

# Medication Reconciliation During Transitions of Care as a Patient Safety Strategy

## A Systematic Review

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Medication reconciliation identifies and resolves unintentional discrepancies between patients' medication lists across transitions in care. The purpose of this review is to summarize evidence about the effectiveness of hospital-based medication reconciliation interventions. Searches encompassed MEDLINE through November 2012 and EMBASE and the Cochrane Central Register of Controlled Trials through July 2012. Eligible studies evaluated the effects of hospital-based medication reconciliation on unintentional discrepancies with nontrivial risks for harm to patients or 30-day postdischarge emergency department visits and readmission. Two reviewers evaluated study eligibility, abstracted data, and assessed study quality.

Eighteen studies evaluating 20 interventions met the selection criteria. Pharmacists performed medication reconciliation in 17 of the 20 interventions. Most unintentional discrepancies identified had no clinical significance. Medication reconciliation alone probably does not reduce postdischarge hospital utilization but may do so when bundled with interventions aimed at improving care transitions.

*Ann Intern Med.* 2013;158:397-403.

[www.annals.org](http://www.annals.org)

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## THE PROBLEM

Transitions in care, such as admission to and discharge from the hospital, put patients at risk for errors due to poor communication and inadvertent information loss (1–5). Unintentional changes to patients' medication regimens represent 1 well-studied category of such errors (6–9). Medication regimens at hospital discharge often differ from preadmission medications. Some differences reflect deliberate changes related to the conditions that led to hospitalization (for example, withholding antihypertensive medications from patients with septic shock). However, other discrepancies are unintentional and result from incomplete or inaccurate information about current medications and doses.

Up to 67% of patients admitted to the hospital have unintended medication discrepancies (9), and these discrepancies remain common at discharge (7, 10). As in other areas of patient safety, errors are more common than actual harms. Reported proportions of unintended discrepancies with the potential for harm range from 11% to 59% of all discrepancies (9). Of note, approximately 40% to 80% of patients have no clinically significant unintended medication discrepancies (8, 10–16). Thus, although unintended medication discrepancies are common, clinically significant discrepancies may affect only a few patients.

Nonetheless, medication reconciliation, the formal process for identifying and correcting unintended medication discrepancies across transitions of care, has been widely endorsed (17, 18) and is mandated by health care accreditation bodies in both the United States (19) and Canada (20). One previous systematic review (21) looked broadly at the effect of medication reconciliation on various processes and outcomes related to medication safety. We sought to focus specifically on the effect of medication

reconciliation on unintentional discrepancies with the potential for harm (“clinically significant discrepancies”) and hospital utilization after discharge, as assessed by unplanned emergency department visits and readmission to the hospital within 30 days.

## PATIENT SAFETY STRATEGY

The best possible medication history (BPMH) provides the cornerstone for medication reconciliation. More comprehensive than a routine primary medication history, the BPMH involves 2 steps: a systematic process for obtaining a thorough history of all prescribed and nonprescribed medications by using a structured patient interview, and verification of this information with at least 1 other reliable source of information (for example, a government medication database, medication vials, patient medication lists, a community pharmacy, or a primary care physician) (17, 22) (Figure).

At a minimum, medication reconciliation refers to the completion of a BPMH and the act of correcting any unintended discrepancies between a patient's previous medication regimen and the proposed medication orders at admission (from home or a health care facility, such as a nursing home), inpatient transfer (to or from other services or units, such as the intensive care unit), or discharge (to home or a health care facility). More advanced medication reconciliation involves

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**Key Summary Points**

Medication reconciliation is widely recommended to avoid unintentional discrepancies between patients' medications across transitions in care.

Clinically significant unintentional discrepancies affect only a few patients.

Medication reconciliation alone probably does not reduce postdischarge hospital utilization within 30 days but may do so when bundled with other interventions that improve discharge coordination.

Pharmacists play a major role in most successful interventions.

Commonly used criteria for selecting high-risk patients do not consistently improve the effect of medication reconciliation.

interprofessional collaboration (for example, a physician and nurse or pharmacist conducting medication reconciliation as a team), integration into discharge summaries and prescriptions, and provision of medication counseling to patients (22). Medication reconciliation has also been bundled with other interventions to improve the quality of transitions in care, such as patient counseling about discharge care plans, coordination of follow-up appointments, and postdischarge telephone calls (23–26).

