











Medication Supports at Transitions Between Hospital and Other Care Settings: A Rapid Scoping Review

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Purpose: Transitions in care (TiC) often involves managing medication changes and can be vulnerable moments for patients. Medication support, where medication changes are reviewed with patients and caregivers to increase knowledge and confidence about taking medications, is key to successful transitions. Little is known about the optimal tools and processes for providing medication support. This study aimed to identify describe patient or caregiver-centered medication support processes or tools that have been studied within 3 months following TiC between hospitals and other care settings.

Methods: Rapid scoping review; English-language publications from OVID MEDLINE, OVID EMBASE, Cochrane Library and EBSCO CINAHL (2004-July 2019) that assessed medication support interventions delivered within 3 months following discharge were included. A subset of titles and abstracts were assessed by two reviewers to evaluate agreement and once reasonable agreement was achieved, the remainder were assessed by one reviewer. Eligibility assessment for full-text articles and data charting were completed by an experienced reviewer.

Results: A total of 7671 unique citations were assessed; 60 studies were included. Half of the studies (n = 30/60) were randomized controlled trials. Most studies (n = 45/60) did not discuss intervention development, particularly whether end users were involved in intervention design. Many studies (n = 37/60) assessed multi-component interventions with written/print and verbal education components. Few studies (n = 5/60) included an electronic component. Very few studies (n = 4/60) included study populations at high risk of adverse events at TiC (eg, people with physical or intellectual disabilities, low literacy or language barriers).

Conclusion: The majority of studies were randomized controlled trials involving verbal counselling and/or physical document delivered to the patient before discharge. Few studies involved electronic components or considered patients at high-risk of adverse events. Future studies would benefit from improved reporting on development, consideration for electronic interventions, and improved reporting on patients with higher medication-related needs.

Keywords: continuity of patient care, patient discharge, patient education, rapid scoping review, medication counseling, care transitions

Introduction

The World Health Organization (WHO) has identified transitions in care (TiC) as a key focus area for improving patient safety and minimizing preventable medication-related harm.¹ TiC, in which patients move from one care setting to

another, often involves changes to medication regimens.² During transitions, discrepancies and gaps in communication can lead to medication errors,³ which in turn, can cause patient harm and lead to emergency department visits, hospitalization, and even death.⁴ A study assessing patient's recall of medication changes one week after discharge found less than half were able to recall whether and which medications changed during their hospital stay, and that nearly 10% experienced changes in their perceived informational needs during their care transition.⁵ As inadequate knowledge about medication regimens can lead to incorrect use and non-adherence,⁶ these findings suggest that many patients may be at risk of harm and/or suboptimal therapy following discharge. Furthermore, certain patient groups are at higher risk for adverse events during transitions in care. Patients with language barriers or low literacy levels often have difficulty understanding their discharge medications.^{7,8} Older people and those with intellectual or physical disabilities experience high rates of multimorbidity and are often prescribed many medications, which need to be reviewed frequently.^{9–11}

Medication support interventions are key to successful transitions.¹² We define medication support interventions as those in which patients and caregivers partner with health-care providers to review medication changes with the goal of increasing the patients' knowledge and confidence about taking their medications. Current knowledge and understanding of the optimal tools for providing medication support during TiC is limited. Further study is required to understand both the design and implementation of successful support tools. As part of this effort, we performed a rapid scoping review to describe medication support tools and processes that have been studied, understand the extent to which elements of user-centered design were included in their development, and to identify opportunities for future research. This rapid scoping review is a component of a multi-method research project to understand the needs and co-develop guidelines and prototypes of potential medication support tool(s) together with patients and providers, with the goals of improving people's medication experiences and optimizing medication management at TiC.

Objective

This rapid scoping review sought to address the following research question: What patient-centered or caregiver-centered medication support tools or processes have been studied within three months following TiC between hospitals and other care settings?

Methods

We undertook a rapid scoping review with the intent of identifying evidence in a timely fashion to facilitate the integration of our findings into our complementary co-design work to create medication support tools for use during TiC.¹³ Our methods were guided by the information and recommendations outlined in the Joanna Briggs Institute Manual for Evidence Synthesis on scoping reviews.¹⁴ Reporting of our work was guided by the Preferred Reporting Items for Systematic Reviews and Meta-analysis for Scoping Reviews (PRISMA-ScR).¹⁵

Eligibility Criteria

Study eligibility criteria were as follows.

P - Population: We included studies that involved patients experiencing TiC, and their caregivers. Caregivers were defined as any person who gives care to people who need help taking care of themselves. Examples included family members, friends, or members of the clergy.¹⁶ Only patients experiencing transitions from hospitals to other care settings (home/community, primary care, long-term care, rehabilitation facilities, etc.) were included because this represents a population at high risk for experiencing medication errors and adverse events.^{17,18}

I-Intervention: Studies that involved or assessed a medication support intervention were included. A medication support intervention was defined as any process or tool that aims to increase patients and caregivers' understanding of their medications, confidence about taking their medication, or aims to increase providers' understanding of a patient's preferences and values with respect to their medications. Broader interventions, such as discharge summaries, with medication information were included.

C - Comparator: Studies with or without controls were eligible for inclusion.

O - Outcomes: Studies that assessed patient and caregivers' knowledge/comprehension, patient attitudes (satisfaction, preferences, values) and confidence (self-efficacy), patient behaviour (self-management, adherence) and health

system outcomes (health care utilization (eg, physician visits, pharmacy visits, readmission) and mortality) were included. Only studies that measured outcomes within 3 months of discharge were included because this time frame is frequently cited as the period in which the outcome may be associated with the intervention administered at discharge.¹⁹

S - Study Designs: Eligible study designs included: experimental studies (randomized controlled trials, quasi-experimental studies with control(s)), observational studies (prospective and historical cohort, case-control, case-cross-over, case-cohort, case-time controlled, self-controlled case-series design, cross-sectional studies, time-series, pre-post studies), qualitative studies, and mixed methods studies.²⁰ Descriptive quantitative studies were excluded as these studies do not assess the effectiveness of the intervention. We included published or in-press peer reviewed articles published as full reports. Book chapters, abstracts, conference proceedings were excluded.

Report Characteristics: Given the short time to conduct the review, we confined our search to published literature available in English-language only. We limited eligible studies to those published within the previous 15 years (2004–2019) due to rapid shifts in clinical practice supporting medication management.

Literature Search Strategy

The search strategy was developed and executed by a university-affiliated librarian co-investigator ([Appendix 1](#)). A second librarian with expertise in health literature reviewed the search strategies using the PRESS EBC Checklist.²¹ The following databases were searched between July 26 and 30, 2019:

- Ovid MEDLINE (1946-present including Epub ahead of print, in-process, and other unindexed citations) Ovid MEDLINE (1946-present including Epub ahead of print, in-process, and other unindexed citations),
- Ovid EMBASE (1947-present),
- Cochrane Library,
- EBSCO CINAHL Plus with Full Text (1981-present).

Search results were exported by the librarian into EndNote and duplicates were removed. After duplicate removal, citations from only the prior 15 years (ie, 2019 to 2004) were identified.

Study Selection

Citation titles and abstracts from the searches were screened to determine study eligibility within Covidence[®].²² Interrater agreement was assessed, and any conflicts resolved.

Standardized relevance screening forms with instructions were prepared and piloted to ensure uniform application of eligibility criteria. Titles and abstracts of identified references were reviewed by an experienced member of the study team. A second reviewer verified a subset of the records (5%) examined by the first reviewer and was also consulted for citations about which the first reviewer is uncertain (DG). Agreement on this subset of records was above a minimum kappa value of 0.80 taken to represent substantial agreement.²³

Full-text articles were retrieved and reviewed using the process described above for any abstract that required further clarification or was related to the study research question. Disagreements were discussed until consensus was reached or reconciled by a third reviewer.

Team members did not review studies they authored, co-authored or consulted upon.

A review log was created to document all decisions made in relation to selecting studies for inclusion including recommendations of the reviewer(s) and reason(s) for exclusion to facilitate development of a flowchart, recommended by PRISMA.²⁴

Data Charting Process and Data Items

We collected data about study characteristics (eg study design, citation), population characteristics (eg number of patients, age, gender, whether the population included was at high risk for adverse events due to presence of disabilities or language barriers), intervention characteristics (eg physical, verbal, or electronic modes of delivery, components of intervention such as videos, counselling, medication list, follow-up, content of intervention, layout (design), process of

the interventions, transition type), study outcomes (eg patient and caregiver knowledge/comprehension, patient and caregiver attitudes and confidence, patient and caregiver behaviour and experience, health system outcomes, other outcomes), and conclusions.

Fields for data abstraction were based on those recommended by the Cochrane Collaboration and the Centre for Reviews and Dissemination.^{24,25} We were also guided by a systematic review conducted by members of our study team that explored the impact of patient-centered discharge tools.¹⁹ Further, the extent of user-centered design approaches used to develop each tool was assessed with the UCD-11 (User-Centred Design for Patient-Centred Tools) instrument.²⁶ The UCD-11 instrument was used to generate a descriptive measure of an intervention's user-centeredness through assessing the extent of end user (eg patients, caregivers, health professionals) involvement in the design, development, and refinement stages of the intervention.²⁶ If the criteria was not explicitly reported in the article, it was assumed this criteria was not a part of tool development.

A preliminary data abstraction form and accompanying guide were created. Cochrane's process for developing the data extraction form guided this process: a paper form was designed, two reviewers independently extracted data from 10 studies, and then met to determine the necessary revisions. Feedback was used to modify the form and repeat the pilot before creating the form electronically. Concurrently, a guide with instructions for completing the extraction and decision rules for coding data was created and revised iteratively. Once the fields for extraction and their accompanying coding rules were agreed upon, an electronic form was developed to facilitate data entry and management.

Due to the time constraints in which this rapid scoping review was conducted, one experienced reviewer abstracted data. A second reviewer was consulted in cases of uncertainty. Disagreements that could not be resolved through consensus were reconciled through discussion with the two reviewers in the presence of a third person.

Mechanisms for recording, assessing, and correcting data entry errors were devised.

A descriptive numerical summary and a narrative synthesis were completed to describe study designs, intervention (and comparator intervention, if applicable) characteristics, target population characteristics, and study outcomes, as stated in our study objective. Results were classified based on main conceptual categories (eg timing, mode of delivery, health-care providers involved). Summary tables were created for study characteristics, intervention characteristics, and development of the interventions (eg UCD-11).

Risk of Bias in Individual Evidence Sources

Our primary interest in this body of literature was to create an inventory of design, layout, and process considerations. Consistent with established scoping review methods, we did not appraise the risk of bias for included studies.^{14,15}

Results

Search Results

The search yielded 8231 reports (Figure 1). After removing duplicates, 7671 articles were assessed for eligibility and after title and abstract screening, 113 articles were marked for full-text review. After full-text review, 53 articles were excluded, and 60 articles remained eligible.^{27–86} For a large number of articles (n = 45/53), the full text could not be found. Other reasons for excluding studies after full-text review included ineligible design (n = 3) or outcome (n = 3) and duplicates (n = 1) that were not identified during the title and abstract screening stage. None of the included studies were co-authored by a team member.

