review

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Published online: 8 July 2020

Abstract

Background Older patients are regularly exposed to multiple medication changes during a hospital stay and are more likely to experience problems understanding these changes. Medication counselling is often proposed as an important component of seamless care to ensure appropriate medication use after hospital discharge.

Objectives The purpose of this systematic review was to describe the components of medication counselling in older patients (aged ≥ 65 years) prior to hospital discharge and to review the effectiveness of such counselling on reported clinical outcomes.

Methods Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology (PROSPERO CRD42019116036), a systematic search of MEDLINE, EMBASE and CINAHL was conducted. The QualSyst Assessment Tool was used to assess bias. The impact of medication counselling on different outcomes was described and stratified by intervention content.

Results Twenty-nine studies were included. Fifteen different components of medication counselling were identified. Discussing the dose and dosage of patients' medications (19/29; 65.5%), providing a paper-based medication list (19/29; 65.5%) and explaining the indications of the prescribed medications (17/29; 58.6%) were the most frequently encountered components during the counselling session. Twelve different clinical outcomes were investigated in the 29 studies. A positive effect of medication counselling on medication adherence and medication knowledge was found more frequently, compared to its impact on hard outcomes such as hospital readmissions and mortality. Yet, evidence remains inconclusive regarding clinical benefit, owing to study design heterogeneity and different intervention components. Statistically significant results were more frequently observed when counselling was provided as part of a comprehensive intervention before discharge.

Conclusions Substantial heterogeneity between the included studies was found for the components of medication counselling and the reported outcomes. Study findings suggest that medication counselling should be part of multifaceted interventions, but the evidence concerning clinical outcomes remains inconclusive.

1 Introduction

Older patients are regularly exposed to a multitude of medication changes during a hospital stay, mostly owing to newly diagnosed conditions or drug therapy optimisation [1–5]. However, such drug regimen changes and resulting polypharmacy might put patients at risk of drug-related problems during and after hospital discharge [6–8]. Forster et al. demonstrated that approximately one in five patients experienced an adverse event after hospital discharge, of which more than two-thirds were drug related and the majority was considered to be preventable and/or ameliorable [7].

Importantly, instructions regarding drug therapy are not always communicated explicitly and adequately to patients or their caregivers upon discharge [9–11]. The lack of discharge instructions, together with the insufficient transfer of information to other healthcare providers, might further contribute to suboptimal therapy compliance in patients after discharge and could lead to avoidable harm [12–14]. Therefore, seamless care is required to ensure patient safety at care transitions [15].

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s40266-020-00780-z) contains supplementary material, which is available to authorized users.

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Key Points

Medication counselling in older patients was conducted by various methods resulting in the identification of 15 different components addressed during counselling sessions.

The impact of medication counselling on clinical outcomes remains unclear as studies had variable methodological quality and heterogeneous study design.

Statistically significant results were more frequently observed when counselling was provided as part of a comprehensive intervention before discharge. This may suggest that medication counselling should preferably be integrated into a holistic approach to ensure appropriate medication use in older patients after hospital discharge.

High-quality trials with a proper description of the counselling intervention and long-term follow-up are needed to provide definitive evidence for the effect of medication counselling in this population.

Medication counselling prior to hospital discharge is often proposed as an important component of seamless care. Currently, a number of terms are used (e.g. medication counselling, medication education, medication consultation) to define the provision of medication information to the patients or their caregivers to ensure appropriate medication use. A systematic review conducted by Bonetti et al. which included patients of all ages, concluded however that components of discharge counselling varied greatly and that evidence of its impact on hospital readmissions and emergency department (ED) visits was lacking [16, 17].

Several additional issues add to the difficulty of providing direct counselling in old and very old patients. First, multimorbidity and polypharmacy are prevalent in older age [18], often leading to complex and difficult to comprehend medication regimens. Second, owing to age-related cognitive impairments, older patients face additional obstacles in understanding medical information. Third, older patients might have decreased physical abilities to use their medications appropriately [19]. Fourth, older people are more frequently hospitalised and experience more drug regimen changes [3, 20]. Consequently, they are more prone to experience problems understanding their medication regimens. This means that data from the younger or general population cannot be extrapolated as such to older patients [21].

Therefore, we aimed to provide an overview of reported components of medication counselling in older patients (aged ≥ 65 years) prior to hospital discharge. We also reviewed the effectiveness on the reported clinical outcomes such as hospital readmissions, medication adherence, medication knowledge and ED visits.

2 Methods

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [22]. The protocol of this systematic review was published in the International Prospective Register of Systematic Reviews (PROSPERO): CRD42019116036.

2.1 Search Strategy

The following electronic databases were searched from inception until 12 December, 2018: MEDLINE, EMBASE and CINAHL. Database alerts were defined, which provided the reviewers with updates to ensure new eligible publications were identified, until September 2019. The search strategy included terms to describe: (1) older patients, (2) medication counselling and (3) a hospital discharge setting. To identify relevant search terms for all concepts, we sought the expertise of content experts, explored Thesaurus, used pearl-growing, used text mining tools and tested multiple search filters. The Boolean operators 'AND' and 'OR' were used, alongside phrase, proximity and truncation operators to increase sensitivity. The search syntax was adapted based on the individual databases and controlled vocabulary terms were used where available. All search strategies are outlined in the Electronic Supplementary Material.