Recommendations for medication reconciliation in ambulatory settings have begun to appear (27, 28). However, most studies still focus on medication reconciliation across hospital-based transitions in care, which is the focus of our review.

**REVIEW PROCESSES**

The **Supplement**, available at [www.annals.org](http://www.annals.org), includes a complete description of the search strategies, summary of evidence search and selection, and evidence tables.

We searched MEDLINE to 5 November 2012, EMBASE between 1980 and July 2012, and the Cochrane Central Register of Controlled Trials to July 2012 for English-language articles (**Figure 1** of the **Supplement**). We also scanned reference lists of all included studies and review articles and directly communicated with study authors as required to obtain details not included in published reports. We included randomized, controlled trials (RCTs); before-and-after evaluations; and postintervention studies.

Eligible studies reported emergency department visits and hospitalizations within 30 days of discharge or evaluated the severity or clinical significance of unintentional discrepancies. For studies reporting unintended discrepancies, we required that at least 1 clinician independent from

the medication reconciliation process assess severity or clinical significance. Thus, we excluded studies in which the person conducting medication reconciliation provided the sole assessment of clinical significance for identified discrepancies. We also required that studies explicitly distinguish unintentional discrepancies from other (intentional) medication changes through direct communication with the medical team.

Although studies varied in their definitions of categories of severity for the potential harm associated with medication discrepancies, most reported a category that amounted to “trivial,” “minor,” or “unlikely to cause harm.” We applied the term “clinically significant” to all unintended discrepancies not labeled as such. This definition of clinically significant unintentional discrepancies corresponds to the concept of potential adverse drug events (ADEs), although only a few studies explicitly used this term (25, 29–31).

Two of 3 reviewers independently screened each citation for inclusion. Information was abstracted about clinical setting, study design, number of participants, components of the intervention, transitions of care targeted, and outcomes. Disagreements between the 2 reviewers were resolved by discussion and involved a third reviewer when necessary to achieve consensus. The full data extraction form (available on request) included questions directed at general methodological features (for example, sample size and study design), details about the components of the medication reconciliation intervention (for example, components of the BPMH and the method for confirming that medication discrepancies were unintended), and the process for assessing the clinical significance of identified discrepancies.

Two reviewers independently applied the Cochrane Collaboration's tool for assessing risk of bias (32) to each of the 5 included RCTs, assessing patient selection bias, selective reporting, patient attrition, and other biases by using this standardized tool. Meta-analysis was performed with Comprehensive Meta-Analysis (Biostat, Englewood, New Jersey). For results from studies of disparate designs, we calculated the median effect and interquartile range by using Microsoft Excel (Microsoft, Seattle, Washington). This approach was first used in a large review of guideline implementation strategies (33) and has since been applied in other systematic reviews of quality improvement interventions (34–37).

This review was supported by the Agency for Healthcare Research and Quality, which had no role in the selection or review of the evidence or the decision to submit the manuscript for publication.

**BENEFITS AND HARMS****Overview of Studies**

Of 1845 screened citations, 18 studies (reporting 20 medication reconciliation interventions) met the inclusion

criteria (Figure 2 of the Supplement). All 18 were from hospitals in the United States or Canada. Studies about medication reconciliation from other countries met pre-specified exclusion criteria, such as not distinguishing intended from unintended medication discrepancies (38–40) or basing the assessment of clinical severity solely on judgments by the personnel conducting medication reconciliation (41, 42).

Five studies (reporting 7 medication reconciliation interventions) used randomized, controlled designs (23–25, 30, 31). All 5 were assessed as having low risk of bias. One study used a quasi-experimental design (intervention delivered in alternating months) (26), 3 had a before-and-after design, and 9 reported postintervention data only (Appendix Table, available at [www.annals.org](http://www.annals.org)). Seven interventions focused on “high-risk patients” based on advanced age, presence of chronic illnesses, or use of multiple medications (Appendix Table).