Study Characteristics

Of the 60 studies included, 50.0% (n = 30) were randomized controlled trials,^{28,29,33–36,39,43,45–47,50,53,54,61–64,68–74,76,80,83,84,86} 23.3% (n = 14) were non-randomized trials,^{30,31,37,40,48,49,51,56–58,60,75,77,78} 11.7% (n = 7) were cohort studies,^{27,42,52,59,66,67,79} 8.3% (n = 5) were before-and-after studies,^{32,41,55,81,82} 5.0% (n = 3) were quasi-randomized trials,^{38,44,85} and 1.7% (n = 1) were case-control studies.⁶⁵ The majority of studies (53.3%, n = 32/60) were conducted in the United States of America (USA).^{29,30,32–34,37,39,42,43,45,48,49,51,53,57,59–61,64–67,69–71,75,78,79,81–83,85} Other countries of origin for more than one study included Australia (n = 4),^{38,40,55,84} Canada (n = 4),^{44,47,76,80} Brazil (n = 2),^{36,68} Croatia (n = 2),^{62,63} France (n = 2),^{56,72}

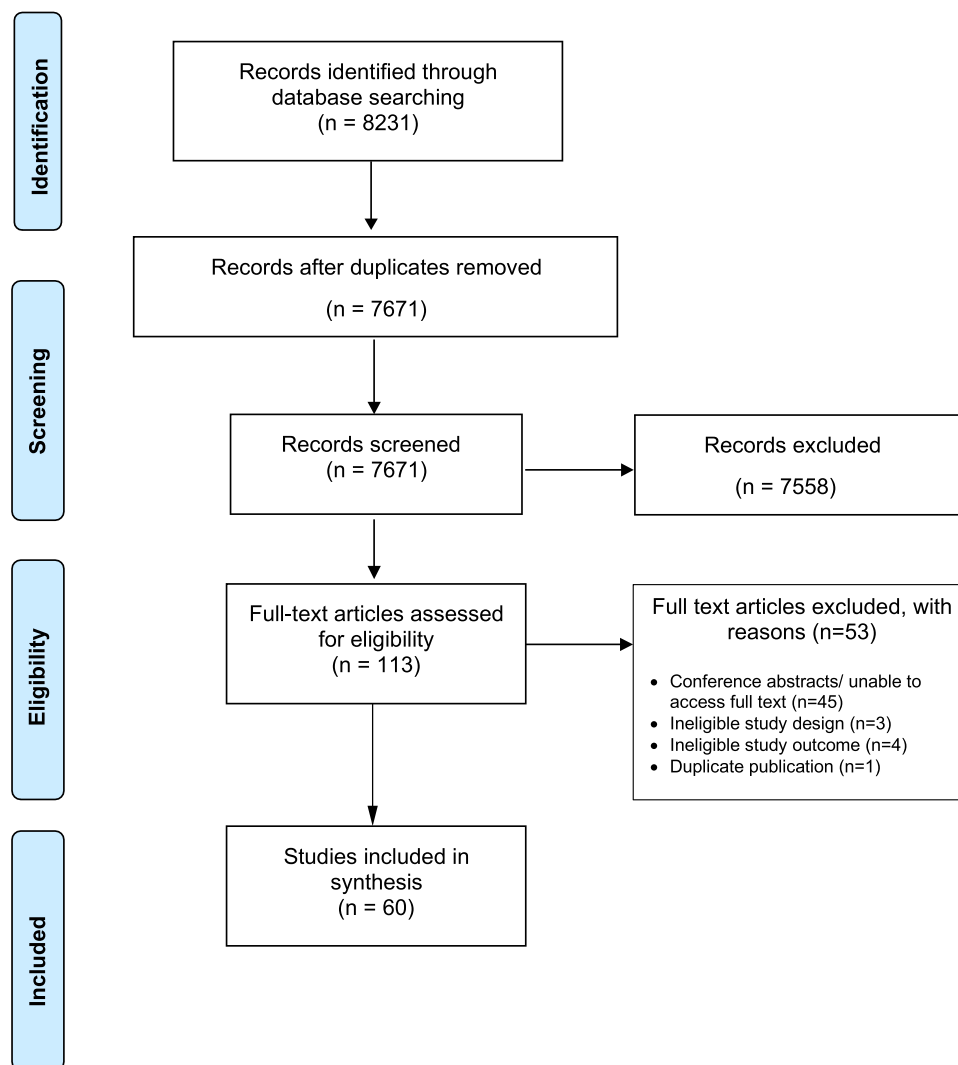


Figure 1 PRISMA flow diagram.

and Switzerland ($n = 2$).^{52,58} The remaining 12 studies originated from other unique countries. Table 1 describes the participants, intervention, comparator and outcome(s) of the included studies. Table 2 provides additional information regarding the interventions of included studies ie, specifies health-care providers delivering the intervention, the timing of the intervention, the various components of multi-pronged interventions, etc.

Many studies selected patients based on age (76.7%, $n = 46/60$)^{27–30,33–45,47,49–53,55–57,60–64,66,67,71–76,78,80,81,83–86} and presence of a particular medical condition (50.0%, $n = 30/60$).^{29–31,33,34,36,37,40,43–45,47,48,50,53,54,59,60,63,66–69,71,76,78,82–84,86} Fewer studies selected patients based on the medication-class prescribed (30.0%, $n = 18/60$)^{29,30,39–41,44,47,48,53,64,68–71,74,78,84,85} or the patients' number of medications (31.7%, $n = 19/60$).^{28,30,33,35,43,46,48,49,52,55,58,61,62,65,70,74,77,84,85} Few studies selected patients based on the presence of an intellectual or physical disability (3.3%, $n = 2/60$),^{45,84} low literacy level ($n = 1/60$),⁴⁸ or language barrier ($n = 1/60$).⁸⁴ There were also only a few studies that included a subgroup analysis involving patients with low literacy (8.3%, $n = 5/60$),^{34,38,53,69,71} intellectual or physical disability (5.0%, $n = 3/60$),^{34,45,84} and language barriers ($n = 1/60$).⁸⁴

UCD-II Reporting

Only 25% of studies ($n = 15/60$) explicitly discussed the development of the intervention,^{29,31,33–36,43,47,51,52,64,76,81,82,86} making it difficult to apply the UCD-II criteria. Of the 60 articles, none met all 11 criteria and only 1 met 10 of the 11

Table 1 Summary of Studies Included

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Acomb et al, 2013 ²⁷ United Kingdom Cohort study	1365 older adults discharged from older people admissions ward	Medicines Care Plan added to discharge communication. Patients were also signposted to primary care provider for follow-up if needed.	No Medicines Care Plan	-Readmission rate ^a
Al-Hashar et al, 2018 ²⁸ Oman Randomized controlled trial	587 adults taking 1 or more medications	Pharmacist performed medication reconciliation and identified medication discrepancies on admission and at discharge. Medication dispensed at bedside with detailed instructions and take-home medication list.	Pharmacist performed standard medication history review on admission, and medications dispensed at pharmacy window with basic instructions.	-Rates of preventable adverse drug events 30 days post-discharge ^a -Hospitalization due to a preventable adverse drug event (ADE) ^a -Nonadherence associated with ADE ^a -Medication discrepancy associated with ADE ^a -Healthcare resource use (eg, readmissions, emergency department visits)
Anderegg et al, 2013 ²⁹ United States Randomized controlled trial	192 adults receiving anticoagulant therapy or had previous diagnosis of one of nine cardiovascular (eg hypertension), respiratory conditions (eg asthma), or diabetes mellitus	Pharmacy case managers performed medication reconciliation, patient education, and pharmacotherapy assessment. At discharge, patient received education, medication list, and wallet card with information from pharmacy case managers.	Usual care with medication reconciliation performed by unit pharmacists on admission, and discharge summary and education provided by unit nurses. Medication lists were provided.	-Acceptance rate of pharmacy case manager recommendations by inpatient physicians (48%) -Healthcare resource use (eg, readmissions, urgent care visits)
Bailey et al, 2019 ³⁰ United States Non-randomized trial	2235 adults with ≥ 1 ambulatory care-sensitive chronic conditions and taking a high-risk medication or ≥ 6 medications	Patient engagement, medication reconciliation, medication management service, discharge preparation, and intensive follow-up provided by multidisciplinary team (including nurses, pharmacists, and social workers).	Usual care (unspecified)	-Medication adherence -Rate of primary care visits within 14 days of discharge -Preventable hospitalization rate -Overall hospitalization rate ^b -30-day readmissions rate ^b -Rate of emergency department visit ^b -Medication expenditure ^a
Baky et al, 2018 ³¹ Saudi Arabia Non-randomized trial	578 patients with acute coronary syndrome or heart failure	Administrative clerks scheduled follow-up appointments for patients. Pharmacist provided medication education. Physicians were encouraged to enter discharge order ahead of time to allow patients to receive discharge instructions early next day and staff time to carry out aforementioned activities.	Usual care (not specified)	-30-day all cause readmission rate ^b -Likelihood of receiving an appointment ^a -Likelihood of receiving medication education ^a -Likelihood of timely discharge ^a

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Balling et al, 2015 ³² United States Before-and-after study	1058 patients discharged from two inpatient units (adult medical or surgical)	Transition-of-care pharmacist reviewed patient information, performed medication reconciliation and delivered discharge counselling. Pharmacist also coordinated with outpatient pharmacy to address financial barriers.	Readmissions and discharges from control year in which discharging physician performed medication reconciliation, and physicians and nurses delivered routine patient education. No transition-of-care pharmacist in control year.	-Readmissions per month ^a -Discharges per month ^a -Medication interventions made by pharmacist at discharge
Barnason et al, 2010 ³³ United States Randomized controlled trial	38 older adults with heart failure taking five or more medications routinely with at least one medication requiring more than once per day dosing	In addition to standard heart failure education program, nurse assessed patients for medication predisposing characteristics of medication use, and personalized interventions (ie hospital transition modules and counselling) based on assessment.	Standard heart failure education program administered by staff nurses before discharge. Include education on heart failure, diet, medications, and signs and symptoms.	-Medication adherence ^a -Number of recall barriers ^a -Self-efficacy ^a -Medication use behaviour skill -Health-related quality of life for symptoms and social limitations ^a
Bell et al, 2016 ³⁴ United States Randomized controlled trial	851 adults with acute coronary syndromes and/or acute decompensated heart failure	Pharmacists assessed patients for medication knowledge and adherence barriers, performed medication reconciliation, and provided tailored counselling using low-literacy adherence aids. Study coordinators performed follow-ups and notified pharmacists to resolve any identified problems.	Standard medication reconciliation and counselling performed by nurses, pharmacists, and physicians involved in the patients' care. Follow-ups after discharge were not routine.	-Time to first unplanned healthcare care event -Readmission or Emergency room visits within 30 days -Effect of intervention on unplanned health care utilization in those with inadequate health literacy ^a -Interaction of the treatment effect with cognitive status
Bolas et al, 2004 ³⁵ Northern Ireland Randomized controlled trial	162 older adults taking 3 or more medications daily	Liaison pharmacist performed several activities: medication reconciliation, daily patient education, personalized medication record sheet, discharge counselling, pharmaceutical discharge letter, and medicines helpline.	Standard clinical pharmacy service with no discharge counselling.	-Mismatch error rate between discharge prescription medication and home medication in 10–14 days post discharge for 1) drug name ^a ; 2) frequency of dosing ^a ; 3) drug dose -Patient knowledge of drug therapy ^a -Emergency readmission rates
Bonetti et al, 2018 ³⁶ Brazil Randomized controlled trial	133 adults admitted to a specialized cardiology ward due to stable angina, acute coronary syndrome, congestive heart failure, valvular disease, arrhythmias, or hypertension	In addition to usual care, pharmacy residents provided individual counselling sessions and information leaflets at discharge. Follow-up counselling was also provided.	Usual care from pharmacists and healthcare providers; received pharmaceutical interventions during hospitalization as needed.	-Mortality rate -Hospital readmissions related to heart disease ^a -Overall readmissions and emergency department visits related to heart disease Medication adherence ^a
Budiman et al, 2016 ³⁷ United States Non-randomized trial	135 adults with STEMI	Pharmacist provided medication reconciliation, education, counselling, and follow-up. Medication list was also provided.	No pharmacist provided education and follow-up.	-All-cause readmission at 30 days -Medication adherence and literacy scores at 30 days post-discharge ^a

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Cabilan et al, 2019 ³⁸ Australia Quasi-randomized trial	51 adults discharged from short stay unit of emergency department with a prescription for medications that they have not been prescribed before or in the last 12 months	Pharmacist provided bed-side discharge counselling. Comprehension was assessed using teach-back approach. Prescription, medications, and written information were also provided.	Doctors provided prescription and medication counselling.	-Patient satisfaction with information about medications ^a -Number of re-presentations to emergency department
Chakravarthy et al, 2018 ³⁹ United States Randomized controlled trial	52 adults receiving an outpatient prescription for opioid analgesic	In addition to standard care, participants watched a 6-minute video on proper opioid use prior to discharge.	Standard care in which nurse provided verbal discharge instructions and information sheet on opioids (eg, side effects, drug interactions, precautions).	-Patient knowledge acquisition regarding the opioid use, risks, and disposal ^a
Chan et al, 2018 ⁴⁰ Australia Non-randomized trial	233 patients discharged with oxycodone for acute pain	Doctors provided education on prescribed opioid and acute pain management. Pain management factsheets were distributed.	Usual care (not specified)	-Patient knowledge on recommended dose ^a and adverse effects ^a -Patient self-reported practice after discharge ^a -Factsheet distribution
Chedepudi et al, 2017 ⁴¹ India Before-and-after study	70 adults on oral anticoagulant therapy (acenocoumarol)	Clinical pharmacist provided educational sessions and leaflets with information on acenocoumarol therapy.	Participants before they received patient education sessions and education leaflets.	-Knowledge on anticoagulation therapy ^a
Christy et al, 2016 ⁴² United States Cohort Study	795 adults discharged from general medical unit	At discharge, pharmacy resident or student performed medication review and bedside counselling. Discharge medications and information pamphlets are distributed at bedside. Patients were referred to ambulatory clinics and received follow-up calls.	Usual hospital discharge service	-30-day all-cause readmissions -Hospital admissions from emergency department visits -Medication satisfaction with medication education and timely bedside medication delivery
Cordasco et al, 2009 ⁴³ United States Randomized controlled trial	210 adults with congestive heart failure or coronary artery disease prescribed 3 or more medications at discharge	Provision of paper-based low-literacy medication tool in addition to standard care.	Standard care with provision of 30-day medication supply, discharge education provided by unit nurse, written instructions from discharge physician and on pill bottle labels.	-Medication knowledge -Self-reported medication adherence -Self-reported pill count -Nurse rated tool acceptability -Self-reported missed dose (higher in intervention arm)
Cote et al, 2015 ⁴⁴ Canada Quasi-randomized trial	179 adults with HIV on anti-retroviral therapy for at least 6 months	Virtual follow-up with virtual nurse in addition to traditional follow-up.	Traditional follow-up meetings with health care professionals over 3 to 4 months. Meetings consist of discussions on medications, symptoms, and encountered problems.	-Self-efficacy -Medication adherence