2.2 Study Selection

The following inclusion criteria were applied: (1) more than half of the study population was aged older than 65 years; (2) counselling was medication related; (3) medication counselling was (the main part of) the intervention; (4) medication counselling was conducted in a hospital setting; (5) medication counselling was conducted prior to discharge; and (6) there was a sufficient description of the intervention. Citations not reported in English and/or not reporting primary data were excluded. There was no restriction for study design or outcomes studied as a small number of studies eligible for inclusion were expected.

All records retrieved using the search strategy were exported into the reference manager EndNote X9.1 (Thomson Reuters, New York, NY, USA). After duplicate removal, the records were imported into Rayyan© QCRI to perform the study selection [23]. All references were scanned based on titles and/or abstracts by one reviewer (AC). A duplicate review was conducted independently by different reviewers (AS, MP, KF, LVDL, KW, JH, AS, ALS) to ensure that each

reference was reviewed by at least two independent reviewers. Next, all full texts of the provisionally included records were reviewed by the same independent authors against the eligibility criteria. Disagreements were resolved by discussion if necessary.

2.3 Data Extraction and Quality Assessment

A pre-agreed standardised data extraction form was used to collect data of the included studies. The following items were extracted from the published articles: study items (author(s), year of publication, country, study design, setting); participants' characteristics (sample size, age, sex); intervention description (provider of the intervention, complementary interventions in adjunct to medication counselling); and outcome(s) studied (follow-up time, outcome measures, results).

To assess the risk of bias for the included studies, the QualSyst Assessment Tool for quantitative research was used from the "Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields" [24]. This validated tool was used because it is not restricted to one study design and can be applied to all studies included. It is a 14-item checklist in which each item was scored as "yes" = 2, "partial" = 1 or "no" = 0, depending on the degree to which the specific criteria were met or reported, creating a maximum score of 28. For non-randomised studies, the item about random allocation was not applicable. Because of the nature of the intervention, which made blinding of personnel and participants impossible, the two items of blinding were not applicable for any of the included studies and were hence excluded from the calculation of the summary score. A percentage was calculated for each paper by dividing the total sum score obtained across rated items by the total possible score [i.e. 28 − (number of not applicable items × 2)] and ranged between 0 and 100%. A score of < 50% or ≥ 80% was defined as a low or a high methodological quality, respectively. The quality of the included articles was assessed by three independent reviewers (AC, AS, MP).

2.4 Data Synthesis

As the high heterogeneity of included studies precluded a quantitative analysis (i.e. meta-analysis), a descriptive approach was followed. The impact of medication counselling on different outcomes was described and stratified by intervention content (studies with medication counselling as a sole intervention vs studies with complementary interventions in adjunct to medication counselling) and by methodological quality (low vs moderate to high methodological quality). Hence, the association between type of intervention, methodological quality and outcome could be investigated.

All statistical analyses were performed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Quantitative variables were described using the mean ± standard deviation or median (interquartile range = Q1–Q3) depending on whether they followed a normal distribution, which was assessed descriptively (skewness, kurtosis), graphically (Q–Q plot and boxplot) and with tests of normality (Shapiro–Wilk).

3 Results

The literature search resulted in 4358 abstracts. After screening titles and abstracts, 129 records were assessed for full-text analysis of which 29 were eligible for inclusion in this systematic review. The article selection process with reasons for exclusion can be found in Fig. 1.

3.1 Characteristics of Included Studies

Characteristics of the included studies are presented in Table 1. In total, 7574 patients were included, with a median number of 162 patients (interquartile range = 85–345) per study. Articles were published between 1977 and 2018. The majority of the studies was conducted in Europe (16/29; 55.2%) [25–40], followed by studies conducted in the USA (8/29; 27.6%) [41–48]. Three studies were conducted in Australia [49–51], one in Brazil [52] and one in Israel [53]. Sixteen studies (55.2%) had a randomised controlled study design [25–27, 30, 31, 35–40, 42–44, 47, 52], the other studies (13/29; 44.8%) were non-randomised [28, 29, 32–34, 41, 45, 46, 48–51, 53]. The studies were mainly conducted at an internal medicine ward (9/29; 31.0%) [26, 30, 32, 33, 38, 39, 44, 50, 53], a geriatric ward (6/29; 20.7%) [25, 29, 34, 36, 47, 51] or a medical admission unit (4/29; 13.8%) [27, 28, 31, 37]. In seven studies (7/29; 24.1%), the counselling intervention was conducted on all wards in the hospital [35, 40–43, 45, 48]. The majority of studies excluded patients who were not discharged to their homes (21/29; 72.4%) and/or were cognitively impaired (18/29; 62.1%).

3.2 Quality Assessment

The included studies showed a variable quality score ranging from 31.8 to 95.8% (Table 1). The mean methodological quality score of the studies was 66.2% ± 18.3%. Six out of 29 studies had low methodological quality (< 50%) [28, 29, 34, 41, 48, 49] and eight studies had high methodological quality (≥ 80%) [26, 30, 31, 35–37, 43, 52].

