Impact of Patient-Centered Discharge Tools: A Systematic Review

Karen Okrainec, MD, MSc[1-3]*, Davina Lau, BSc[4], Howard B. Abrams, MD[1-3,] Shoshanna Hahn-Goldberg, PhD[3],
Ronak Brahmbhatt, MBBS, MPH[3], Tai Huynh, MBA[3], Kenneth Lam, MD[2], Chaim M. Bell, MD, PhD[2,4-6]

[1]University Health Network, Toronto, Ontario, Canada; [2]Department of Medicine, University of Toronto, Ontario, Canada; [3]OpenLab, University Health Network, Toronto, Ontario, Canada; [4]Samuel Lunenfeld Research Institute/Mount Sinai Hospital, Toronto, Ontario, Canada; [5]University of Toronto Institute of Health Policy, Management and Evaluation, Ontario, Canada; [6]Institute for Clinical Evaluative Sciences, Toronto, Ontario, Canada.

BACKGROUND: Patient-centered discharge tools provide an opportunity to engage patients, enhance patient understanding, and improve capacity for self-care and postdischarge outcomes.

PURPOSE: To review studies that engaged patients in the design or delivery of discharge instruction tools and that tested their effect among hospitalized patients.

DATA SOURCES: We conducted a search of 12 databases and journals from January 1994 through May 2014, and references of retrieved studies.

STUDY SELECTION: English-language studies that tested discharge tools meant to engage patients were selected. Studies that measured outcomes after 3 months or without a control group or period were excluded.

DATA EXTRACTION: Two independent reviewers assessed the full-text papers and extracted data on features of patient engagement.

DATA SYNTHESIS: Thirty articles met inclusion criteria, 28 of which examined educational tools. Of these, 13 articles involved patients in content creation or tool delivery, with only 6 studies involving patients in both. While many of these studies (10 studies) demonstrated an improvement in patient comprehension, few studies found improvement in patient adherence despite their engagement. A few studies demonstrated an improvement in self-efficacy (2 studies) and a reduction in unplanned visits (3 studies).

CONCLUSIONS: Improving patient engagement through the use of media, visual aids, or by involving patients when creating or delivering a discharge tool improves comprehension. However, further studies are needed to clarify the effect on patient experience, adherence, and healthcare utilization postdischarge. Better characterization of the level of patient engagement when designing discharge tools is needed given the heterogeneity found in current studies. *Journal of Hospital Medicine* 2017;12:110-117. © 2017 Society of Hospital Medicine

Patient-centered care, defined by the Institute of Medicine as "health care that establishes a partnership among practitioners, patients, and their families to ensure that decisions respect patients' wants, needs and preferences and that patients have the education and support they need to make decisions and participate in their own care," has been recognized as an important factor in improving care transitions after discharge from the hospital.[1] Previous efforts to improve the discharge process for hospitalized patients and reduce avoidable readmissions have focused on improving systems surrounding the patient, such as by increasing the availability of outpatient follow-up or standardizing communication between the inpatient and outpatient care teams.[1,2] In fact, successful programs such as Project BOOST and the Care Transitions Interventions™ provide healthcare institutions with a "bundle" of evidence-based transitional care guidelines for discharge: they provide postdischarge transition coaches, assistance with medication self-management, timely follow-up tips, and improved patient records in order to improve postdischarge outcomes.[3,4] Successful interventions, however, may not provide more services, but also engage the patient in their own care.[5,6] The impact of engaging the patient in his or her own care by providing patient-friendly discharge instructions alone, however, is unknown.

A patient-centered discharge may use tools that were designed with patients, or may involve engaging patients in an interactive process of reviewing discharge instructions and empowering them to manage aspects of their own care after leaving the hospital. This endeavour may lead to more effective use of discharge instructions and reduce the need for additional or more intensive (and costly) interventions. For example, a patient-centered discharge tool could include an educational intervention that uses the "teach-back" method, in which patients are asked to restate in their own words what they thought they heard, or in which staff use additional media or a visual design tool meant to enhance comprehension of discharge instructions.[6,7] Visual aids and the use of larger fonts are particularly useful design elements for improving comprehension among non-English speakers and patients with low health literacy, who tend to have poorer recall of instructions.[8-10] What may constitute essential design elements to include in a discharge instruction tool, however, is not clear.

Moreover, whether the use of discharge tools with a specif-

ic focus on patient engagement may improve postdischarge outcomes is not known. Particularly, the ability of patient-centered discharge tools to improve outcomes beyond comprehension such as self-management, adherence to discharge instructions, a reduction in unplanned visits, and a reduction in mortality has not been studied systematically. The objective of this systematic review was to review the literature on discharge instruction tools with a focus on patient engagement and their impact among hospitalized patients.