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Table I (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Davis et al, 2012 ⁴⁵ United States Randomized controlled trial	125 adults with systolic or diastolic heart failure and mild cognitive impairment	Heart failure case manager delivered customized education on heart failure self-care and problem-solving during hospitalization. Supplies such as workbook and audiotape were provided provided to help patients organize, document, or remember information. Follow-up was also conducted.	Heart failure case manager provided standard heart failure discharge teaching with verbal review of patient education booklet on symptom management, lifestyle modifications, and medication adherence.	-Mean knowledge score ^a -Self-care mean change score -30-day readmission rate
De La Fuente et al, 2011 ⁴⁶ Spain Randomized controlled trial	59 patients hospitalized for 3 months or more and prescribed 4 or more active ingredients at discharge	Pharmacist provided verbal and written information regarding their treatment at discharge.	Did not receive verbal or written pharmacotherapeutic information.	-Adherence to treatment at discharge -Adherence to treatment in telephone interview (30–50 days) after discharge ^a -Hospital readmission rate -Emergency department visits -Mortality rate
Ducharme et al, 2011 ⁴⁷ Canada Randomized controlled trial	219 children with asthma who received albuterol and fluticasone inhalers	Treating emergency physician recorded discharge and management instructions on written action plan for asthma attacks coupled with a prescription (WAP-P). WAP-P also contained additional information and tools for self-management.	Treating emergency physician recorded discharge and management instructions on standard unformatted prescription.	-Adherence to fluticasone ^a -Asthma control ^a -Percent of patients who filled oral corticosteroid prescription -Cessation of fluticasone
Feldman et al, 2018 ⁴⁸ United States Non-randomized trial	985 adult general medicine inpatients	Pharmacist conducted medication review, provided education, and identified and resolved medication-related problems and barriers. Follow-up was also provided. Patients with higher readmission risk worksheet score received the service.	Patients with lower readmission risk worksheet score received usual care (unspecified).	-30-day readmissions ^a -30-day readmissions in patients with Medicare Fee for Service insurance
Hyrkas et al, 2014 ⁴⁹ United States Non-randomized trial	303 adult patients on a medication regimen discharged from inpatient medical-surgical units	Patients received either patient-centered intervention or motivational interviewing from nurses. Both interventions were targeted towards improving medication adherence.	Nurses performed medication reconciliation and delivered discharge instructions and education.	-Medication adherence -Confidence in medication adherence ^b -Self-efficacy -Therapeutic alliance -Patient's experience -Readmission rate -Predictors of readmission ^b

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Jiang et al, 2016 ⁵⁰ China Randomized controlled trial	182 adults with type 2 diabetes receiving insulin therapy	In addition to routine education, diabetes nurse specialist delivered picture description education seminars to provide knowledge on insulin use, benefit, side effects, storage, and treatment targets. Colored picture on insulin use was employed in the sessions.	Routine health education seminars organized by diabetes nurse specialist on diabetes, diet, exercise, drug therapy, complication prevention, blood glucose monitoring. Standard insulin injection method was demonstrated 4 times.	-Patient knowledge on diabetes, insulin use, injection, hypoglycemia and complications ^a -Adherence to insulin therapy ^a -FPG, postprandial glucose level, HbA1C control ^b -Obtainment of correct diabetic medications, standardized monitoring, and timely referrals 3 months after discharge ^a
Jones et al, 2018 ⁵¹ USA Non-randomized trial	68 adults at high risk of readmission based on Parkland risk score	Transition of care pharmacist obtained medication history, performed medication reconciliation, and provided medication counselling. Follow-up phone call after discharge was conducted.	Medical team without transition of care pharmacist provided usual care.	-Readmission rate -Composite outcome of a readmission or emergency department visit -Number of patients with case management or social work note ^a
Kaestli et al, 2016 ⁵² Switzerland Cohort study	125 children discharged from pediatric emergency department	Pharmacist provided drug information leaflets to parents. Leaflets contain information on drug administration, interactions, storage etc.	Physician provided prescription and brief explanation to parents.	-Parental knowledge (on dose, frequency, etc.) ^a -Parental satisfaction on discharge information
Kapoor et al, 2019 ⁵³ United States Randomized controlled trial	162 adults with new episode of venous thromboembolism and prescribed warfarin, direct oral anticoagulants, low-molecular weight heparin or fondaparinux	Pharmacist assessed patient's self-management of medications, identified and discussed knowledge gaps on medications and conditions, and provided colored medication list during home visit. Nurse delivered follow-up to provide further education and to update medication list.	Usual care in which clinical pharmacist met with patient discharged from hospital (but not those discharged from emergency department or outpatient settings). No medication simulations or illustrated instructions were used.	-Care transition quality -Patient knowledge -Adherence
Khonsari et al, 2014 ⁵⁴ Malaysia Randomized controlled trial	62 patients with acute coronary syndrome	Patient received automated text message reminders before every cardiac medication intake to optimize adherence.	Usual post-discharge care with cardiac rehabilitation and follow-up with cardiologist.	-Medication adherence ^a -Heart function status ^a -Acute coronary syndrome-related hospital readmission rate -Death rate
Lam et al, 2011 ⁵⁵ Australia Before-and-after study	24 older adults taking 3 or more long-term medications	Self-administration of medications programme delivered by nurses and pharmacists to allow patients to learn to self-medicate in a supported manner with education and supervision.	Before participation in program.	-Patients' competence to manage medication ^a -Non-adherent behaviour ^a -Adherent behaviour

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Leguelinel-Blache et al, 2015 ⁵⁶ France Non-randomized trial	193 adults admitted to infectious and tropical diseases or general medicine unit	Initial counselling session, medication reconciliation, inpatient follow-up and discharge counselling performed by clinical pharmacist.	Medication reconciliation and inpatient follow-up performed by clinical pharmacist.	-Rate of unfilled new prescriptions ^a -Adherence rate ^a -Post-discharge healthcare utilization (ie readmissions, emergency department visits)
Li et al, 2016 ⁵⁷ United States Non-randomized trial	190 adults discharged from general medicine unit	Pharmacist created best possible medication discharge list, delivered discharge medications to bedside, provided counselling, and communicated with follow-up providers on discharge medications.	Not specified	-30-day readmission rates
Louis-Simonet et al, 2004 ⁵⁸ Switzerland Non-randomized trial	410 patients discharged from internal medicine services and prescribed one or more medications	Physicians provided patient-centered interview at discharge to discuss each discharge medications and to address any questions or concerns. Standardized treatment card containing information on discharge medications was provided.	Usual procedure in which medical residents provided information on discharge medications as judged appropriate.	-Percentage of medications for which patients correctly knew: 1) purpose ^a ; 2) possible side effects ^a ; 3) precautions to observe ^a -Number of medications discontinued after discharge -Patient assessment of standardized treatment card usefulness
Lu et al, 2017 ⁵⁹ United States Cohort study	277 patients with heart failure	Heart Failure Post-Discharge Management Clinic provided counselling on disease state, lifestyle modifications, and medications. Patient medication regimen was assessed and modified as needed at each visit.	Usual care (not specified)	-Adherence to angiotensin-converting enzyme inhibitors ^a , to aldosterone antagonist ^a , to twice-daily beta blockers ^a , to once-daily beta blockers, to all beta blockers, and to digoxin
Luder et al, 2015 ⁶⁰ United States Non-randomized trial	90 adults with congestive heart failure, chronic obstructive pulmonary disease, or pneumonia	Pharmacist provided medication therapy management service (contents include medication review patient education and counselling) and written materials to aid in self-management. Patients could also receive Care Transition Intervention.	Usual care consists of either no intervention or Care Transition Intervention (nurse home visit and follow-up weekly calls)	-30-day readmissions rate ^a -Patient satisfaction
Manning et al, 2007 ⁶¹ United States Randomized controlled trial	138 adults with more than 3 discharge medications	Durable Display at Discharge (3D) medication sheets which displayed sample of discharge medications and listed medication name, indication, administration time and amount, and additional comments and prompts.	Personalized Medication Discharge Worksheet which listed medications and administration times	-Patient knowledge of prescribed medications ^a -Patient satisfaction -Self-reported medication errors

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Marusic et al, 2018 ⁶³ Croatia Randomized controlled trial	125 adults with type 2 diabetes	In addition to standard care, before discharge, physician provided education on discharge prescriptions. Information on indication, medication regimen, side effects, and importance of adherence were provided.	Standard care involving standardized diabetes education (on disease, complications, medications, lifestyle modifications, and self-monitoring of blood glucose) and discharge letter (lists diagnosis, intervention, medications).	-Number of adherent patients ^a -Number of patients who experienced adverse outcomes
Marusic et al, 2013 ⁶² Croatia Randomized controlled trial	160 older adults with 2 or more discharge medications for treatment of chronic conditions	In addition to standard care, before discharge, physician provided education on discharge prescriptions. Information on indication, medication regimen, side effects, and importance of adherence were provided.	Standard care involving discharge letter which lists diagnosis, intervention, and medications.	-Medication compliance ^a -Readmission rate ^b -Emergency department visits ^b
McCarthy et al, 2015 ⁶⁴ United States Randomized controlled trial	210 adults discharged on hydrocodone-acetaminophen combination oral opioid analgesics	MedSheets containing information on hydrocodone-acetaminophen presented by research assistant. Physician answered any questions that arose.	Usual care (unspecified)	-Knowledge of precautions ^a -Knowledge of side effects ^a -Likelihood of driving within 6 hours after hydrocodone use ^a -Knowledge on interaction between alcohol and hydrocodone -Knowledge on opioid addiction
Miller et al, 2016 ⁶⁵ United States Case-control study	314 patients discharged on 4 or more maintenance medications	Pharmacist provided medication therapy management services over the phone. A follow-up phone call was also conducted.	Usual care (unspecified)	-30-day readmission rate -Pharmacist interventions and recommendations on medication-related problems
Moye et al, 2018 ⁶⁶ United States Cohort study	177 older adults admitted due to heart failure	In addition to standard care, pharmacy team provided medication reconciliation, discharge counselling, personalized binder to for patients to document weight changes and dietary intakes, as well as follow-up.	Standard of care with heart failure education delivered by case managers, physicians, and nurses. Nurses ensured patient can monitor weight changes at home, invited patients to educational sessions, provided heart failure education packets, and contacted patients within 72 hours post-discharge. Case managers arranged appointment within 7 days after discharge.	-30-day readmission rate ^a
Murphy et al, 2019 ⁶⁷ United States Cohort study	359 adults admitted due to heart failure exacerbation and 251 adults admitted due to acute myocardial infarction	Multidisciplinary team consisting of cardiologist, pharmacists, pharmacy residents, nurses, and dieticians provided education and counselling on disease state, medication, and diet. Follow-ups were also conducted.	Usual care (not specified)	-30-day readmission rate -72-hour emergency department visits -Mortality rates