Seven studies compared medication reconciliation with “usual care” (23, 26, 30, 31, 43–45), whereas 2 studies (24, 25) compared 2 forms of medication reconciliation. All but 2 of the studies (15, 44) were done in academic medical centers, although 1 study involved both teaching and nonteaching settings (43). Five of the interventions targeted admission to a hospital (8, 11, 14, 16, 46), 7 targeted discharge home (10, 23, 26, 29, 31, 43, 45), 1 targeted in-hospital transfer (13), and 7 targeted multiple care transitions (15, 24, 25, 30, 44).

Our 2 outcomes of interest—clinically significant unintentional discrepancies and 30-day postdischarge hospital utilization—corresponded to the primary outcome in 9 of 18 included studies (15, 23–26, 29, 30, 43, 45). The primary outcome for most of the remaining studies involved variations of our outcomes of interest, such as all unintentional discrepancies rather than the subset of clinically significant unintentional discrepancies (8, 14, 16, 46). Only 1 study (44) reported a primary outcome substantially different from our outcomes of interest. This study evaluated the feasibility of implementing an electronic system for targeted pharmacist- and nurse-conducted admission, but it included sufficient information to abstract data for our outcomes of interest.

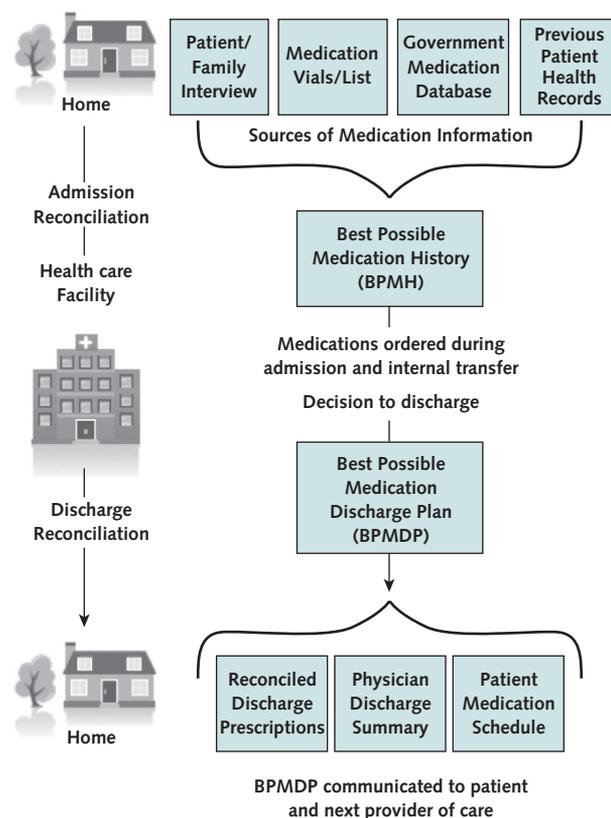
## Benefits

### Clinically Significant Unintended Medication Discrepancies

The number of clinically significant unintentional discrepancies per patient varied greatly across the 12 included medication reconciliation interventions (Table 1 of the Supplement). The median proportion of all unintended discrepancies judged as having clinical significance was 34% (interquartile range, 28% to 49%). The median proportion of patients with at least 1 clinically significant discrepancy was 45% (interquartile range, 31% to 56%).

Two of the interventions that reported clinically significant unintended discrepancies focused on “high-risk patients” based on number of medications (8) and medical

Figure. Overview of medication reconciliation in acute care.



Adapted, with permission, from Fernandes OA. Medication reconciliation. *Pharmacy Practice*. 2009;25:26.

complexity (14). One intervention identified 0.36 clinically significant discrepancies per patient (8), whereas the other reported a much higher value of 0.91 per patient (14).

Only 2 RCTs (30, 31) evaluated the effect of medication reconciliation on clinically significant unintended discrepancies. One trial (31) randomly assigned 178 patients being discharged from the medical service at a teaching hospital in Boston, Massachusetts, to an intervention that included medication reconciliation and counseling by a pharmacist, as well as a follow-up telephone call within 5 days. For patients in the control group, nurses provided discharge counseling and pharmacists reviewed medication orders without performing a formal reconciliation process. Fewer patients in the intervention group experienced preventable ADEs (1% vs. 11%;  $P = 0.01$ ). Total ADEs did not differ between the 2 groups.