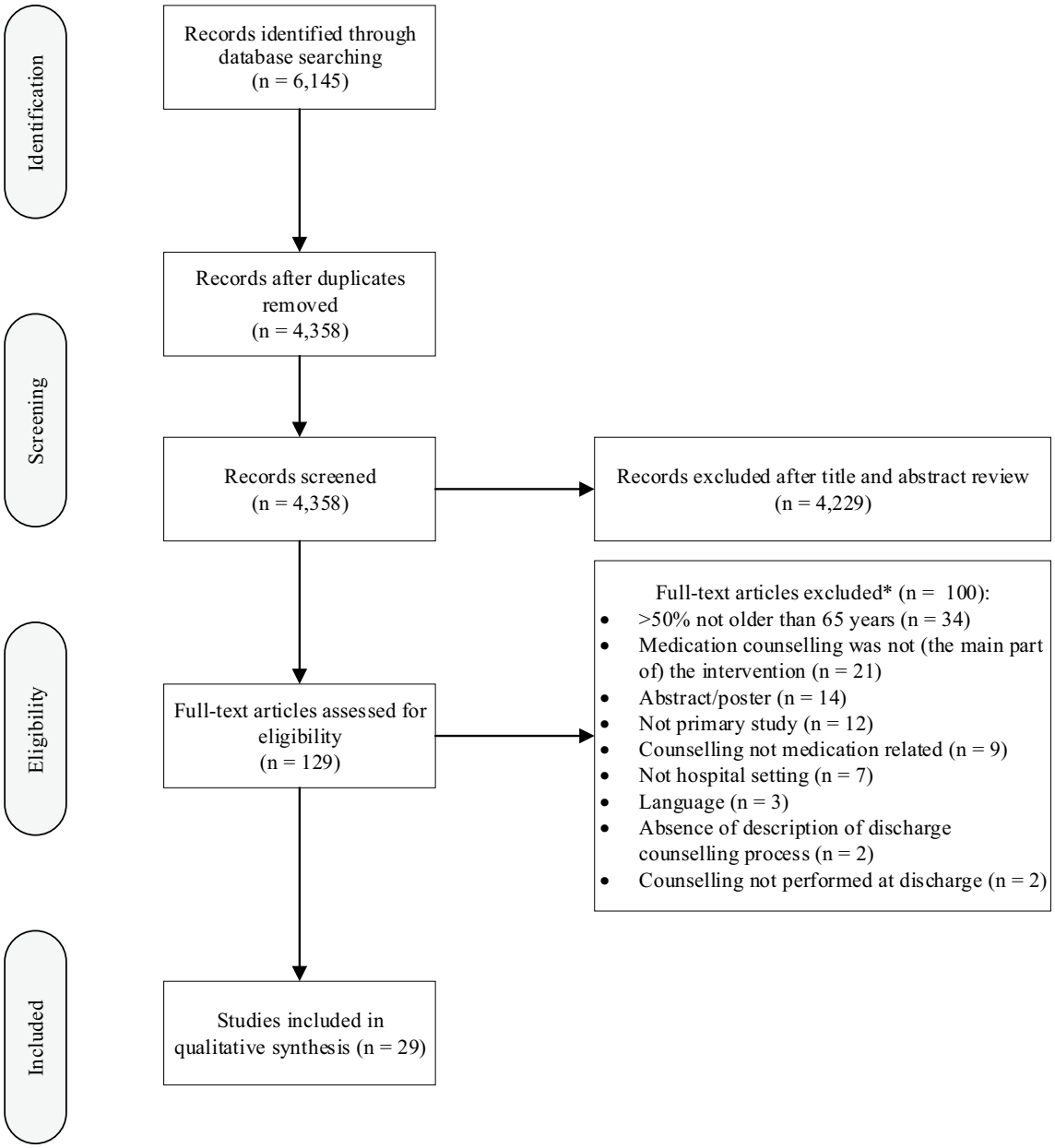

Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the included studies. *Multiple reasons possible

3.3 Components of Counselling Interventions

In a majority of studies (23/29; 79.3%), pharmacists were involved in performing medication counselling at hospital discharge. In some studies, nurses (6/29; 20.7%) or physicians (2/29; 6.9%) were also involved. Counselling components varied widely between studies (Fig. 2). The most frequently encountered components during counselling sessions were "discussing the dose and dosage of patients' medications" (19/29; 65.5%) and "providing a paper-based medication list" (19/29; 65.5%), followed by "explanation of the indications of the prescribed medications" (17/29; 58.6%). Furthermore, in 12 studies (12/29; 41.4%), potential adverse drug reactions that patients might experience during therapy were addressed. Information about medications stopped, newly started drugs and drugs that were changed (e.g. altered dose or frequency) were part of the counselling process in eight studies (8/29; 27.6%). In six studies (6/29; 20.7%), the importance of medication adherence was stressed during the session. Other components of medication

Table 1 Characteristics of the included studies

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Al-Rashed et al. 2002 [25]	UK	RCT	Geriatric ward	83	IG: 80.2 (5.7); CG: 81.1 (5.8)	IG: 37.2; CG: 50.0	Pharmacist	Domiciliary visit	3 months	(1) Medication knowledge; (2) medication adherence; (3) any healthcare-related events	(1) S better at 3 weeks, not at 3 months after discharge; (2) S better at both visits; (3) S less unplanned GP visits and re-admissions	66.7
Bisharat et al. 2012 [53]	Israel	NRCT	Internal medicine ward	74	IG: 65.3 (12.17); CG: 72.73 (10.64)	IG: 66.7; CG: 68.3	Nurse; pharmacist	/	6 months	(1) Medication adherence	(1) S increase in the IG compared to CG	54.6
Bladh et al. 2011 [26]	Sweden	RCT	Internal medicine ward	345	IG: ITT 81 (72–87) or if PP 84 (75–88); CG: 82 (75–86)	IG: ITT 40 or if PP 34; CG: 39	Pharmacist	Medication review	6 months	(1) HRQL	(1) ITT: NS differences; PP: S better HRQL (global health), NS difference as measured by summarised EQ-5D index	83.3