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Oliveira-Filho et al, 2014 ⁶⁸ Brazil Randomized controlled trial	61 patients with cardiovascular disease on antihypertensive medication	Pharmacist conducted medication review at discharge, provided counselling on disease and therapy, and provided drug treatment card in the form of refrigerator magnet.	Usual care (unspecified)	-Medication adherence ^a -Readmission rate -Mortality rate
Olives et al, 2016 ⁶⁹ United States Randomized controlled trial	2521 patients with outpatient antibiotic prescription	In addition to standard of care, patients received either text message or voice mail on antibiotic self-administration.	Standard of care discharge instructions involving routine verbal discharge instruction and printed after-visit summary.	-Discharge instruction modality preference ^b -72-hour antibiotic retrieval ^b -Antibiotic course completion
Phatak et al, 2016 ⁷⁰ United States Randomized controlled trial	278 discharged on more than 3 prescription medications or at least 1 high-risk medication	Pharmacist provided face-to-face medication reconciliation, personalized medication plan, and discharge counselling. Pharmacist conducted post-discharge follow-up at day 3, 14, and 30.	Standard of care involving medication reconciliation (without face-to-face interaction) and daily pharmacotherapy assessment by clinical pharmacist, and discharge counselling by physician or nurse. Pharmacist conducted post-discharge follow-up at day 30.	-30-day post-discharge readmission or emergency department visits ^a -Rate of adverse drug events or medication errors -Hospital Consumer Assessment of Healthcare Providers and Systems score in medication knowledge domain
Press et al, 2016 ⁷¹ United States Randomized controlled trial	120 adults with asthma or COPD who were discharged on pressurized metered-dose inhaler	Research educators provided teach-to-goal intervention with repeated demonstrations and evaluations of participant inhaler technique. Participants received written instructions on inhaler technique, and pamphlet on their condition.	Research educators provided brief instruction intervention with verbal (without demonstration) and written instructions on inhaler technique, verbal education on condition, and assessment of inhaler technique	-Metered-dose inhaler misuse immediately after discharge ^a , 30 days post-discharge, and 90 days post-discharge ^a -Diskus misuse immediately after discharge ^a , 30 days post-discharge, and 90 days post-discharge -Acute care events at 30 days ^a and 90 days -Rescue metered dose inhaler use or Diskus adherence at 30 and 90 days
Renaudin et al, 2017 ⁷² France Randomized controlled trial	1400 children hospitalized in pediatric care unit or older adults hospitalized in post-emergency care unit	Pharmacist conducted medication reconciliation and treatment review at admission and discharge. At discharge, pharmacist also provided comprehensive medication history and patient counselling, and communicated discharge letter to community providers.	Medical staff collected medication information at admission and provided prescription at discharge. Pharmacy team only involved in dispensing medications.	-Results not available (trial protocol) -Outcome measures include: all-cause hospital readmission, death, and/or emergency department visits 30 days post-discharge.
Salmany et al, 2018 ⁷³ Jordan Randomized controlled trial	332 adults discharged from inpatient service	Patients received telephone follow-up from pharmacist within 72 hours of discharge. Questions regarding medications were asked during the phone call.	Patients did not receive telephone follow-up provided by pharmacist.	-Patient satisfaction -30-day post-discharge hospital readmission and emergency department visits

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Sanii et al, 2016 ⁷⁴ Iran Randomized controlled trial	154 adults discharged from respiratory ward	Pharmacist provided medication reconciliation and education (on inhaler technique, disease state, and medications) at discharge. Two follow-ups were provided at 2 weeks and 1 month respectively.	No pharmacist discharge intervention. One follow-up 1 month after discharge conducted by pharmacist in which discharge medications, inhaler technique, and medication adherence were assessed.	-Treatment satisfaction ^a -Medication adherence ^a -Rate of medication-related hospital readmission or emergency department visit
Sarangarm et al, 2012 ⁷⁵ United States Non-randomized trial	279 adults discharged from internal medicine	Pharmacist conducted medication reconciliation and provided discharge counselling on medications and disease state. Follow-up was conducted through telephone calls.	Usual care in which nurse delivered prescription and provided discharge counselling on self-care management. No follow-up or additional medication reconciliation was provided.	-Patient satisfaction ^a -Primary medication adherence ^a -30-day hospital reutilization (combined readmissions and emergency department visits) -Predictors for hospital utilization -Number of pharmacist interventions
Schwalm et al, 2015 ⁷⁶ Canada Randomized controlled trial	852 adults with STEMI who underwent coronary angiography procedure	Personalized letters detailing medication information and encouraging adherence was sent to patient and family physician at 1, 5, 8, and 11 months after angiogram.	Usual care (not specified)	-Portion of participants taking all 4 cardiovascular medication classes at 12 months -Medication adherence ^a -Persistence to all 5 medications at 3 and 12 months -Number of discussions with health care providers on medications
Send et al, 2014 ⁷⁷ Germany Non-randomized trial	90 patients who took one or more drug	Physicians provided enhanced medication plan (generated in semi-automatic fashion using electronic database) containing information on indication, drug handling recommendations, and administration instructions.	Physicians provided simplified medication plan (containing brand name, drug regimen, and physician's recommendations) and discharge education.	-Patient knowledge ^a -Number of drugs mentioned and explained -Number of drug administration recommendations given by physician ^a -Time physician spent on patient education ^a
Shaver et al, 2019 ⁷⁸ United States Non-randomized trial	1219 adults with cardiovascular disease (eg acute myocardial infarction, heart failure, atrial fibrillation/flutter, stroke, pulmonary embolism, etc.) or adults taking narrow therapeutic index medications (eg anticoagulants)	Transition of Care program in addition to Prescriptions Plus Program. Patients received telephone calls after discharge to encourage adherence and attendance at follow-up appointments. Pharmacy student made the phone calls with pharmacist available to answer patient questions if asked.	Prescriptions Plus Program in which patients were provided with bedside discharge counselling and 30-day medication supply before discharge. No Transitions of Care program	-30-day all cause readmission ^a -30-day related admissions ^a
Shull et al, 2018 ⁷⁹ United States Cohort study	1059 patients discharged from hospital	Pharmacist conducted medication reconciliation, medication therapy management, patient education and assessed access to care at all stages of hospitalization. Bridge care coordinator conducted follow-ups.	Senior medical resident led discharge process with standard medication reconciliation performed by medical team and medication education performed by nurse. The outpatient pharmacy is offered to fill prescriptions at discharge.	-Readmission rate within 30 days ^a -Estimated net benefit of the transition-of-care program through reduced unplanned 30-day readmission

(Continued)

Table 1 (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Singh et al, 2018 ⁸⁰ Canada Randomized controlled trial	80 opioid naïve adults post foot and ankle surgery	Participants received written discharge instructions on acetaminophen, ibuprofen, and opioid use in addition to usual care.	Usual care with just a prescription. No written discharge instructions.	-Postoperative pain satisfaction -Modified brief pain inventory score -Interference scores -Total prescriptions used -Renewal of prescription medication -Number of participants who returned unused medication to pharmacy
Sinha et al, 2019 ⁸¹ United States Before-and-after study	40 adults discharged from general medicine service	Participants viewed videos that target barriers for successful transition from hospital to home.	Participants before implementation of intervention (video).	-Median self-efficacy score ^a -Percent of participants who found the intervention to be helpful -Percent of participants that correctly answered at least 4/5 of knowledge assessment questions
Smith et al, 2017 ⁸² United States Before-and-after	265 patients with acute myocardial infraction	Patients received Heart Attack Program Guide and education during hospitalization, and follow-up and cardiac rehabilitation after discharge.	Unspecified	-30-day readmission rates
Tuttle et al, 2018 ⁸³ United States Randomized controlled trial	141 adults with chronic kidney disease stages 3–5 not treated by dialysis hospitalized for acute illness	In addition to usual care, pharmacist provided home visits after discharge to perform medication review, to create medication action plan, and to deliver medication list and counselling.	Usual care in which, at discharge, nurse provided electronic health record-derived drug list and discharge prescriptions. Nurse also educated patients on disease management, importance of adherence and follow-up, and the need to provide health care providers with the discharge medication list.	-Acute care utilization (readmission, emergency department and urgent care visits) within 90 days post-discharge -Achievement of guideline-based goals -Rate of adverse events
Vuong et al, 2008 ⁸⁴ Australia Randomized controlled trial	316 older adults taking 3 or more medications with dexterity, language, hearing, or visual difficulties	In addition to standard care, community liaison pharmacist provided home visits following discharge to assess patient's knowledge, management, and compliance with medication regimen.	Standard care in which pharmacist provided discharge counselling and compliance aids, and communicated with primary providers when needed.	-Self-perceived medication understanding ^a -Mean overall medication knowledge score ^a -Medication adherence ^a
Walker et al, 2009 ⁸⁵ United States Quasi-randomized trial	724 adults at high risk of medication related adverse events post discharge	Pharmacist conducted medication reconciliation, discharge counselling (including written information to patient), communicated discharge medication list to follow-up care provider, and did 72h and 30-day follow-up phone call with patient.	Nurse provided medication list and discharge instructions. Medicare beneficiaries received follow-up phone call from nurse within 72 hours after discharge to identify and resolve any post-discharge problems. No pharmacist involved.	-Medication discrepancies at discharge ^a -Readmission rate at 14 days ^b and 30 days post discharge -Emergency department visits within 72 hours of discharge

(Continued)

Table I (Continued).

Study, Year, Country Design	N and Study Population	Intervention(s)	Comparator	Outcome
Zerfa et al, 2011 ⁸⁶ Malta Randomized controlled trial	80 adults post cardiac surgery	Pharmacist provides medication counselling and non-pharmacological recommendations for exercise and lifestyle. Discharge medication chart provided to aid in education.	Doctor provided verbal and written advice on medication regimen. Physiotherapy team and nurse provided education on exercise regimens and lifestyle changes respectively	-Mean percentage compliance ^a

Notes: ^aSignificantly better in intervention group. ^bSignificant differences found among subgroup of population.

UCD-11 criteria (Table 3).⁴⁷ Twenty percent (n = 12/60) of articles met more than 3 of the 11 UCD-11 criteria.^{29,33–36,43,47,52,64,76,81,86} Of the 15 studies which discussed intervention development, 1 study reported consultation of expert opinion in the development process (n = 1/15),³⁴ and 3 studies reported usage of three or more iterative cycles in which outside opinions were consulted and prototype revisions were made accordingly (n = 3/15).^{36,47,81} In contrast to these under-reported criteria, end user involvement in evaluation of the intervention, part of our study eligibility criteria, was consistently reported by all 15 studies (n = 15/15) that explicitly discussed intervention development.^{29,31,33–36,43,47,51,52,64,76,81,82,86}

Content

Physical/Electronic Medication List Interventions

For details regarding interventions including physical or electronic medication lists, see “Table 4”. These included any interventions that contained the patient’s medication lists in either a physical (eg paper) or electronic format. While 63.3% (n = 38/60) interventions included a physical or electronic document containing information regarding the patient’s medications (eg customized medication list, medication information pamphlet on a particular medication),^{28,29,33–43,45–47,50,52,53,55,56,58–68,71,76,77,83,85,86} only 36.7% (n = 22/60) interventions included a list of the patient’s medications.^{28,29,33–37,43,45,53,55,56,58,60,61,65–67,77,83,85,86} Of the 38 interventions with a physical or electronic document pertaining to the patient’s medications, the content related to medication information included varied. Many included an indication/reason for use (52.6%, n = 20/38),^{29,33–37,40,43,47,52,53,56,58,61–64,66,76,77} timing of administration (42.1%, n = 16/38),^{34–37,40,43,52,53,55,60–64,77,86} frequency of administration (42.1%, n = 16/38),^{34,36,37,40,43,47,52,53,56,58,60,61,64,66,77,86} and side effects (34.2%, n = 13/38).^{34,36,39,40,50,52,56,58,61–64,66} Ten percent (n = 6/60) of interventions included an electronic component.^{29,39,44,54,69,81}

Design

Mode of Delivery

Interventions included in the study were classified based on their mode of delivery into either physical, verbal, electronic or a combination of these modalities. The majority of interventions consisted of multiple components (78.3%, n = 47)^{27–38,41–43,45–51,53,55–60,63–72,74,75,78,79,82,83,85,86} with 41.7% (n = 25) of interventions including a follow-up component.^{27,30,33,34,36,37,42,44,45,48,51,53,59,65–67,70,73–75,79,82–85} Sixty-percent (n=37/60) of interventions, used physical and verbal means to deliver various components (eg medication list and patient education).^{28,29,33–43,45,46,49,50,53,55,56,58–60,62–69,71,74,82,83,85,86} Three of these interventions also included an electronically delivered component.^{29,39,69} Some interventions had only one mode of delivery: thirty percent (n = 13/60) of interventions were only verbally communicated to the patient,^{30–32,48,51,57,70,72,73,75,78,79,84} while 10% (n = 6/60) were solely physically provided to the patient^{47,52,61,76,77,80} and 5% (n = 3/60) were only electronically delivered.^{44,54,81} A small number of interventions did not involve direct delivery to patients. One of the interventions consisted of a letter mailed to the patient⁷⁶ and family physician while another intervention involved a referral to outpatient providers if a need was identified.²⁷