A subsequent cluster randomized trial from the same research group involved 14 medical teams at 2 teaching hospitals in Boston (30). The intervention included a Web-based application using the hospital’s electronic medical record (which included ambulatory visits) to create a preadmission medication list to facilitate the medication reconciliation process. This study reported a relative reduc-

tion in potential ADEs (equal to clinically significant unintended medication discrepancies) of 0.72 (95% CI, 0.52 to 0.99). Of note, the intervention's effect achieved statistical significance at only 1 of the 2 participating hospitals, with an adjusted relative risk for potential ADEs of 0.72 (CI, 0.52 to 0.99), but not at the other (0.87 [CI, 0.57 to 1.32]).

#### Emergency Department Visits and Readmission Within 30 Days

Nine interventions reported emergency department visits and readmission within 30 days per patient (Table 2 of the Supplement). Of these interventions, 5 applied selection criteria for high-risk patients (24, 26, 47, 48). Again, however, focusing on high-risk patients did not consistently increase the effect of medication reconciliation.

Across 3 RCTs, readmissions and emergency department visits were reduced by 23% (CI, 5% to 37%;  $I^2 = 24\%$ ) (Figure 3 of the Supplement). This pooled result was driven by the statistically significant reduction achieved by an intensive intervention (23) that included additional components beyond medication reconciliation that were specifically aimed at reducing readmissions.

One other RCT (47) met inclusion criteria but was excluded from meta-analysis because it reported hospital utilization at 12 months rather than 30 days after discharge. This study showed that reconciliation led to a significant 16% reduction in all visits to the hospital. The intervention consisted of a fairly intensive medication reconciliation strategy in which pharmacists identified drug-related problems beyond unintended discrepancies, counseled patients at admission and discharge, and telephoned patients 2 months after discharge to ensure adequate home management of medications.

#### Harms

Mistakes in the medication reconciliation process may become "hard-wired" into the patient record. Once medication reconciliation has occurred, clinicians assessing a given patient may rely exclusively on the documented medication history and be less likely to confirm its accuracy with the patient or other sources.

The larger concern with medication reconciliation pertains to the reliance on pharmacists. Pharmacists have proven roles in the prevention of ADEs (48–50); however, they are in short supply in most hospitals. Thus, involving pharmacists in medication reconciliation, as most published studies have done, risks taking these personnel away from other important activities related to patient safety.

## IMPLEMENTATION CONSIDERATIONS AND COSTS

### Effect of Context on Effectiveness

Conceptually, 3 categories of contextual factors probably affect the impact of medication reconciliation: the degree to which patients can directly provide up-to-date medication histories, which reflects patients' knowledge of

their medications, health literacy, and language; availability of medication data sources (for example, electronic medical records in an ambulatory setting and regional prescription databases) to facilitate the medication reconciliation process; and possibly the clinical informatics milieu, including the degree to which medication reconciliation can be integrated into such applications as computerized physician order entry and electronic medical records. We had hoped to explore the impacts of these factors on effectiveness, but the number of included studies and the studies' descriptions of context were insufficient to permit such analyses.

#### Costs

Medication reconciliation has become mandatory for hospital accreditation in the United States (19) and Canada (20). Thus, it has been implemented in hospitals of varying types and sizes and across a broad range of clinical services. However, most published studies evaluating the effect of medication reconciliation come from academic settings (Appendix Table). Moreover, in routine practice, medication reconciliation is probably done by physicians and nurses, especially outside of academic centers. By contrast, pharmacists played a major role in conducting medication reconciliation in 17 of the 20 interventions included in this review (Appendix Table). Nurses or physicians delivered only 3 interventions (23, 25, 45) without substantial support from pharmacists, and one of these interventions used a nurse discharge advocate assigned to deliver the intervention (23).

A clinical informatics milieu (computerized physician order entry or electronic medical record) was noted for 13 interventions, but electronic medication reconciliation occurred in only 9 interventions. The medication reconciliation process generated new medication orders in only 3 interventions (25, 44), 2 of which came from 1 study (25) (Table 3 of the Supplement).