METHODS
The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Statement was followed as a guideline for reporting throughout this review.[11]

Data Sources
A literature search was undertaken using the following databases from January 1994 or their inception date to May 2014: Medline, Embase, SIGLE, HTA, Bioethics, ASSIA, Psych Lit, CINAHL, Cochrane Library, EconLit, ERIC, and BioMed Central. We also searched relevant design-focused journals such as *Design Issues, Journal of Design Research, Information Design Journal, Innovation, Design Studies*, and *International Journal of Design*, as well as reference lists from studies obtained by electronic searching. The following key words and combination of key words were used with the assistance of a medical librarian: patient discharge, patient-centered discharge, patient-centered design, design thinking, user based design, patient education, discharge summary, education. Additional search terms were added when identified from relevant articles (Appendix).

Inclusion Criteria
We included all English-language studies with patients admitted to the hospital irrespective of age, sex, or medical condition, which included a control group or time period and which measured patient outcomes within 3 months of discharge. The 3-month period after discharge is often cited as a time when outcomes could reasonably be associated with an intervention at discharge.[2]

Exclusion Criteria
Studies that did not have clear implementation of a patient-centered tool, a control group, or those whose tool was used in the emergency department or as an outpatient were excluded. Studies that included postdischarge tools such as home visits or telephone calls were excluded unless independent effects of the predischarge interventions were measured. Studies with outcomes reported after 3 months were excluded unless outcomes before 3 months were also clearly noted.

All searches were entered into Endnote and duplicates were removed. A 2-stage inclusion process was used. Titles and abstracts of articles were first screened for meeting inclusion and exclusion criteria by 1 reviewer. A second reviewer independently checked a 10% random sample of all

the abstracts that met the initial screening criteria. If the agreement to exclude studies was less than 95%, criteria were reviewed before checking the rest of the 90% sample. In the second stage, 2 independent reviewers examined paper copies of the full articles selected in the first stage. Disagreement between reviewers was resolved by discussion or a third reviewer if no agreement could be reached.

Data Analysis and Synthesis
The following information was extracted from the full reference: type of study, population studied, control group or time period, tool used, and outcomes measured. Based on the National Health Care Quality report's priorities and goals on patient and/or family engagement during transitions of care, educational tools were further described based on method of teaching, involvement of the care team, involvement of the patient in the design or delivery of the tool, and/or the use of visual aids.[12] All primary outcomes were classified according to 3 categories: improved knowledge/comprehension, patient experience (patient satisfaction, self-management/efficacy such as functional status, both physical and mental), and health outcomes (unscheduled visits or readmissions, adherence with medications, diet, exercise, or follow-up, and mortality).

No quantitative pooling of results or meta-analysis was done given the variability and heterogeneity of studies reviewed. However, following guidelines for Effect Practice and Organisation of Care (EPOC) Risk of Bias criteria,[13] studies that had a higher risk of bias such as uncontrolled before-after studies or studies with only 1 intervention or control site (historical controls, eg) were excluded from the final review because of the difficulties in attributing causation. Only primary outcomes were reported in order to minimize type II errors.

RESULTS
Our search revealed a total of 3699 studies after duplicates had been removed (Figure). A total of 714 references were included after initial review by title and abstract and 30 studies after full-text review. Agreement on a 10% random sample of all abstracts and full text was 79% (κ=0.58) and 86% (κ=0.72), respectively. Discussion was needed for fewer than 100 references, and agreement was subsequently reached for 100%.