Table 2 Key Characteristics of Studies Included

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Acomb et al 2013 ²⁷	Pharmacists, Pharmacy technicians, Primary care providers (numbers unspecified)		X	Other	Medicines Care Plan Follow-up	Medicines Care Plan: added to patient's discharge communication if patient was determined to have medicines related needs post-discharge by pharmacists and pharmacy technicians. Follow-up: Patients in hospital were referred to primary care providers outside the hospital who would provide follow-up care if a need was identified. Primary care providers include general physicians, community pharmacists, district nurses etc.).	X
Al-Hashar et al 2018 ²⁸	1 Pharmacist	X		P, V	Pharmacist service on admission and discharge Medication list	On admission: medication history, identification of counselling needs, reconciliation, and identification of unintentional medication discrepancies On discharge: medication reconciliation and identification of unintentional medication discrepancies. Dispensing medications at bedside. Provision of counselling about the medication and take-home medication list.	X
Anderegg et al 2013 ²⁹	1 or 2 Pharmacy case managers	X		P, V, E	Pharmacist service on admission, during admission, and at discharge Medication list and wallet card	On admission: medication reconciliation, identification of drug related problems During admission: education every 2 or 3 days on drug indications, goals of therapy, adverse drug events, drug adherence mechanisms, and self-monitoring measures. Pharmacotherapy assessment and recommendations to inpatient physicians. On or after discharge: provision of discharge education, drug therapy list, and a wallet card detailing medication name, indication, dosage, instructions; patients received in-person education and counselling, or over the phone with the paperwork mailed to them.	X

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Bailey et al 2019 ³⁰	Advanced practice nurse, Registered nurse, Licensed practical nurses, Pharmacists, Pharmacy technicians, Social worker	X	X	V	Healthcare team service before discharge Follow-up	Before discharge: 1) patient identification and enrollment by lead nurses; 2) patient engagement by all members of multidisciplinary team; 3) medication reconciliation and medication therapy management led by pharmacists; 4) discharge preparation involving planning, education, and coordination of care. After discharge: weekly telephone calls and biweekly home visits by licensed practical nurse and pharmacy technician. Social worker provided service if needed.	X
Baky et al 2018 ³¹	I Administrative clerk, I Pharmacist, I Physician	X		V	Follow-up appointment scheduling Medication education Early entry of discharge order	Appointment scheduling: administrative clerk attempted to schedule appointments at 1- or 2-weeks post-discharge for patients with heart failure or acute coronary syndrome respectively. Medication education: pharmacist involved in morning rounds provided medication education to patients. Discharge orders: entered by physician the day before patient discharge date to allow patients to receive discharge instruction early next day, and to allow staff time to schedule appointments and provide education.	
Balling et al 2015 ³²	I Transition-of-care pharmacist Nurses, case managers, social workers, and outpatient pharmacy technicians assisted, when needed	X		V	Pharmacist service on admission and discharge	On admission: review of patient information (e.g. insurance coverage, medication adherence, history and physical at admission), coordination with outpatient pharmacy on insurance and payment barriers. On discharge: medication reconciliation and identification of discrepancies. Medication and disease counselling.	X

Barnason et al 2010 ³³	I Research nurse with extensive cardiac experience		X	P, V	Standard heart failure education program prior to discharge Hospital transition modules and counseling following discharge Written educational materials	Face-to-face meeting to assess patient's medication knowledge and medication use motivation. Intervention was personalized based on assessment scores. Hospital transitions modules and counselling: delivered through telephone in two 20-30 minute sessions. Modules were on self-care survival skills, strategies for self-regulation of heart failure, managing barriers to heart failure self-care. Involves employment of self-efficacy coaching strategies (e.g., setting goals for self-care) and provision of written health literacy-adapted educational materials.	X
Bell et al 2016 ³⁴	Pharmacists, Research/Project team (number unspecified)	X	X	P, V	Pharmacist service on enrollment and discharge Adherence aids Follow-up	On enrollment: pharmacist conducted tailored counselling with assessment of patient knowledge, barriers to medication adherence, and level of social support. On discharge: pharmacist conducted medication reconciliation and counselling with adherence aids (i.e., illustrated medication schedule showing the discharge regimen, and a pillbox). Confirmed understanding with "teach-back" technique. Follow-up: study coordinators asked about patients' general health, symptoms, and medication-related problems. Pharmacists were contacted to provide reinforcement education and solve identified problems when needed.	X
Bolas et al 2004 ³⁵	I Community liaison pharmacist	X		P, V	Pharmacist service during admission and at discharge Discharge letter, medicines record Helpline	During admission: Obtainment of accurate medication history through medication reconciliation. Daily meetings with patients to explain treatment changes. On discharge: Preparation of pharmaceutical discharge letter detailing drug therapy changes (faxed to patient's general physician and community pharmacist). Provision of personalized medicines record with information on how to take prescribed medications. Provision of discharge counselling. Medicines Helpline: provide more information after discharge if needed.	X

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Bonetti et al 2018 ³⁶	2 Pharmacy residents	X	X	P, V	Pharmacy resident service during admission and at discharge Information leaflet Follow-up	During admission: Pharmaceutical interventions when needed. On discharge: Individual counselling sessions for patients/ caregivers to assess patient's discharge medication and to provide medication education. Provision of leaflet with all the information from the sessions. Follow-up: Reinforcement counselling over the phone 3 and 15 days after discharge.	X
Budiman et al 2016 ³⁷	1 Pharmacist	X	X	P, V	Pharmacist service Medication List Follow-up	Pharmacist service: medication reconciliation, assessment of medication adherence and literacy, medication education, counselling on lifestyle management, provision of customized medication list (see Table 3 for details), and coordination with discharge pharmacy to resolve insurance barriers. Follow-up: post-discharge phone call within 48 to 72 hours and at 30 days. Assessment of side effects, adherence, and medication knowledge. Any questions or concerns were addressed.	X
Cabilan et al 2019 ³⁸	1 Pharmacist	X		P, V	Discharge medication counselling Consumer Medication Information leaflet Comprehension assessment	Counselling: involves assessment of patient's understanding of the prescribed medication, explanation of medications, and medication education (e.g. generic name, dose, reasons for use, precautions, side-effects, drug/food interactions). Consumer Medication Information leaflet: provided at start of counselling. Comprehension assessment: done through teach-back approach.	X
Chakravarthy et al 2018 ³⁹	1 Nurse, Research/Project team	X		P, V, E	Informational video in addition to standard care	Video: information on opioid safety, proper usage, storage, and disposal. Video utilized whiteboard and markers to illustrate contents with synchronized voiceover.	

Chan et al 2018 ⁴⁰	I Emergency physician	X		P, V	Education	Education: doctors used PAID mnemonic (precautions, adverse effects, other interventions, dosage and duration of opioid therapy) to educate patients on prescribed opioid and acute pain management. Pain management factsheets were distributed.	
Chedepu-di et al 2017 ⁴¹	Clinical pharmacist (number unspecified)	X		P, V	Education sessions Education leaflets	Education sessions: detailed verbal educational sessions approximately 30-minute-long on acenocoumarol therapy (e.g., reason for use and side effects of medication, purpose of INR, and missed dose instructions). Educational leaflets: Details not specified.	
Christy et al 2016 ⁴²	I pharmacy residents, or I advanced pharmacy practice experience student	X	X	P, V	Pharmacy service at discharge Patient information pamphlet Follow-up	At discharge: review of discharge prescriptions to ensure appropriateness. Beside delivery of discharge medications, provision of medication education (i.e., drug name, dose, indications, directions for use, side effects, precautions, self-monitoring techniques, and missed dose instructions), and distribution of patient information pamphlets. Patients were referred to hospital-affiliated ambulatory clinics. Follow-up: telephone calls 7 days post-discharge to monitor efficacy and safety medication therapy as well as patient health.	X
Cordasco et al 2009 ⁴³	I Nurse	X		P, V	Medication tool Discharge education and instructions	Medication tool: paper-based, low-literacy tool that is color coded and provides customized medication schedules with pictures and icons. Education and discharge instructions: education was conducted using the medication tool. Discharge instructions are provided as in standard care.	X

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Cote et al 2015 ⁴⁴	I Nurse (virtual)		X	E	Virtual follow-up in addition to traditional follow-up	Virtual follow-up: consists of 4 sessions. In the sessions, virtual nurse provided tailored teaching and shared anecdotes of other individuals with HIV who coped successfully 1 st session: development of self-assessment and motivational skill. 2 nd session: emotional management and problem-solving process for dealing with situations where medication intake is awkward. 3 rd session: social relations and interaction with health professionals. 4 th session: all the skills previously worked on are consolidated.	X
Davis et al 2012 ⁴⁵	Heart Failure Case Manager (unclear profession)	X	X	P, V	Service during hospitalization Workbook and other supplies Follow-up	During hospitalization: customized education, using pictograms and association techniques, to aid in self-care schedule development. Individualized problem-solving sessions with structure self-care scenarios. Workbook and other supplies: Workbook allowed patients to create personal self-care schedule and medication schedule, to track appointments, and to record symptoms. Other supplies include refrigerator card with self-care reminders and audiotape of education sessions. Both workbook and refrigerator card used pictograms. Follow-up: phone call within 1-3 days post-discharge. Involves teach-back session focused on self-care or other knowledge that was identified to be of concern, review use of provided materials, medication reconciliation, and clarification of questions on self-care.	X
De La Fuente et al 2011 ⁴⁶	I Pharmacist	X		P, V	Verbal and written information at discharge	At discharge: pharmacotherapeutic information was provided both verbally and in written form. Details unspecified.	X

Ducharme et al 2011 ⁴⁷	I Emergency physician	X		P	Written action plan for asthma attacks coupled with a prescription (WAP-P)	WAP-P: includes discharge instructions, template for exacerbation and chronic management, emphasize asthma chronicity, self-assessment tool for asthma control, prescription, chart copy, and take-home plan.	X
Feldman et al 2018 ⁴⁸	I Community pharmacist	X	X	V	Pharmacist service during admission Follow-up	During admission: initial visit within 2 days of admission included program introduction, medication review, follow-up on issues identified on admission through medication reconciliation, identify and resolve other medication problems/barriers, patient education on medication. Option to have newly prescribed medications delivered to hospital room was offered Follow-up: telephone calls at 8 days and 25 days after discharge on medication issues, side effects, refill needs, etc.	X
Hyrkas et al 2014 ⁴⁹	I Nurse	X		P, V	1) Patient-centered intervention 2) Motivational interviewing	Patients received one of two interventions: Patient-centered intervention: Involved teach-back method and tailored tools such as pill boxes and reminders to aid in self-management of medication regimens and to improve medication adherence. Motivational interviewing: Used techniques such as open-ended questions and asking permission to discuss patient understanding and concerns, to provide education, and to improve medication adherence.	X
Jiang et al 2016 ⁵⁰	I Diabetes nurse specialist	X		P, V	Picture Description Education with class and tool in addition to routine seminar	Class: provided knowledge on insulin (e.g. use, benefit and storage) hypoglycemia, and treatment targets (e.g. blood glucose levels, hemoglobin A ₁ C levels). Patients were encouraged to participate in in-class discussions. Tool: colored picture on insulin use.	