One model-based study (51) considered the cost-effectiveness of 5 pharmacist-led strategies for reducing ADEs. Pharmacist-led medication reconciliation carried a reasonable probability of cost-effectiveness (compared with no reconciliation) at £10 000 (\$16 240 as of 31 December 2012) per quality-adjusted life-year. The authors estimated the cost for implementing pharmacist-led medication reconciliation at £1897 (\$3200) per 1000 prescription orders (51). A systematic review of economic analyses of patient safety strategies (52) judged this study as having acceptable quality features for economic analyses of patient safety strategies. The main limitation identified was the uncertainty surrounding assumptions about expected reductions in ADEs as a result of reductions in potential ADEs.

## DISCUSSION

Medication reconciliation addresses the conceptually plausible and well-documented problem of unintended

medication discrepancies introduced across transitions in care. This review suggests that only a few unintended discrepancies have clinical significance. Furthermore, most patients have no unintentional discrepancies. Therefore, the actual effect of medication reconciliation on reducing clinically significant discrepancies in the inpatient setting remains unclear.

Medication reconciliation has attracted interest because of its potential effect on reducing postdischarge utilization. The pooled results of 3 RCTs showed that interventions significantly reduced emergency department visits and readmissions within 30 days of discharge. However, this finding was driven by the results of a single trial—a robust intervention that included several additional facets aimed at improving the discharge process and coordinating postdischarge care (23). The degree to which medication reconciliation contributed to the result is unclear.

The lack of effect of medication reconciliation alone on hospital utilization within 30 days of discharge may reflect the need to consider a longer window of observation to demonstrate benefit. The inadvertent discontinuation of cholesterol-lowering medications, antiplatelet or anticoagulant agents, thyroid hormone replacement, antiresorptive therapy for osteoporosis, and gastric acid suppression agents—all commonly encountered examples of unintended discrepancies—carry risks for adverse clinical effects that may require hospital utilization in the long term but not usually within 30 days of discharge. It is thus noteworthy that a trial of medication reconciliation alone (that is, with no additional discharge coordination interventions) that used a longer postdischarge follow-up (12 months) reported a significant reduction in emergency department visits and readmissions (47).

Given limited resources, the paramount issue becomes how to target medication reconciliation to direct resources most efficiently. This is especially important given that most studies involve pharmacists to conduct medication reconciliation, which requires substantial investment of resources beyond usual care. Our review suggests that common selection criteria for high-risk patients showed no consistent correlation with the prevalence of clinically significant unintentional discrepancies.

The absence of apparent effect from focusing on high-risk patients could reflect the limited number of studies. However, the high-risk criteria that are used also have plausible limitations. For example, even though elderly patients and patients with multiple chronic conditions may receive many medications, their medication regimens may remain stable for some time or may be well-known to the patients or their caregivers. These risk factors for unintended medication discrepancies do not account for such nuances. A more direct risk factor is probably frequent or recent changes to medication regimens. This risk factor unfortunately cannot be ascertained reliably without conducting a thorough medication history, not unlike that required by the BPMH for medication reconciliation.

Our findings have some similarities with a previous review of hospital-based medication reconciliation (21) in that we found that most successful interventions relied heavily on pharmacists and that, on the whole, medication reconciliation remains a potentially promising intervention. The previous review found inconsistent reductions in postdischarge health care utilization and indicated greater success from targeting high-risk patients. These differences may reflect the methodological differences between our studies. We explicitly selected for studies that assessed the clinical significance of unintentional discrepancies, required a clear distinction between intentional and unintentional medication changes through communication with the medical team, and required that assessments of clinical significance be performed by at least 1 clinician independent from the reconciliation process.

Our review has several limitations. Although we conducted a comprehensive literature search, we had no way of identifying unpublished research. One of our outcomes of interest, clinically significant unintentional discrepancies, was not always the primary outcome in included studies. In addition, this outcome is subjective and open to individual interpretation. Lastly, in most of the included studies, the interventions were described with relatively little detail and frequently omitted potentially important contextual features (for example, patients' understanding of their medications and the interprofessional culture at the institution).

Hospital-based medication reconciliation at care transitions frequently identifies unintended discrepancies, but many have no clinical significance. Pharmacists play important roles in most published interventions. Most studies have assessed patient outcomes during or shortly after hospitalization, but the benefits of resolving unintended discrepancies may not become apparent for months after discharge. Perhaps for this reason, medication reconciliation alone does not seem to reduce emergency department visits or readmission within 30 days.