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Bolas et al. 2004 [27]	Northern Ireland	RCT	Medical admission unit	162	IG: 73 (1–27); CG: 75 (1–37)	IG: 49.3; CG: 48.1	Pharmacist	Medication reconciliation; inpatient counselling; medicine (telephone) helpline	3 months	(1) Mismatch between discharge prescription and home medication; (2) medication knowledge; (3) ED visits	(1) S improvement for correct drug name and frequency of dosing, but not for drug dose; (2) S increase; (3) NS difference	75.0
Bonetti et al. 2018 [52]	Brazil	RCT	Cardiology ward	104	IG: 65 (10); CG: 65 (13)	IG: 68.6; CG: 64.2	Pharmacist	Medication review; telephone follow-up	30 days	(1) Mortality rate, (2) hospital readmissions, (3) ED visits within 30 days; (4) medication adherence	(1) NS difference; (2) hospital readmissions related to heart disease S, overall NS; (3) NS difference; (4) S difference	87.5
Brookes et al. 2000 [28]	Northern Ireland	NRCT	Medical admission unit	109	75 (NR)	NR	Pharmacist	Medication reconciliation	NR	Hospital readmissions	Readmission rate of the study group was 6.4%; readmission rate in patients over 60 years of age was 8.8%	31.8

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Donihi et al. 2008 [41]	USA	NRCT	All wards	100	66 (NR)	44	Nurse; pharmacist; respiratory therapist	/	2–3 days	(1) Recall (2–3 days after discharge) of the indication, name, dose, frequency and side effects for 2 medications	(1) No control group to compare recall accuracy, no significant differences were seen for the time before discharge the education occurred	45.5
Drenth-van Maanen et al. 2013 [29]	The Netherlands	NRCT	Geriatric ward	85	83 (NR)	30	NR	/	1 week	(1) Medication discrepancies 1 week after discharge	(1) NS differences	40.9

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Gillespie et al. 2009 [30]	Sweden	RCT	Internal medicine ward	368	IG: 86.4 (4.2); CG: 87.1 (4.1)	IG: 42.3; CG: 40.3	Pharmacist	Medication reconciliation; medication review; telephone follow-up	12 months	(1) Costs; (2) ED visits; (3) hospital readmissions	(1) Total direct cost of secondary healthcare during the follow-up year was $400 lower per patient in the IG vs the CG. The direct costs of ED visits and readmissions were decreased by $100 and $300, respectively, in the IG (2) 47% reduction in ED visits and (2) + (3) 16% reduction in all visits to the hospital (ED visits + readmissions)	87.5

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Graabaek et al. 2018 [31]	Denmark	RCT	Medical admission unit	600	IG (STAY): 74 (69–80); IG (ED): 74 (69–80); CG: 75 (70–82)	IG (STAY): 50; IG (ED): 52; CG: 51	Pharmacist	Medication reconciliation; medication review	180 days	(1) Number of patients with a medication-related readmission within 30 days from discharge; (2) mortality; (3) patients with readmissions (acute and planned, both including medication-related readmission) within 30 days after discharge	(1) IG (STAY): 2.6%; IG (ED): 4.5%; CG: 5.6% NS difference; (2) IG (STAY): 6.5%; IG (ED): 5.5%; CG: 8.0% NS difference; (3) IG (STAY): 24%; IG (ED): 30%; CG: 34% NS difference	91.7

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Greissing et al. 2016 [32]	Germany	NRCT	Internal medicine ward	200	IG: 73 (60–80); CG: 72 (62–81)	IG: 46; CG: 50	Pharmacist	/	4 weeks	(1) proportion of patients with at least one potentially jeopardizing category A medication change; (2) proportion of patients with at least one potentially jeopardizing category B medication change; (3) proportion of patients with a gap in care after hospital discharge	(1) 39 percentage points lower in the IG than in the CG: S difference; (2) 46 percentage points lower in the IG than in the CG: S difference; (3) 10 percentage points lower in the IG than in the CG: S difference	68.2
Hawe et al. 1990 [49]	Australia	NRCT	NR	268	IG: 69 (8.2); CG: 68 (8.2)	IG: 38; CG: 47	Pharmacist	/	3 months	(1) Medication adherence at 1 month post-discharge; (2) medication adherence 3 months post-discharge	(1) NS difference; (2) NS difference	36.4

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Koehler et al. 2009 [42]	USA	RCT	All wards	41	IG: 77.2 (5.3); CG: 79.8 (5.6)	IG: 15; CG: 38	Nurse; pharmacist	Medication review; telephone follow-up	60 days	(1) 0–30 day post-discharge readmissions/ED visits; (2) 31–60 day post-discharge readmissions/ED visits	(1) lower in IG: S difference; (2) NS difference	75.0
Leguelinel-Blache et al. 2015 [33]	France	NRCT	Internal medicine ward	394	IG: 72 (56–82); CG: 76 (63–83)	IG: 53.9; CG: 53.5	Pharmacist	/	7 days	(1) Medication adherence	(1) Rate of adherence increased from 51.0% of the CG to 66.7% to the IG (S difference); when discharge counselling was performed this rate rose to 79.7% (S difference).	63.6

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Leung et al. 2017 [50]	Australia	NRCT	Internal medicine ward	148	IG: 70 (56–80); CG: 73 (63–79)	IG: 52.5; CG: 50.0	Medical student	/	30–40 days	(1) Medication adherence	(1) Patients in IG had higher adherence than patients in the CG (S difference) 76.3% compared to 60.3%	63.6
Lipton and Bird 1994 [43]	USA	RCT	All wards	706	IG: 74.6 (NR); CG: 74.4 (NR)	NR	Pharmacist	Medication review; domiciliary visit	6 months	(1) Hospital readmissions during the first month, the first 3 months, and 6 months; (2) medication adherence; (3) medication knowledge	(1) NS difference; (2) S increase on some dimensions; (3) S increase	83.3