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Jones et al 2018 ⁵¹	I Transition of care pharmacist	X	X	V	Pharmacist service on admission and discharge Follow-up	On admission: pharmacy-initiated medication history, medication reconciliation On discharge: medication reconciliation, medication counselling. Follow-up: telephone call within 3 days of discharge. Involved medication reconciliation, review of indications, assessment of barriers to filling or taking medications, and assessment of medication-related problems (e.g., adverse drug reaction, etc.).	X
Kaestli et al 2016 ⁵²	I Pharmacist	X		P	Drug information leaflets	Drug information leaflet: designed for commonly prescribed drugs. Used patient-friendly language. Contained information on pediatric drug administration, interaction, storage, discontinuation etc.	
Kapoor et al 2019 ⁵³	I Clinical Pharmacist I Nurse Practitioner		X	P, V	Home visit Medication list Follow-up anticoagulation expert consultation	During home visit: pharmacist 1) assessed patient's medication self-management proficiency; 2) identified knowledge gaps on medications and condition through open-ended questions and provided education; 3) provided illustrated medication list and instructions. During follow-up: phone consultation in which nurse 1) asked the same open-ended questions presented in home visit; 2) reviewed and updated medication list; 3) and provided updated instructions to patients.	X
Khonsari et al 2014 ⁵⁴	Intervention did not require delivery/administration by an individual		X	E	Automated web-based system managing short message service (SMS) reminders	SMS reminder: Provision of automated text message reminders before every cardiac medication intake. Information text message information include patient's name, medication name and quantity, and time of administration.	X

Lam et al 2011 ⁵⁵	I Nurse I Pharmacist	X		P, V	Self-Administration of Medications Programme (SAMP) Medication list	3 levels of SAMP Level 1: medication education by nurse and pharmacist, provision of medication list with instructions and dose times, nurse responsible for medication administration Level 2: patient self-administrates medication under nurse supervision Level 3: independent patient self-administration	X
Leguelinel-Blache et al 2015 ⁵⁶	I Pharmacist	X		P, V	Pharmacist service on admission, during admission, and at discharge	On admission: medication reconciliation to obtain best possible medication history. Initial counselling occurs during medication reconciliation process and determined patient understanding and attitude towards medication use, assessed barriers to adherence and social support, and reviewed side effects, allergies, and intolerances. During admission: routine prescription analysis to check for dose, interactions, contraindications etc. At discharge: reviewed discharge medication name, use, dose, regimen, side effects etc. Sometimes supplemented with illustrated medication schedule and drug containers. Followed-up on barriers detected at admission.	X
Li et al 2016 ⁵⁷	I Pharmacist	X		V	Pharmacist service during admission and at discharge	During admission: daily medication profile review and creation of a best possible medication discharge list which was later compared with the actual discharge list to identify and resolve any discrepancies At discharge: delivery of medications to the bedside. Counseling on high-risk medications, select disease states, and/or additional information given at the pharmacist's discretion. Patient's discharge medication list is also sent to follow-up providers.	X
Louis-Simonet et al 2004 ⁵⁸	I Physician	X		P, V	Physician service at discharge Treatment card	At discharge: patient-centered interview which employed communication skills-based approach. Involved education on medications, solicitation of questions and clarification of treatment options. Standardized treatment card which listed discharge medications was provided (see Table 3 for details).	X

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Lu et al 2017 ⁵⁹	I Cardiologist, I Nurse, I Pharmacist, I Physician assistant		X	P, V	Heart Failure Post-Discharge Management Clinic (HF-PDM)	HF-PDM clinic visits: 5-6 visits in total. Physician assistant determined factors contributing to heart failure-related admission and provided disease state education at first visit. Pharmacist assessed medication regimen and made therapeutic modifications in following visits. Cardiologist reviewed patient case, assessment and plan created by physician assistant or pharmacist at each visit. Nurse provided education on lifestyle modifications. A provider provided patient counselling and education at each visit. Written instructions on medication change was also provided by physician assistant or pharmacist.	X
Luder et al 2015 ⁶⁰	I Pharmacist		X	P, V	In-person medication therapy management (MTM) services Written material	MTM: involves medication reconciliation, comprehensive medication review, disease and self-management education, communication on medication changes, and medication counselling. Written material: includes medication list, health action plan, appointment list, self-monitoring logs, educational material, and pharmacist's contact information was provided at end of visit Patient also has the option to receive Care Transition Intervention.	X
Manning et al 2007 ⁶¹	I Nurse	X		P	Durable Display at Discharge (3D) medication sheets	3D medication sheet: includes space to affix/display medication, medication name, unit strength, administration time, quantity of unit to be taken, indication, comment/caution, and reconciliation prompt. The information is written in enlarged font at 6 th grade reading level.	X

Marusic et al 2018 ⁶³	I Physician	X		P, V	Patient education before discharge in addition to standard care Information leaflet	Patient education: provided for each discharge prescription. Information include indication, dosage and time of administration, importance of adherence, possible consequences of non-adherence, possible side effects, and measures to take if suspect adverse drug reaction. Leaflet containing the same information in writing was also given.	X
Marusic et al 2013 ⁶²	I Physician	X		P, V	Patient education before discharge in addition to standard care Information leaflet	Patient education: provided for each discharge prescription. Information include indication, dosage and time of administration, importance of adherence, possible consequences of non-adherence, and possible side effects. Leaflet containing the same information in writing was also given.	X
McCarthy et al 2015 ⁶⁴	Physician, Research/Project team (number unspecified)	X		P, V	MedSheets Verbal information	MedSheets: research assistant provided patient with one-page medication information sheet on hydrocodone-acetaminophen. Content include drug name, indication, benefit, administration, discontinuation, etc. Information was written in lower than 8 th grade reading level. Verbal: The information on MedSheets was also read out loud by a research assistant. Physicians addressed any patient questions.	
Miller et al 2016 ⁶⁵	Pharmacist, Pharmacy technician (number unspecified)		X	P, V	Medication Therapy Management (MTM) service Follow-up	MTM: pharmacist provided comprehensive medication review, personalized medication list, medication action plan, and provider intervention (unspecified). Service occurred over the phone. Follow-up review call: pharmacist confirmed possession of medication list and action plan (sent after initial call), assessed for resolution of previously identified problems and evaluated for any new issues. Pharmacy technician provided administrative support and gathered demographic and lifestyle information.	X

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Moye et al 2018 ⁶⁶	Pharmacist, Pharmacy residents, Pharmacy students, Physician, Nurse, Case manager (number unspecified)	X	X	P, V	Pharmacy team service upon patient in addition to standard care Personalized binder Follow-up	Pharmacy team service: Medication reconciliation and assessment of discrepancies with inpatient medication orders. Discharge counselling on medications as well as the importance of adherence (information was provided in both verbal and written forms). Personalized binder: provided to each patient. Contained personalized medication record, weight and symptom log, fluid intake log, salt intake log. Follow-up: phone calls to ensure adherence and address any issues that arose.	X
Murphy et al 2019 ⁶⁷	Cardiologist, Nurse, Pharmacists, Pharmacy residents, Dietitians (number unspecified)	X	X	P, V	Healthcare team service during admission and at discharge Follow-up	Day 2-3 of admission: pharmacy personnel provided education (signs and symptoms, healthy diet, post-discharge medications) Day 4-5: dietician counselled patient on heart healthy diet Day of discharge: pharmacist assisted cardiologist and/ or nurse practitioner with discharge medication reconciliation and helped ensure the patient had a follow-up appointment with their cardiologist within 1 week. Throughout hospitalization: cardiologist and nurse provided general disease state education Follow up: Week 1: cardiologist appointment, nurse phone call and then pharmacy resident phone call to ensure understanding of and adherence to medications regimens Week 2: Pharmacist medication therapy management appointments. Patients provided with a list of current medications and a medication action plan Week 3: Dietician follow-up phone call	X

Oliveira-Filho et al 2014 ⁶⁸	I Research Pharmacist	X		P, V	Pharmacist service at discharge Drug treatment card	At discharge: review of prescription to ensure appropriateness and to minimize regimen complexity. Counselling on disease and medications. Information on therapeutic goals, self-monitoring of therapy, and adverse reactions related to antihypertensive therapy were provided. Drug treatment card: Created by pharmacist after review of patient data and prescription information. Adapted as refrigerator magnet. Contains advice, dosage and medication schedule.	X
Olives et al 2016 ⁶⁹	Physician, Text message alerts did not require deliver by an individual	X	Not clear when text or voice mail is sent	P, V, E	2 types: 1) standard of care in addition to text message 2) standard of care in addition to voice mail	Text message: contained the treating physician's instructions for self-administration of antibiotics. Voice mail: contained spoken information from the treating physician on self-administration of antibiotics.	X
Phatak et al 2016 ⁷⁰	I Pharmacist	X	X	V	Pharmacist service on admission and at discharge Follow-up	On admission: Face-to-face medication reconciliation At discharge: created personalized medication plan and addressed medication discrepancies before discharge. Provided discharge instructions and medication counseling. Follow-up: phone calls at 3, 14, and 30 days post-discharge to assess for adverse drug events and medication errors.	X
Press et al 2016 ⁷¹	I Research educator, I Research assistant	X		P, V	Teach-to-goal intervention with evaluation, demonstration and written information	Evaluation and demonstration: 1) Evaluation of participant technique; 2) Demonstration of correct technique; 3) re-assessment of participant technique using teach-back method; 4) repeat of step 2-3 for up to two rounds; 5) final evaluation of participant inhaler technique. Written information: Provision of written instructions and pamphlet describing basic information about asthma or COPD (depending on participant condition).	

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Renaudin et al 2017 ⁷²	I Pharmacist or Pharmacy resident	X		V	Pharmacist service at admission and at discharge	At admission: medication reconciliation (comparison of medication history with admission prescription to identify discrepancies) and treatment review. At discharge: medication reconciliation (comparison of medication history with discharge prescription to identify discrepancies), treatment review, and medication liaison service (including comprehensive medication history, counselling on medications, and discharge letter faxed to the community pharmacist and general practitioner).	X
Salmany et al 2018 ⁷³	I Research pharmacist		X	V	Follow-up	Follow-up: phone call within 72 hours of discharge. Whether patients were able to obtain all their medications was assessed. Patients were inquired on medication understanding and adverse reactions. Physician was notified if patient reports medication-related adverse reactions.	X
Sanii et al 2016 ⁷⁴	I Pharmacist	X	X	P, V	Pharmacist service at discharge Written education material 2 Follow-ups	At discharge: counselling on medications (indication, interaction, administration, and side effect). Medication reconciliation. Education on correct inhaler technique. Provision of written asthma education materials. Follow-up 1: telephone call at 2 weeks after discharge to determine medication discrepancies, medication adherence, and possible adverse drug events. Follow-up 2: meeting in clinic at 1 month after discharge to assess discharge medications, inhaler technique, and medication adherence.	X
Sarangarm et al 2012 ⁷⁵	I Pharmacist	X		V	Pharmacist service at discharge Follow-up	At discharge: Medication reconciliation and identification of potential drug therapy problems. Discharge counselling with education on medication administration, adverse reaction, and disease state. Follow-up: phone call at 36-72 hours after discharge to assess patient health and to identify and address drug-related problems.	X

Schwalm et al 2015 ⁷⁶	Intervention did not require delivery/administration by an individual		X	P	Personalized letters	Personalized letters: Sent to patient and family physician at 1, 5, 8, and 11 months after angiogram. Letter reviewed role of each prescribed cardiac medication and encouraged adherence. Letter encouraged family physician and pharmacist participation in promoting adherence. Information was written at 6 th grade reading level. Patient received additional reminder postcard at 2 months.	X
Send et al 2014 ⁷⁷	I Physician	X		P	Enhanced Medication Plan (EMP)	EMP: contained information on indications, step-by-step administration instructions for complex processes such as inhaler use, drug handling recommendations (e.g. storage, drug-food staggering time). Generated using electronic database with physician modification before printing.	X
Shaver et al 2019 ⁷⁸	I Advanced Pharmacy Practice Experience (APPE) student, I Pharmacist	X	X	V	Transitions of Care program in addition to Prescriptions Plus	Transitions of Care program: APPE student conducted telephone call 2-7 days after discharge. Involved medication reconciliation, assessment of adherence, and medication counselling. Patients were encouraged to arrange and attend follow-up appointments. Importance of adherence and follow-up was emphasized. Pharmacist addressed questions if needed.	X
Shull et al 2018 ⁷⁹	I Pharmacist, I Bridge care coordinator	X	X	V	Pharmacist service at admission, during admission, and at discharge Follow-up	At admission, during admission, and at discharge: pharmacist conducted 1) medication reconciliation; 2) medication therapy management and counselling; 3) patient-centred education (involving teach-back); and 4) assessed and addressed barriers to access to care. During follow-up after discharge: bridge care coordinator (and pharmacist if required) conducts follow-up phone call weekly to encourage adherence, review discharge instructions, address emerging issues. Potential home visit offered to patient.	X
Singh et al 2018 ⁸⁰	Intervention did not require delivery/ administration by an individual	X		P	Written discharge instructions in addition to usual care	Written discharge instructions: information pamphlet with instructions on ibuprofen, acetaminophen and opioid use and management, postoperative pain expectations, and recommendations for opioid medication indication, usage, and disposal.	

(Continued)

Table 2 (Continued).