Bundling medication reconciliation with other interventions aimed at improving care coordination at hospital discharge holds more promise, but the specific effect of medication reconciliation in such multifaceted interventions may not become apparent until much later than 30 days after discharge. Future research should examine the effect of medication reconciliation on postdischarge hospital utilization at time points extending past the traditional 30-day mark and identify patient features that more consistently increase the risk for clinically significant unintended discrepancies.

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**Note:** The Agency for Healthcare Research and Quality reviewed contract deliverables to ensure adherence to contract requirements and quality, and a copyright release was obtained from the Agency for Healthcare Research and Quality before submission of the manuscript.

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**Financial Support:** From the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services (contract HHS-A-290-2007-100621).

**Potential Conflicts of Interest:** Dr. Shojania: *Other:* Agency for Healthcare Research and Quality as a subcontract from the University of California, Los Angeles-RAND Evidence-Based Practice Centre. All other authors have no disclosures. Disclosures can also be viewed at [www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M12-2634](http://www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M12-2634).

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**Appendix Table. Studies of Medication Reconciliation, Including Assessment of Clinically Significant Unintended Discrepancies and Emergency Department Visits and Hospitalizations Within 30 Days of Discharge**

Study, Year (Reference)	Setting	Study Design (Sample Size, n)	Selection for High-Risk Patients	Transition of Care Targeted	Person Performing Medication Reconciliation	Additional Interventions Beyond Medication Reconciliation	Outcome
Coffey et al., 2009 (11)	Pediatric ward in academic medical center in Canada	Prospective postintervention study (272)	None	Admission to hospital	Pharmacy student	None	Clinically significant unintentional discrepancies
Cornish et al., 2005 (8)	Medical ward in academic medical center in Canada	Prospective postintervention study (151)	≥4 medications	Admission to hospital	Pharmacist, pharmacy student, or medical student	None	Clinically significant unintentional discrepancies
Dedhia et al., 2009 (43)	Medical wards in U.S. academic medical center, community teaching hospital, and urban community hospital	Prospective before-and-after study (185)	Age ≥65 y	Discharge home	Physician followed by pharmacist	Safe STEPS intervention, including admission assessment, communication with PCP, and multidisciplinary discharge meeting	Emergency department visits and hospitalizations within 30 d of discharge
Gleason et al., 2004 (46)	Surgical and medical wards in U.S. academic medical center	Postintervention study (204)*	None	Admission to hospital	Pharmacist	None	Clinically significant unintentional discrepancies
Gleason et al., 2010 (16)	Medical ward in U.S. academic medical center	Prospective postintervention study (651)	None	Admission to hospital	Pharmacist	None	Clinically significant unintentional discrepancies
Jack et al., 2009 (23)	Medical ward in U.S. academic medical center	RCT (373)	None	Discharge home	Nurse discharge advocate	Nurse discharge advocates created a posthospitalization care plan and postdischarge telephone call	Emergency department visits and hospitalizations within 30 d of discharge
Koehler et al., 2009 (24)	Medical ward in U.S. academic medical center	RCT (21)†	Age ≥70 y, ≥5 medications, ≥3 chronic comorbid conditions, ≥1 ADL requirement for assistance with	Admission to hospital, discharge home	Nurse and reviewed by pharmacist	Counseling by registered nurse	Emergency department visits and hospitalizations within 30 d of discharge
Koehler et al., 2009 (24)	Medical ward in U.S. academic medical center	RCT (20)†	Age ≥70 y, ≥5 medications, ≥3 chronic comorbid conditions, ≥1 ADL requirement for assistance with	Admission to hospital, discharge home	Pharmacist	Supplemental elderly care bundle (counseling by pharmacist, postdischarge telephone call, and discharge letter to PCP)	Emergency department visits and hospitalizations within 30 d of discharge
Kramer et al., 2007 (44)	Medical ward in U.S. community teaching hospital	Prospective before-and-after study (136)	≥1 of the following: ≥7 medications, substantial comorbid condition, previous admission for ADR, ≥4 drug allergies	Admission to hospital, discharge home	Pharmacist and physician	None	Emergency department visits and hospitalizations within 30 d of discharge
Kripalani et al., 2012 (25)	Medical and cardiology wards in 2 U.S. academic medical centers	RCT (428)	None	At time of enrollment in study, discharge home, and in-hospital transfer	Physician and nurse	Discharge counseling	Clinically significant unintentional discrepancies
Kripalani et al., 2012 (25)	Medical and cardiology wards in 2 U.S. academic medical centers	RCT (423)	None	At time of enrollment in study, discharge home, and in-hospital transfer	Pharmacist	Pharmacist intervention, including inpatient pharmacist counseling, low-literacy adherence aids, and postdischarge telephone call	Clinically significant unintentional discrepancies
Lee et al., 2010 (13)	Inpatient wards and critical care units in 2 academic medical centers in Canada	Prospective postintervention study (129)†	None	In-hospital transfer	Pharmacist	None	Clinically significant unintentional discrepancies
Pipins et al., 2008 (29)	Medical wards in 2 U.S. academic medical centers	Prospective postintervention study (180)§	None	Discharge home	Pharmacist	None	Clinically significant unintentional discrepancies
Schipper et al., 2006 (31)	Medical ward in U.S. academic medical center	RCT (92)¶	None	Discharge home	Pharmacist	None	Emergency department visits and hospitalizations within 30 d of discharge
Schipper et al., 2009 (30)	Medical wards in 2 U.S. academic medical centers	RCT (162)§	None	Admission to hospital, discharge home	Physician with confirmation by pharmacist or nurse (enhanced by preadmission medication list builder in electronic medical record)	None	Clinically significant unintentional discrepancies Emergency department visits and hospitalizations within 30 d of discharge