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
MacDonald et al. [34]	UK	NRCT	Geriatric ward	165	IG: 79.7 (NR); IG+: 78.8 (NR); CG: 81.2 (NR)	IG: 8.3; IG+: 6.67; CG: 8.3	Pharmacist	/	12 weeks	(1) Number of medication errors 1 week after discharge; (2) Number of medication errors 12 weeks after discharge	(1) IG vs CG: S difference, IG+ vs CG: NS difference, IG vs IG+: NS difference; (2) IG vs CG: S difference, IG+ vs CG: NS difference, IG vs IG+: NS difference	36.4
Manning et al. 2007 [44]	USA	RCT	Internal medicine ward	138	IG: 68.1 (5.65); CG: 67.6 (13.06)	IG: 51; CG: 38	NR	/	7–14 days	(1) Patient satisfaction; (2) patient understanding; (3) self-reported medication errors	(1) NS difference; (2) greater understanding in IG compared to CG: S difference; (3) NS difference	79.2
Marusic et al. 2012 [35]	Croatia	RCT	All wards	160	IG: 74.0 (6.7); CG: 73.9 (5.5)	IG: 46.2; CG: 41.2	Physician	/	30 days	(1) Hospital readmissions or ED visit; (2) medication adherence; (3) ADRs	(1) NS difference; (2) S higher medication adherence in IG compared to CG; (3) NS difference	87.5

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Moye et al. 2018 [45]	USA	NRCT	All wards	177	IG: 70.3 (7.4); CG: 71.5 (8.9)	IG: 34.0; CG: 36.3	Pharmacist	Telephone follow-up	30 days	(1) 30-day readmission rate	(1) More patients readmitted in CG than in IG (S difference)	63.6
Nazareth et al. 2001 [36]	UK	RCT	Geriatric ward	362	IG: 84 (5.2); CG: 84 (5.4)	IG: 38; CG: 34	Pharmacist	Medication review; domiciliary visit	6 months	(1) Readmissions to hospital within 6 months	(1) NS differences	87.5
Ravn-Nielsen et al. 2018 [37]	Denmark	RCT	Medical admission unit	1467	IG+: 71 (63–79); IG: 72 (63–80); CG: 73 (65-80)	IG+: 45.0; IG: 49.7; CG: 44.2	Pharmacist	Medication reconciliation; medication review; telephone follow-up	6 months	(1) Hospital readmissions within 30 and 180 days; (2) readmissions within 180 days; (3) mortality	(1) and (2) IG+ had a S effect; (3) NS reduction	95.8
Raynor et al. 1993 [38]	UK	RCT	Internal medicine ward	197	A: 70 (38–89); B: 68 (36–87); C: 70 (39–89); D: 68 (38–91)	A: 59.2; B: 58.0; C: 56.0; D: 50.0	Nurse; pharmacist	/	10 days	(1) Medication knowledge; (2) medication adherence	(1) Groups that received reminder chart scored S better; (2) groups that received reminder chart scored S better	54.2

Table 1 (continued)

Study items				Participants' characteristics			Intervention description		Outcome(s) studied			Quality assessment
Author, year	Country	Study design	Setting (type of ward)	Number of patients	Age (mean (SD) or median (IQR))	% Male	Provider of intervention	Other components of intervention	Follow-up time	Outcome measures	Results	Score (%)
Scullin et al. 2007 [39]	UK	RCT	Internal medicine ward	762	IG: 70.3 (13.8); CG: 69.9 (14.8)	IG: 45.0; CG: 49.1	Pharmacist	Medication reconciliation; medication review; inpatient counselling	12 months	(1) Hospital readmissions; (2) time to readmission	(1) S different with 59.2% of the IG not being readmitted within 12 months compared with 50.7% of the CG; (2) S difference	75.0
Shen et al. 2006 [51]	Australia	NRCT	Geriatric ward	60	78.5 (5.4)	31.7	Nurse	Inpatient counselling	10 days	(1) Medication knowledge	(1) S increase	59.1
Smith et al. 1997 [40]	UK	RCT	All wards	53	IG: 77.5 (7.3); CG: 77.6 (6.1)	NR	Pharmacist	Medicine (telephone) helpline	7–10 days	(1) Medication adherence	(1) S better for IG compared to CG	58.3
Szkiladz et al. 2013 [46]	USA	NRCT	Cardiology ward	180	IG: 70 (14.8); CG: 72 (14.2)	IG: 44.2; CG: 52.1	Pharmacist	/	30 days	(1) Heart failure readmissions within 30 days of discharge	(1) NS difference	59.1
Vinluan et al. 2015 [47]	USA	RCT	Geriatric ward	16	IG: 74 (5.9); CG: 71 (6.9)	IG: 14; CG: 22	Pharmacist	Medication review; telephone follow-up	90 days	(1) Medication adherence; (2) hospital readmissions	(1) and (2) NS difference	66.7
Wolfe et al. 1992 [48]	USA	NRCT	All wards	50	IG: 72.84 (5.83); CG: 75.16 (7.54)	IG: 48; CG: 36	Nurse	/	3–6 weeks	(1) Medication knowledge; (2) medication adherence	(1) S difference; (2) NS difference	41.7

ADRs adverse drug reactions, *CG* control group, *ED* emergency department, *GP* general practitioner, *HRQL* health-related quality of life, *IG* intervention group, *IQR* interquartile range, *ITT* intention-to-treat, *NR* not reported, *NRCT* non-randomised controlled trial, *NS* not significantly, *PP* per-protocol, *RCT* randomised controlled trial, *S* significantly, *SD* standard deviation