Study (Author, Year)	Intervention Delivered by	Timepoint During Discharge		Mode of Delivery to Patient or Caregiver*	Components of Intervention	Content of Intervention Tool	Personalized to Patients
		Before	After				
Sinha et al 2019 ⁸¹	Medical students (number unspecified)	X		E	Video discharge education	Video: addressed barriers to successful transition to home. Topics were on medication reconciliation, medication uncertainty, medication administration, medication availability, and access to delivery of medication. Each educational topic was followed by short multiple-choice assessments.	
Smith et al 2017 ⁸²	Pharmacist, Physician, Nutrition course administration, GAP transitional care services (numbers unspecified)	X	X	P, V	Patient education during hospitalization Services after discharge	During hospitalization: patient education on admission utilizing Heart Attack Program Guide and at discharge utilizing teach-back strategies. Assessment of medications prior to discharge. After discharge: physician follow-up within one week. Pharmacist follow-up on medications. Cardiac rehabilitation.	X
Tuttle et al 2018 ⁸³	1 Nurse, 1 Pharmacist	X	X	P, V	Follow-up home visit in addition to usual care Medication list	Home visit: 1-2 hour home within 7 days of discharge provided by pharmacist. Involved 1) comprehensive medication review to identify and resolve medication-related problems; 2) medication action plan in relation to identified problems; 3) a personal medication list; 4) counselling on proper medication use and avoidance of contraindicated medication.	X
Vuong et al 2008 ⁸⁴	1 Community-liaison pharmacist	X	X	V	Follow-up home visits in addition to standard care	During home visits: assessment of patient medication knowledge, administration techniques, medication supply and storage, and compliance with medication regimen. Additional education is provided when necessary. Expired or no longer required medications were removed.	X

Walker et al 2009 ⁸⁵	I Pharmacist	X	X	P, V	Pharmacist service at discharge Follow-up	At discharge: patient interviews, assessment of medication therapy, medication reconciliation, communication of medication monitoring follow-up plan, discharge counselling on medications (e.g. medication instructions) with written medication information, identification of potential adherence concerns, communication with follow-up provider to provide discharge medication list. Follow-up: pharmacist telephone call at 72 hours and at 30 days to non-Medicare Beneficiaries to address medication-related problems and other patient concerns.	X
Zerafa et al 2011 ⁸⁶	I Pharmacist	X		P, V	Pharmacist service on discharge Discharge medication chart	On discharge: colored medication photographs and discharge medication chart provided to educate patient on identification of medication, medication doses, and medication administration. Counselling on importance of adherence with oral analgesia, exercise, and avoidance of alcohol and smoking during recovery period. Discharge medication chart: pictograms and information on medications, regimens, administration instructions (see Table 3 for details).	X

Notes: *P, print; V, verbal; E, electronic.

Table 3 UCD-II²⁶ Criteria of Included Studies

UCD-II Criterion	Study (Author, Year)														
	Anderegg et al, 2013 ²⁹	Baky et al, 2018 ³¹	Barnason et al, 2010 ³³	Bell et al, 2016 ³⁴	Bolas et al, 2004 ³⁵	Bonetti et al, 2018 ³⁶	Cordasco et al, 2009 ⁴²	Ducharme et al, 2011 ⁴⁷	Jones et al, 2018 ⁵¹	Kaestli et al, 2016 ⁵²	McCarthy et al, 2015 ⁶⁴	Schwalm et al, 2015 ⁷⁶	Sinha et al, 2019 ⁸¹	Smith et al, 2017 ⁸²	Zerafa et al, 2011 ⁸⁶
Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps to help understand users and their needs?	X		X	X			X	X		X			X		
Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps of designing, developing, and/or refining a prototype?		X					X	X				X	X		X
Did the development process have 3 or more iterative cycles?						X		X					X		
Were changes between iterative cycles explicitly reported in any way?	X				X	X		X							
Were health professionals consulted at any point before a first prototype was developed?	X							X	X	X	X	X	X		
Were health professionals consulted between initial and final prototypes?	X				X	X	X	X			X	X	X	X	
Was an expert panel involved?				X											
Were potential end users (eg, patients, caregivers, family and friends, surrogates) observed using the tool in any way?			X	X	X	X	X	X				X	X		X
Were potential end users (eg, patients, caregivers, family and friends, surrogates) involved in any steps intended to evaluate prototypes or a final version of the tool?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Were potential end users (eg, patients, caregivers, family and friends, surrogates) asked their opinions of the tool in any way?					X		X	X		X			X		
Were health professionals asked their opinion of the tool at any point?	X				X		X	X		X		X	X		

Table 4 Characteristics of Written Information in Physical/Electronic Interventions*

Study (Author, Year)	Pictograms	Medication Schedule	Colored Coded	Content
Al-Hashar et al, 2018 ²⁷	No	No	No	-Generic name of medications
Anderegg et al, 2013 ²⁹	No	No	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use
Barnason et al, 2010 ³³	No	Yes	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use
Bell et al, 2016 ³⁴	Yes - Used to indicate time of dosing (eg, morning, afternoon, evening, bedtime icons) and indication	Yes	No	-Brand name, generic name -Charts for medications to start, stop or continue -Reasons for use -Timing and frequency of administration -Side effects
Bolas et al, 2004 ³⁵	No	Yes	No	-Brand name, generic name -Medications to take home -Reasons for use -Timing of administration
Bonetti et al, 2018 ³⁶	No	Yes	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Route, timing, frequency of administration -Side effects
Budiman et al, 2016 ³⁷	No	No	No	-Brand name, generic name -Medications to start and continue -Reasons for use -Timing and frequency of administration
Chan et al, 2018 ⁴⁰	No	Yes	Yes	-Brand name, generic name -Listed paracetamol, ibuprofen, oxycodone -Reasons for use -Dosage form -Timing and frequency of administration -Side effects -Drug/food interactions
Cordasco et al, 2009 ⁴³	Yes – used to indicate time of dosing in the day (eg, morning, afternoon, bedtime), Medication (eg, picture of the tablet/capsule), drug administration (eg, with/without food, indication (eg, image of heart)	Yes	Yes	-Brand name, generic name -Listed prescribed medications -Reasons for use -Dosage form -Timing and frequency of administration
Davis et al, 2012 ⁴⁵	Yes	Yes	No	-Details unspecified
Ducharme et al, 2011 ⁴⁷	Yes - Included icons of individuals who are happy, okay, sad to indicate what one should do based on how well one's asthma control is	No	Yes	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Dosage form -Frequency of administration
Jiang et al, 2016 ⁵⁰	Yes	No	No	-Side effects
Kaestli et al, 2016 ⁵²	No	No	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Dosage form -Timing and frequency of administration -Side effects -Drug/food interactions

(Continued)

Table 4 (Continued).

Study (Author, Year)	Pictograms	Medication Schedule	Colored Coded	Content
Kapoor et al, 2019 ⁵³	Yes – Used to indicate time of dosing during the day (eg morning, afternoon, evening, bedtime icons). Number of pills taken per dose. Medication (eg picture of the tablet/capsule). Indication	Yes	Yes	-Common names of medications -Medications to start and continue -Reasons for use -Dosage form -Timing and frequency of administration
Lam et al, 2011 ⁵⁵	No	No	No	-Medication format (eg, brand name, generic) unspecified -Timing of administration
Leguelinel-Blache et al, 2015 ⁵⁶	No	Yes	No	-Medication format (eg, brand name, generic) unspecified -Medications to start and continue -Reasons for use -Frequency of administration -Side effects
Louis-Simonet et al, 2004 ⁵⁸	No	No	No	-Medication format (eg, brand name, generic) unspecified -Listed all discharge medications -Reasons for use -Frequency of administration -Side effects
Luder et al, 2015 ⁶⁰	No	No	No	-Medication format (eg, brand name, generic) unspecified -Medications to start and continue -Timing and frequency of administration
Manning et al, 2007 ⁶¹	No	Yes	Yes	-Brand name, generic name -Medications to start, stop, and continue -Reasons for use -Dosage forms -Timing and frequency of administration -Side effects -Drug/food interactions
Marusic et al, 2018 ⁶³	No	No	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Timing of administration -Side effects
Marusic et al, 2013 ⁶²	No	No	No	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Timing of administration -Side effects
McCarthy et al, 2015 ⁶⁴	Unspecified	Unspecified	Unspecified	-Medication format (eg, brand name, generic) unspecified -Reasons for use -Timing and frequency of administration -Side effects
Moye et al, 2018 ⁶⁶	No	Yes	No	-Medication format (eg, brand name, generic) unspecified -Listed prescribed medications -Reasons for use -Frequency of administration -Side effects
Send et al, 2014 ⁷⁷	Yes – used to provide information on dosage form and drug administration (eg, with/without food, shake well before use, do not split tablet, protect from heat/light etc.)	Yes	Yes	-Brand name, generic name, -Medications to start and continue -Reasons for use -Dosage form -Timing and frequency of administration

(Continued)

Table 4 (Continued).

Study (Author, Year)	Pictograms	Medication Schedule	Colored Coded	Content
Schwalm et al, 2015 ⁷⁶	No	No	No	-Brand name, generic name -Listed cardiac medications -Reasons for use
Singh et al, 2018 ⁸⁰	Yes	Yes	Yes	-Brand name, generic name of acetaminophen and ibuprofen -Reasons for use -Medications to start -Frequency of administration
Zerafa et al, 2011 ⁸⁶	Yes - Used to indicate time of dosing (eg, morning, afternoon, evening, bedtime icons). Pictures of prescribed medication	Yes	Yes	-Brand name, generic name -Medications to start and continue -Dosage form -Timing and frequency of administration

Notes: * Studies with interventions that included physical/electronic components but did not specify the characteristics listed herein are not included in this table. These studies include: Cabilan et al, 2019, Chedepudi et al, 2017, Christy et al, 2016, De La Fuente et al, 2011, Lu et al, 2017, Miller et al, 2016, Murphy et al, 2019, Oliveira-Filho et al, 2014, Press et al, 2016, Sanii et al, 2016, Smith et al, 2017, Tuttle et al, 2018, Walker et al, 2009.

Personalization

Interventions were considered “personalized” if they contained any information specific to the patient, rather than a particular medication or medical condition. Most of the interventions (83.3%, n = 50/60) were personalized to the patient.^{27–30,32–38,42–49,51,53–63,65–70,72–79,82–86} The most common methods of personalization were including the patient’s specific medications list. However, only 13.3% (n = 8/60) involved assessment of the patient’s health priorities (eg if they wanted the medication list in a particular language).^{33,34,36,43,45,47,49,79} Even fewer (11.7%, n = 7/60) reported integrating the patient’s values and preferences into the care plan.^{33,34,36,43,45,49,79} Few interventions (20.0%, n = 12/60) addressed the patient’s ability to access medications financially in the community.^{32–34,36,37,48,51,56,70,73,75,79}

Process

Patient Involvement

A large portion (81.7%, n = 49) of interventions included patient counselling.^{28–46,48–51,53,55–60,62,63,66–75,78,79,82–86} Of these interventions, 53.1% (n = 26/49) directly involved the patient during intervention delivery through strategies such as assessing patient understanding during the delivery or engaging patients in creation of a management plan.^{33,34,36–38,42,44,45,49,53,55,56,58,60,66,68,70,71,73,74,79,82–86} Twenty-two (44.9%) interventions assessed the patient for understanding,^{33,34,37,38,42,45,49,56,60,66,68,70,71,73,74,79,82–86} while 22.4% (n = 11/49) of these interventions specifically used teach-back (eg confirm patients’ understanding by asking them to “teach it back” to the health-care provider),^{34,38,42,45,49,53,71,74,79,82,83} and 12.2% (n = 6/49) assessed the patient’s health priorities (eg values, preferences).^{33,34,36,45,49,79} Other strategies used included increasing responsibility based on patient’s successful compliance, patient’s own management plan using a template, and positive reinforcement.