*Continued on following page*

*Appendix Table. —Continued*

Study, Year (Reference)	Setting	Study Design (Sample Size, n)	Selection for High-Risk Patients	Transition of Care Targeted	Person Performing Medication Reconciliation	Additional Interventions Beyond Medication Reconciliation	Outcome
Showalter et al., 2011 (45)	All admitted patients through emergency department in U.S. academic medical center	Retrospective before-and-after study (17 516)	None	Discharge home	Physician	Standardized mandatory electronic discharge instructions document with embedded computerized medication reconciliation	Emergency department visits and hospitalizations within 30 d of discharge
Stone et al., 2010 (14)	Pediatric ward in U.S. academic medical center	Prospective postintervention study (237) <sup>†</sup>	Identification of medically complex conditions based on published guidelines	Admission to hospital	Pharmacist	None	Clinically significant unintentional discrepancies
Vira et al., 2006 (15)	Acute care units in urban community hospital in Canada	Retrospective postintervention study (60)	None	Admission to hospital, discharge home	Pharmacist	None	Clinically significant unintentional discrepancies
Walker et al., 2009 (26)	Medical ward in U.S. academic center	Prospective quasi-experimental study (358) <sup>**</sup>	≥1 of the following: ≥5 medications, ≥1 targeted medication <sup>††</sup> , medication requiring monitoring, ≥2 changes to regimen, dementia or confusion, or inability to manage medications	Discharge home	Pharmacist	Pharmacist-facilitated discharge program, including counseling, provision of medication list, education to PCP, and postdischarge telephone call	Emergency department visits and hospitalizations within 30 d of discharge
Wong et al., 2008 (10)	Medical ward in academic medical center in Canada	Prospective postintervention study (150)	None	Discharge home	Pharmacist or pharmacy resident	None	Clinically significant unintentional discrepancies

ADL = activity of daily living; ADR = adverse drug reaction; PCP = primary care physician; RCT = randomized, controlled trial; Safe STEPS = Safe and Successful Transition of Elderly Patients Study.

\* 12 adult medical–surgical units.

† 2 hospital medicine groups.

‡ 10 patient care units.

§ 7 medical teams.

|| 4 medical teams.

¶ On 2 medical teams.

‡‡ On 2 medical teams and 1 hospitalist service.

†† Targeted medications included digoxin, diuretics, anticoagulants, sedatives, opioids, asthma or chronic obstructive pulmonary disease medications, and angiotensin-converting enzyme inhibitors or angiotensin-receptor blockers.