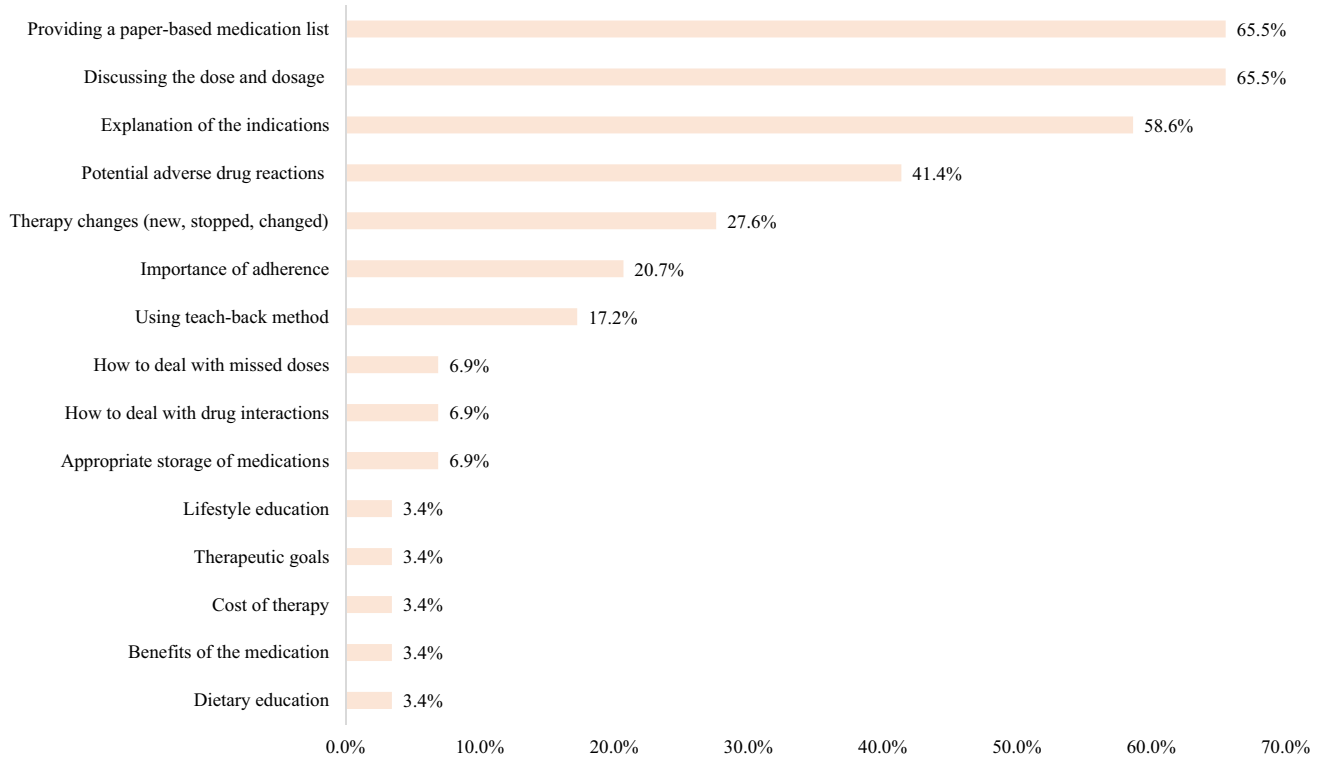

Fig. 2 Frequency of components addressed during discharge medication counselling in the included studies

counselling were information about the storage of medications, instructions on how to deal with missed doses, dietary and lifestyle education, information about the benefits of therapy, the cost of therapy and explanation of therapeutic goals. Five studies (5/29; 17.2%) used the teach-back method to ensure patients understood the instructions provided.

Upon hospital discharge, complementary interventions, in adjunct to medication counselling, were performed in 16 studies (16/29; 55.2%) (Table 2). Medication review (10/29; 34.5%), medication reconciliation (6/29; 20.7%) and telephone follow-up of patients post-discharge (6/29; 20.7%) were most frequently reported. In addition, three studies already conducted inpatient medication counselling during hospitalisation. Home-based patient visits (3/29; 10.3%) and the use of a medication telephone helpline (2/29; 6.9%) were also reported in addition to medication counselling.

Table 2 Interventions performed in addition to medication counselling in 13 of the 29 included studies (multiple interventions could be combined)

Other components of the intervention	*N* (%)
Medication review	10/29 (34.5)
Medication reconciliation	6/29 (20.7)
Telephone follow-up	6/29 (20.7)
Inpatient counselling	3/29 (10.3)
Home-based patient visit	3/29 (10.3)
Medicine (telephone) helpline	2/29 (6.9)

3.4 Outcome Measures for Discharge Medication Counselling

The impact of discharge medication counselling was measured on 12 different outcomes, with the following being most common: hospital readmissions (14/29; 48.3%), medication adherence (12/29; 41.4%), medication knowledge (8/29; 27.6%), ED visits (6/29; 20.7%) and mortality (3/29; 10.3%) (Table 3).