There were 22 randomized controlled trials and 8 nonrandomized studies (5 nonrandomized controlled trials and 3 controlled before-after studies). Most of these studies were conducted in the United States (13/30 studies), followed by other European countries (5 studies), and the United Kingdom (4 studies). A large number of studies were conducted among patients with cardiovascular disease or risk factors (10 studies), followed by postsurgical patients such as coronary artery bypass graft surgery or orthopaedic surgery (5 studies). Five of 30 studies were conducted among individuals older than 65 years. Most studies excluded patients who did not speak English or the country's official language; only 3
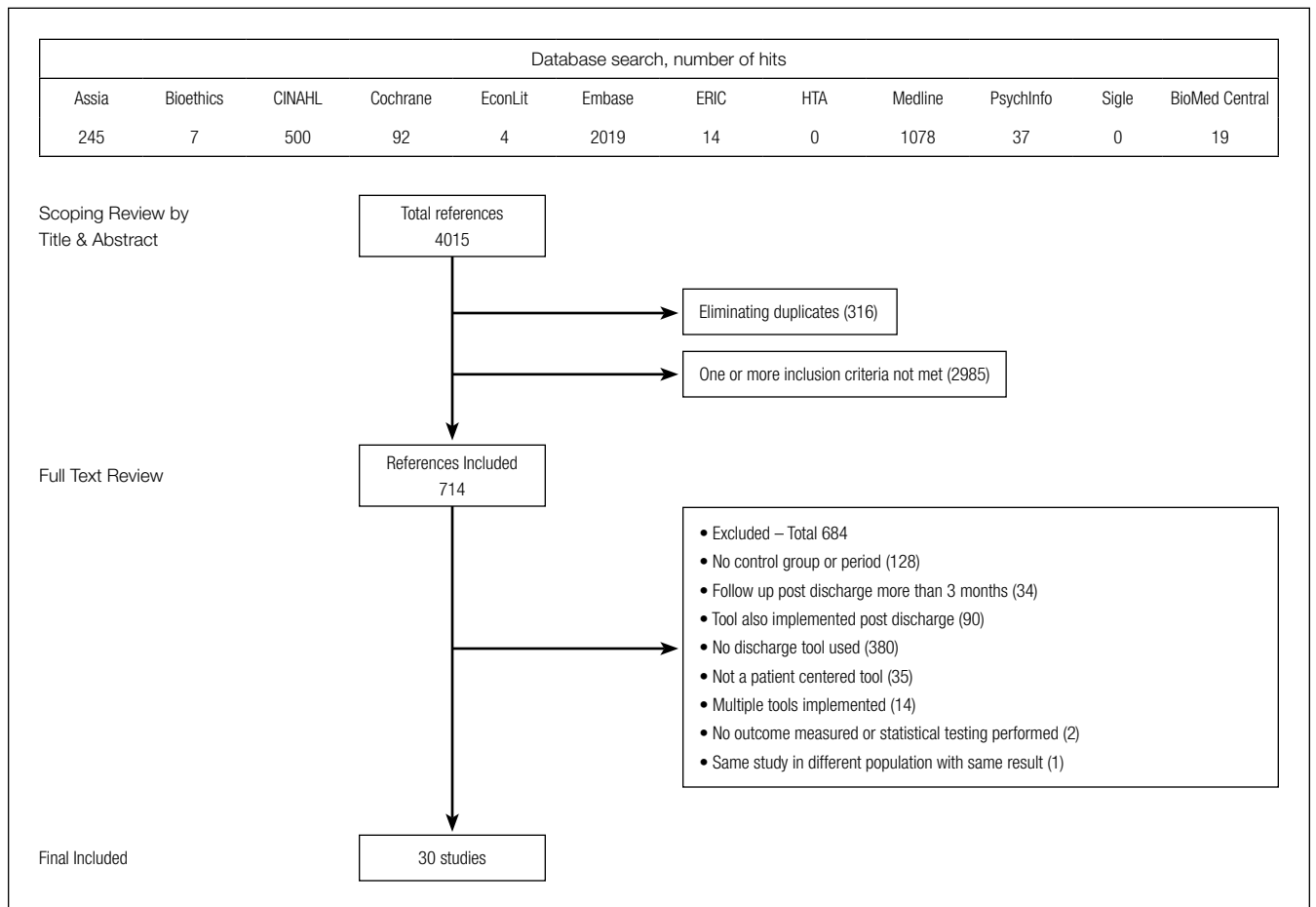
Database search, number of hits											
Assia	Bioethics	CINAHL	Cochrane	EconLit	Embase	ERIC	HTA	Medline	PsychInfo	Sigle	BioMed Central
245	7	500	92	4	2019	14	0	1078	37	0	19

Scoping Review by Title & Abstract

Total references 4015

Eliminating duplicates (316)

One or more inclusion criteria not met (2985)

Full Text Review

References Included 714

- Excluded – Total 684
- No control group or period (128)
- Follow up post discharge more than 3 months (34)
- Tool also implemented post discharge (90)
- No discharge tool used (380)
- Not a patient centered tool (35)
- Multiple tools implemented (14)
- No outcome measured or statistical testing performed (2)
- Same study in different population with same result (1)

Final Included

30 studies

FIG. Flow diagram of the inclusion process.

studies included patients with limited literacy, patients who spoke other languages, or caregivers if the patients could not communicate.

Most studies tested the impact of educational discharge interventions (28 of 30 studies) (Table 1). Quite often, it was a member of the research team who carried out the patient education. Only 3 studies involved multiple members of the care team in designing or reviewing the discharge tool with the patient. Almost half (12 studies) targeted multiple aspects of postdischarge care, including medications and side effects, signs and symptoms to consider, plans for follow-up, dietary restrictions, and/or exercise modifications. Many (19 studies) provided education using one-on-one teaching in association with a discharge tool, accompanied by a written handout (13 studies), audiotape (2 studies), or video (3 studies). While 13 studies had patients involved in creating what content was discussed and 14 studies had patients involved in the delivery of the tool, only 6 studies had patients involved in both design and delivery of the tool. Nine studies also used visual aids such as pictures, larger font, or use of a tool enhanced for patients with language barriers or limited health literacy.