Timing

The majority of interventions were delivered to the patient before leaving the hospital (51.7%, n = 31).^{28,29,31,32,35,38–41,43,46,47,49,50,52,55–58,61–64,68,71,72,75,77,80,81,86} Thirty percent (n = 18) of interventions had elements delivered before and after the patients left the hospital,^{30,34,36,37,42,45,48,51,66,67,70,74,78,79,82–85} 16.7% (n = 10) of interventions were delivered exclusively after the patients left the hospital,^{27,33,44,53,54,59,60,65,73,76} and for one of the studies, it was not clear when the intervention was delivered to the patient based on the manuscript.⁶⁹

Healthcare Providers Involved and Number of Providers

Many interventions involved delivery from pharmacists (61.7%, n = 37),^{27–32,34–38,41,42,46,48,51–53,55–57,59,65–68,70,72–75,78,79,82,84–86} physicians (25.0%, n = 15),^{27,31,40,47,58–60,62–64,66,67,69,77,82} and nurses (25.0%, n = 15).^{30,32,33,39,43,44,49,50,53,55,59,61,66,67,83}

Table 5 Outcome Measures of Studies*

Outcome	Number of Studies with Outcome (% of All Studies, n / 60 Studies)	Number of Studies With Impact Demonstrated (% Studies Within Category)	Study
Patient and caregiver knowledge/ comprehension	18 (30)	12 (67)	Al-Hashar et al, 2018 Baky et al, 2018 ^a Barnason et al, 2010 Bolas et al, 2004 ^a Chakravarthy et al, 2018 ^a Chedepudi et al, 2017 ^a Cordasco et al, 2009 Davis et al, 2012 ^a Jiang et al, 2016 ^a Kaestli et al, 2016 ^a Kapoor et al, 2019 Louis-Simonet et al, 2004 ^a Manning et al, 2007 ^a McCarthy et al, 2015 ^a Phatak et al, 2016 Send et al, 2014 ^a Sinha et al, 2019 Vuong et al, 2008 ^a
Patient and caregiver attitudes (e.g., satisfaction, preferences, values) and confidence (e.g., self-efficacy)	17 (28)	7 (41)	Barnason et al, 2010 ^a Cabilan et al, 2019 ^a Christy et al, 2016 Cote et al, 2015 Hyrkas et al, 2014 ^b Kaestli et al, 2016 Kapoor et al, 2019 Khonsari et al, 2015 Louis-Simonet et al, 2004 Luder et al, 2015 Manning et al, 2007 Olives et al, 2016 ^b Salmany et al, 2018 Sanii et al, 2016 ^a Sarangarm et al, 2012 ^a Singh et al, 2018 Sinha et al, 2019 ^a

(Continued)

Thirteen interventions (21.7%) involved delivery from multiple health-care providers.^{27,30–32,53,55,59,65–67,79,82,83} Only 26.7% (n = 16/60) studies reported training the staff administering the intervention.^{33,34,36,38,40,43,45,48,49,53,60,64,67,68,71,83} Twenty percent (n = 12) of interventions were shared with other health-care practitioners outside the intervention setting.^{35,47,48,53,57,60,72,73,76,83–85}

Reported Outcomes

“Table 5: Outcome Measure of Studies” presents details regarding outcome measures ie, which of the included studies assessed a particular outcome category, and those that demonstrated a clinically significant impact in the intervention group. Overall, 63% (38/60)^{27–38,42,45–49,51,54,56,57,60,62,65–68,70,71,73–75,78,79,81,83,85} of included studies reported health system outcomes (eg readmission rate, mortality rate) and 52% (31/60)^{28,30,33,36,37,40,43–47,49,50,53–56,58,59,62–64,68,69,71,74,75,80,84,86} explored patient and caregiver behavior and experience (eg behaviours related to adherence, life-style management). Thirty-percent (18/60)^{28,31,33,35,39,41,43,45,50,52,53,58,61,64,70,77,81,84} examined patient and caregiver knowledge/comprehension (eg, understanding of condition and medication), 28% (17/60)^{33,38,42,46,49,52–54,58,60,61,69,73–75,80,81}, reported patient and caregiver attitudes and confidence (eg, satisfaction, preferences, values and self-efficacy; and

Table 5 (Continued).

Outcome	Number of Studies with Outcome (% of All Studies, n / 60 Studies)	Number of Studies With Impact Demonstrated (% Studies Within Category)	Study
Patient and caregiver behavior and experience (e.g., adherence, self-management)	31 (52)	21 (68)	Al-Hashar et al, 2018 ^a Bailey et al, 2019 ^a Barnason et al, 2010 ^a Bonetti et al, 2018 ^a Budiman et al, 2016 Chan et al, 2018 ^a Cordasco et al, 2009 Cote et al, 2015 Davis et al, 2012 De La Fuente et al, 2011 ^a Ducharme et al, 2011 ^a Hyrkas et al, 2014 Jiang et al, 2016 ^a Kapoor et al, 2019 Khonsari et al, 2015 Lam et al, 2011 ^a Leguelinel-Blache et al, 2015 ^a Louis-Simonet et al, 2004 Lu et al, 2017 ^a Marusic et al, 2013 ^a Marusic et al, 2018 McCarthy et al, 2015 ^a Oliveira-Filho et al, 2014 ^a Olives et al, 2016 ^b Press et al, 2016 ^a Sanii et al, 2016 ^a Sarangarm et al, 2012 ^a Schwalm et al, 2015 ^a Singh et al, 2018 Vuong et al, 2008 ^a Zerafa et al, 2011 ^a

(Continued)

27% (16/60)^{30,31,35,40,43,50,51,54,63,65,70,75,77,79,82,85} explored other outcome measures (eg, health-care provider insights, economic impact).

With respect to included studies reporting significant findings, 68% (21 of 31 studies)^{28,30,33,36,40,46,47,50,55,56,59,62,64,68,69,71,74-76,84,86} of studies reported significant impact on patient and caregiver behavior and experience. Sixty-seven percent (12 of 18 studies)^{31,35,39,41,45,50,52,58,61,64,77,84} assessing patient and caregiver knowledge, 55% (21 of 38 studies)^{27-33,35,36,47-49,60,62,66,70,71,75,78,79,85} assessing health system outcomes, 44% (7 of 16 studies)^{30,31,50,51,54,77,85} assessing other outcome measures (eg health-care provider insights, economic impact) and 41% (7 of 17 studies)^{33,38,49,69,74,75,81} assessing patient and caregiver attitudes and confidence demonstrated a clinically significant impact in the intervention group.

Discussion

Our rapid scoping review of medication support-related TiC interventions identified 60 relevant studies. The majority of studies were randomized controlled trials involving verbal counselling and/or physical document delivered to the patient before discharge. Most studies assessed health system outcomes and patient/caregiver behavior and experience, with the majority of studies showing a significant improvement in these outcomes. We identified four key findings, which differ from previous reviews on the topic of medication support and care transitions.^{87,88} 1) the need for improved reporting of intervention development and characteristics; 2) the need to include high-risk populations when designing studies; 3) the

Table 5 (Continued).

Outcome	Number of Studies with Outcome (% of All Studies, n / 60 Studies)	Number of Studies With Impact Demonstrated (% Studies Within Category)	Study
Health system outcomes (e.g., readmission, mortality)	38 (63)	21 (55)	Acomb et al, 2013 ^a Al-Hashar et al, 2018 ^a Anderegg et al, 2013 ^a Bailey et al, 2019 ^b Baky et al, 2018 ^b Balling et al, 2015 ^a Barnason et al, 2010 ^a Bell et al, 2016 Bolas et al, 2004 ^a Bonetti et al, 2018 ^a Budiman et al, 2016 Cabilan et al, 2019 Christy et al, 2016 Davis et al, 2012 De La Fuente et al, 2011 Ducharme et al, 2011 ^a Feldman et al, 2018 ^a Hyrkas et al, 2014 ^a Jones et al, 2018 Khonsari et al, 2015 Leguelinel-Blache et al, 2015 Li et al, 2016 Luder et al, 2015 ^a Marusic et al, 2013 ^b Miller et al, 2016 Moye et al, 2018 ^a Murphy et al, 2019 Oliveira-Filho et al, 2014 Phatak et al, 2016 ^a Press et al, 2016 ^a Salmany et al, 2018 Sanii et al, 2016 Sarangarm et al, 2012 ^a Shaver et al, 2019 ^a Shull et al, 2018 ^a Sinha et al, 2019 Tuttle et al, 2018 Walker et al, 2003 ^b
Other (e.g., economic analysis, health care provider insights/ interview/ survey)	16 (27)	7 (44)	Bailey et al, 2019 ^a Baky et al, 2018 ^a Bolas et al, 2004 Chan et al, 2018 Cordasco et al, 2009 Jiang et al, 2016 ^a Jones et al, 2018 ^a Khonsari et al, 2015 ^a Marusic et al, 2018 Miller et al, 2016 Phatak et al, 2016 Sarangarm et al, 2012 Send et al, 2014 ^a Shull et al, 2018 Smith, 2017 Walker et al, 2003 ^a

Notes: ^aRenaudin et al, 2017 not included as results are not available (trial protocol). ^aSignificant finding in this study. ^bSignificant differences found among subgroups of population.

potential for future research to apply user-centred design approaches to intervention development, 4) the opportunity for future studies to examine electronic interventions.

Our first key finding is that included studies lacked reporting on the development and characteristics of interventions. The majority of included studies failed to mention the development of their tool entirely, making it difficult to understand the rationale and elements of the interventions, and to assess whether the interventions addressed patient needs. Further, studies were lacking in their description of interventions for both physical and counselling interventions. For example, Lam 2011 mentioned a “medication list with detailed instructions” but did not specify these details.⁵⁵ Also, Chakravarthy 2018 suggested that “discharge instructions” were provided by nursing staff but did not describe the content or components of the instructions.³⁹

Importantly, these gaps in reporting make it difficult to discern what was tested, thereby diminishing the replicability of particular studies in situations where beneficial impact in the intervention group was demonstrated. We recommend increased use of the TIDieR reporting guideline to ensure that authors provide sufficient details when describing their intervention.⁸⁹ Further, similarly detailed reporting of the elements of usual care comparators will help readers better understand the “baseline” and assess applicability to their own health systems. This review identified that few staff administering interventions were trained prior to the study. It was unclear whether training was not reported or if it was not provided. A possible explanation may be that interventions were delivered by health-care providers performing their regular scope of practice and did not require additional training. Regardless, additional reporting in publications regarding training, or the lack thereof, is encouraged.

Second, our scoping review identified an important gap with respect to patient populations that have been studied. Very few studies included or considered at-risk populations beyond older adults, such as patients with low literacy, language barriers, or disabilities, in their patient selection or sub-group analysis. These groups are at increased risk of adverse events and more likely to experience systemic barriers to care.^{8,10,90} Based on the theory of design by exception, considering these “extreme” users when designing an intervention, instead of designing for the average, will result in more equitable interventions that are compatible with the large majority of users and does so more efficiently than other mainstream design approaches.^{13,91}

Third, we found that very few studies met the UCD-11 criteria, which is a way to describe an intervention’s user centredness ie, explores end user involvement in design, development and refinement stages of an intervention.²⁶ This may be partially but not fully explained by poor reporting of how interventions were developed. The strengths of participatory action and user-centered design approaches when developing complex interventions are increasingly recognized, as evidenced, for example, by their inclusion in recent UK Medical Research Council guidance.⁹² Members of our research team have successfully used these approaches to engage patients, caregivers, and health-care providers in co-developing patient-oriented discharge instructions, which has subsequently undergone wide-scale implementation and evaluation at the provincial level with positive results.^{90,93} The application of these approaches when developing medication-focused interventions at care transitions is an important opportunity for researchers to explore.

Finally, we note that most interventions included in this review involved providing written information and verbal instructions or education to patients and caregivers. Electronic interventions were the least frequently used. The paucity of electronic interventions was somewhat unexpected considering the shift toward technology in health care. Considering that the technology is available for various tools, such as medication time reminder, missed medication alerts, applications across multiple devices and much more, future assessment and use of these tools is another opportunity for future studies.

Strengths and Limitations

Limitations of this study are consistent with those known for rapid reviews.⁹⁴ After piloting the process for title and abstract screening to attain agreement on 5% of the studies, subsequent studies were assessed for eligibility by one reviewer. Our review was limited to articles published between January 2004 and July 2019 in English, articles indexed in well-known databases, and those known to context experts. Grey literature sources were not searched and as an optional component of scoping reviews, risk of bias for included studies was not assessed.

Despite these limitations, our study has several strengths building on previous research conducted examining medication interventions during care transitions. For example, Tomlinson et al⁸⁷ conducted a systematic review and meta-analysis of randomized controlled trials evaluating interventions that support medication continuity in older adults at or started within one month of discharge from hospital. Consistent with scoping review methods, we used a broader search strategy (ie, included more constructs), and included study designs beyond randomized controlled trials, more eligible populations, and studies with a range of outcomes. Another systematic review and meta-analysis by Daliri et al⁸⁸ examining the impact of prospective studies of medication-related interventions at care transitions on outcomes, is complementary to our review. They used meta-analyses to estimate the impact of interventions on outcomes while we focused on describing patient and caregiver-centered medication support interventions and how user-centered design elements were considered in the development of these interventions. Our study builds on their review by expanding the breadth of study designs and outcomes eligible for inclusion.

Conclusion

There is global interest in understanding the components and impact of medication-related interventions on patient outcomes during care transitions, as evidenced by recent systematic reviews exploring this topic. In this rapid scoping review, focused on describing patient and caregiver-centered medication support interventions and the role of user-centred design, the majority of studies included were randomized controlled trials involving verbal counselling and/or physical document delivered to the patient before discharge. Most studies selected patients based on age or medical condition, and few studies considered patients at high-risk of adverse events. Few studies reported on the development of the intervention. The majority of studies included multiple components, most commonly involving verbal or physical modalities, rather than electronic interventions. With respect to outcomes, most studies assessed health system outcomes and patient and caregiver behavior and experiences. Less commonly explored were patient and caregiver knowledge, attitudes or confidence. Studies assessing medication support interventions at TiC would benefit from improved reporting on development, characteristics of the intervention and usual care comparators, and training administered. As well, active involvement of people with higher medication-related needs, such as those with low literacy, language barriers, and disabilities, is highly encouraged.

Data Sharing Statement

All search strategies are included in [Appendix 1](#) and included studies are cited herein. Citations for excluded studies are available on reasonable request from the corresponding author.

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