Overall, in 20 studies (20/29; 69.0%), statistically significant findings on at least one of the measured outcome indicators were found. A significant result was found more frequently in studies that evaluated the impact on medication knowledge and medication adherence with seven out of eight studies and 9 out of 12 studies, respectively. One-third of studies demonstrated a significant impact of the intervention on hospital readmissions (5/14; 35.7%) and ED visits (2/6; 33.3%). A reduction in mortality was not reported. Taking into account the reported sample sizes, a higher proportion of statistically significant findings was observed in studies with a higher number of enrolled participants. Additionally, studies where medication counselling was combined

Table 3 Impact of medication counselling stratified by intervention (medication counselling alone vs accompanied by complementary interventions) and methodological quality (moderate to high [score of ≥ 50% [24] vs low [score of < 50% [24]])

	Hospital readmissions	Medication adherence	Medication knowledge	ED visits	Mortality	Other[a]
All included studies ($N = 29$)						
Outcome studied, n[b] (%)	14/29 (48.3)	12/29 (41.4)	8/29 (27.6)	6/29 (20.7)	3/29 (10.3)	8/29 (27.6)
Significant finding, n[b] (%)	5/14 (35.7)	9/12 (75.0)	7/8 (87.5)	2/6 (33.3)	0/3 (0.0)	4/8 (50.0)
Significant finding, n[c] (%)	2530/5135 (49.3)	1919/2253 (85.2)	1396/1496 (93.3)	1508/2302 (65.5)	0/2171 (0.0)	872/1623 (53.7)
Studies with medication counselling as a sole intervention ($N = 13$)						
Outcome studied, n[b] (%)	2/13 (15.4)	7/13 (53.8)	4/13 (30.8)	1/13 (7.7)	0/13 (0.0)	5/13 (38.5)
Significant finding, n[b] (%)	0/2 (0.0)	5/7 (71.4)	3/4 (75.0)	0/1 (0.0)	N.A.	2/5 (40.0)
Significant finding, n[c] (%)	0/340 (0.0)	973/1291 (75.4)	385/485 (79.4)	0/160 (0.0)	N.A.	365/748 (48.8)
Studies with complementary interventions in adjunct to medication counselling ($N = 16$)						
Outcome studied, n[b] (%)	12/16 (75.0)	5/16 (31.3)	4/16 (25.0)	5/16 (31.3)	3/16 (18.8)	3/16 (18.8)
Significant finding, n[b] (%)	5/12 (41.7)	4/5 (80.0)	4/4 (100)	2/5 (40.0)	0/3 (0.0)	2/3 (66.7)
Significant finding, n[c] (%)	2530/4795 (52.8)	946/962 (98.3)	1011/1011 (100)	1508/2142 (70.4)	0/2171 (0.0)	507/875 (57.9)
Studies with moderate to high methodological quality ($N = 23$)						
Outcome studied, n[b] (%)	13/23 (56.5)	10/23 (43.5)	6/23 (26.1)	6/23 (26.1)	3/23 (13.0)	6/23 (26.1)
Significant finding, n[b] (%)	5/13 (38.5)	9/10 (90.0)	6/6 (100)	2/6 (33.3)	0/3 (0.0)	3/6 (50.0)
Significant finding, n[c] (%)	2530/5026 (50.3)	1919/1935 (99.2)	1346/1346 (100)	1508/2302 (65.5)	0/2171 (0.0)	707/1373 (51.5)
Studies with low methodological quality ($N = 6$)						
Outcome studied, n[b] (%)	1/6 (16.7)	2/6 (33.3)	2/6 (33.3)	0/6 (0.0)	0/6 (0.0)	2/6 (33.3)
Significant finding, n[b] (%)	0/1 (0.0)	0/2 (0.0)	1/2 (50.0)	N.A.	N.A.	1/2 (50.0)
Significant finding, n[c] (%)	0/109 (0.0)	0/318 (0.0)	50/150 (33.3)	N.A.	N.A.	165/250 (66.0)

ED emergency department, *N.A.* not applicable

[a]Quality of life, medication discrepancies after discharge, costs, potentially jeopardizing medication change, medication errors, patient satisfaction, adverse drug reactions

[b]Number of studies

[c]Number of patients

with other interventions and studies with a moderate to high methodological quality found more frequently statistically significant results (Table 3).

4 Discussion

This systematic review identified 29 studies that assessed the impact of medication counselling in older patients prior to hospital discharge. Medication counselling was most commonly performed by pharmacists and conducted in various methods with 15 different components identified. Medication lists, medication dosages and the indications of the prescribed medications were most commonly discussed during counselling sessions. However, although older patients experience a multitude of medication changes during a hospital stay, remarkably little emphasis was placed on that topic during the counselling sessions. We observed that less than one-third of the studies discussed such therapy changes during the counselling process. However, this does not necessarily imply that medication changes were not identified. Indeed, medication reconciliation was often combined with the counselling intervention, and this includes highlighting and communicating treatment changes.

Across the 29 included studies, we identified 12 different outcomes with hospital readmissions, medication adherence, medication knowledge and ED visits having been most frequently investigated. Briefly, the impact of medication counselling on clinical outcomes remains inconclusive. Studies that evaluated associations between counselling and medication adherence or medication knowledge reported statically significant findings more frequently compared with studies with hard outcomes such as hospital readmissions, ED visits and mortality.

Mainly, the impact of medication counselling on clinical outcomes remains unclear as studies were heterogeneous in design and components of the intervention. Furthermore, a large variety in methodological quality was detected and for most studies the duration of follow-up was short with only eight studies following patients for longer than 3 months. Therefore, the lack of positive results of medication

counselling may be attributable in part to the methodological quality, insufficient sample sizes and short follow-up period.

Previously, it has been shown that it is complex to prove the impact of pharmaceutical care interventions on healthcare utilisation (such as hospital readmissions and ED visits) and mortality [54–56]. Because of the complex nature of pharmaceutical care interventions, it has been suggested to rather evaluate the impact on endpoints that are more patient related such as quality of life, the prevalence of drug-related problems, knowledge, adherence and patient satisfaction [57].

In more than half of the included studies, medication counselling was accompanied by other interventions such as medication reconciliation, medication review and telephone follow-up of patients post-discharge. These studies found statistically significant findings more frequently compared with studies where medication counselling was conducted as the sole intervention. This finding may suggest that medication counselling should hence preferably be integrated into a holistic approach to ensure appropriate medication use in older patients after hospital discharge. This approach, with positive findings on hospital readmissions, consists of a patient-centred medication review, medication reconciliation and motivational counselling at discharge, as well as contact with the primary caregivers and follow-up after discharge [37]. It was also acknowledged in the systematic review of Burke et al. that such multifaceted interventions are necessary to substantially improve the transition of care [54]. Other studies have also shown that a single pharmaceutical care intervention has no clear effect on itself [58–60].

4.1 Strengths and Limitations

The present systematic review was conducted in accordance with the PRISMA statement [22] and the protocol of the review was published on PROSPERO. To our knowledge, this is the first systematic review to evaluate the impact of medication counselling prior to hospital discharge, specifically in older patients. Additionally, we described the different components of medication counselling. However, this study also has several limitations. First, because of the high heterogeneity of the included studies, a meta-analysis could not be performed and the results were discussed only descriptively. In addition, it was not possible to identify which components were associated with improved clinical outcomes and should subsequently be provided as part of successful medication counselling. Second, other interventions should also be taken into account when evaluating the impact of medication counselling, such as a medication review during hospitalisation and a medication reconciliation at admission and discharge, as it is likely that this will have impacted the individual study findings. However, it was not always clearly stated in the included studies if other interventions were performed and what comprised those interventions. In addition, it is unfeasible to clearly determine the degree that each part contributed to possible demonstrated effects. Third, as data were only extracted from the published articles and we did not contact the authors to confirm or receive additional or more detailed information, this could have resulted in an inadequate reporting of the counselling intervention. Fourth, only published studies were included and we did not consider the grey literature such as conference papers or unpublished initiatives, which could have led to publication bias. Finally, we included only articles published in English and may, therefore, have missed some relevant studies.

4.2 Future Perspectives

Almost three-quarters of studies excluded patients who were not discharged to their homes and more than 60% excluded patients with cognitive impairments. Importantly, older patients are often discharged from the hospital to healthcare facilities and frequently experience cognitive impairments and are therefore underrepresented in the studies. This may limit the external validity of the study findings to complex older patients who might require long-term institutional care. Moreover, it remains unclear how medication counselling should be performed and adapted to this specific population. Future studies should therefore consider these aspects to provide the important information that is currently lacking.

As discussed above, clinical pharmacy services, such as medication counselling, are often insufficiently described with inconsistent definitions of the components of the interventions. Consequently, there is a need for high-quality well-designed trials with a proper description of the counselling intervention and a long-term follow-up to provide definitive evidence for the effect of medication counselling [61]. Therefore, reporting guidelines such as the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) and the Reporting of studies Conducted using Observational Routinely collect health Date (RECORD) statements should be used. Furthermore, core outcome sets should be defined to standardise several outcomes [62]. This will allow comparisons between studies and may enable identification of the true effect of the interventions. In this manner, we believe high-level evidence will be provided to identify effective strategies that will guide us to optimal medication use in older patients. Potentially, the ongoing MedBridge trial in Sweden might provide more robust information with high external validity. This trial studies the effects of a comprehensive intervention with an active follow-up on older patient's healthcare utilisation and is sufficiently powered to detect the impact of the intervention [63]. Last, it might be essential to investigate which conditions

should be available and fulfilled to provide a model for a multifaceted approach including medication counselling. We would like to translate this multifaceted approach to a practical guideline that can be used by geriatricians, clinical pharmacists and geriatric nurses in real-life clinical practice.

5 Conclusions

This systematic review evaluated the impact of medication counselling in older patients prior to hospital discharge. Substantial heterogeneity between the included studies was found for the components of medication counselling, the reported outcomes as well as the methodological quality. Study findings suggest that medication counselling should be part of multifaceted interventions, but the evidence with regard to clinical outcomes remains inconclusive.

Acknowledgements The authors thank the executive board of the Belgian Society for Gerontology and Geriatrics (BSGG), which includes the following members: Jean-Pierre Baeyens, Ivan Bautmans, Nicolas Berg, Katrien Cobbaert, Isabelle de Brauwer, Sandra de Breucker, Anne Marie de Cock, Marie de Saint Hubert, Johan Flamaing, Sophie Gillain, Tony Mets, Nele Van Den Noortgate.

Author Contributions All authors have made substantial contributions to the conception or design of the work, or the acquisition, analysis or interpretation of data: AC, AS and MP designed the study; AC developed the search strategy and performed the literature search; all authors conducted the review; AC, AS and MP performed the data extraction and quality assessment; AC wrote the first draft of the manuscript and all authors revised the manuscript, approved the final version and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Compliance with Ethical Standards

Funding This study was funded by the Belgian Society for Gerontology and Geriatrics (BSGG).

Conflict of interest Andreas Capiau, Katrien Foubert, Lorenz Van der Linden, Karolien Walgraeve, Julie Hias, Anne Spinewine, Anne-Laure Sennesael, Mirko Petrovic and Annemie Somers have no conflicts of interest that are directly relevant to the content of this article.

Data Availability The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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