Among all 30 studies included, 16 studies tested the impact of their tool on comprehension postdischarge, with 10 studies demonstrating an improvement among patients who had received the tool (Table 2). Five studies evaluated healthcare utilization outcomes such as readmission, length of stay, or physician visits after discharge and 2 studies found improvements. Twelve studies also studied the impact on adherence with medications, diet, exercise, or follow-up instructions postdischarge. However, only 4 of these 12 studies showed a positive impact. Only 2 studies tested the impact on a patient's ability to self-manage once at home, and both studies reported positive statistical outcomes. Few studies measured patient experience (such as patient satisfaction or improvement in self-efficacy) or mortality postdischarge.

DISCUSSION/CONCLUSION

Our systematic review found 30 studies that engaged patients during the design or the delivery of a discharge instruction tool and that tested the effect of the tool on postdischarge outcomes.[6-10,14–38] Our review suggests that there is sufficient evidence that patient-centered discharge tools improve comprehension. However, evidence is currently insufficient to determine if patient-centered tools improve adherence with discharge instructions. Moreover, though limited studies show promising results, more studies are needed to determine if patient engagement improves self-efficacy and

TABLE 1. Summary of Discharge Educational Instruction Tools Being Tested (N = 28)

Study	N and Study Population	Content of Intervention Tool	Method of Teaching	Additional Use of Media[a]	Degree of Patient Centeredness		
					Patient Involved in Design/Content	Patient Involved in Process/Delivery	Visual Aids[b]
Randomized Controlled Trials							
Mahler et al., 1999[17]	215 adults post-CABG	Expected symptoms, instructions regarding exercise, diet, when to seek attention	None	Video	Custom-made using descriptions of 4 actual CABG patients	No	No
Morice et al., 2001[8]	80 Adults with asthma	Pathophysiology, triggers, review of medications, self-management plan, when to seek care	One-on-one	Written	Use of self-management plan	Use of teach-back	Illustrations in written booklet
Osman et al., 2002[6]	280 Adults with acute asthma	Medications, warning symptoms	One-on-one	Written	Use of self-management plan	Patient's own management plan using template	No
Gwadry-Sridhar et al., 2005[21]	134 Adults with heart failure	Medication compliance, diet, and lifestyle recommendations	Multidisciplinary	No	Incorporate personalized feedback in education	No	No
Cordasco et al., 2009[7]	210 Adults with low literacy	Medication schedule	None	Written	Tool developed with patient feedback	No	Picture- and icon-based for low literacy, English and Spanish
Kommuri et al., 2012[25]	265 Adults with heart failure	Medication compliance, diet and lifestyle recommendations, when to seek attention	One-on-one	Written	No	No	Written guidelines provided for low literacy
Al-Rashed et al., 2002[18]	89 Elderly	Medications and compliance	One-on-one	No	No	Use of teach-back	No
Press et al., 2014[38]	120 Adults with COPD or asthma	Medication technique	One-on-one	No	No	Use of teach-back	No
Legrain et al., 2011[10]	665 Elderly	Medication review, self-management, communication with outpatient physician	One-on-one	No	Incorporated patient priorities into treatment plan	Education assessed the patient's health priorities	No
Lysack et al., 2005[28]	40 Adults postorthopedic surgery receiving rehab	Rehabilitation exercises	None	Video	No	Patients assessed for understanding through demonstration	No
Ho et al., 2009[22]	200 Postpartum	Information regarding postpartum depression	One-on-one	Written	No	No	No
Pereles et al., 1996[30]	107 Elderly	Self-medication program	Multidisciplinary	No	No	Increasing responsibility based on patient's successful compliance	No
Williford et al., 1995[36]	60 Adults from rehab and acute care	Medication review	One-on-one	No	No	Patient assessed for understanding	No

healthcare utilization after discharge.

A major limitation of current studies is the variability in the level of patient engagement in tool design or delivery. Patients were involved in the design mostly through targeted development of a discharge management plan and the delivery by encouraging them to ask questions. Few studies involved patients in the design of the tool such that patients were responsible for coming up with content that was of interest to them. The few that did, often with the additional use of video media, demonstrated significant outcomes. Only a minority of studies used an interactive process to assess understanding such as "teach-back" or maximize patient comprehension such as visual aids. Even fewer studies engaged patients in both developing the discharge tool and providing discharge instructions.

Several previous studies have demonstrated that most complications after discharge are the result of ineffective communication, which can be exacerbated by lack of fluency in English or by limited health literacy.[2,39-43] As a result, poor understanding of discharge instructions by patients and their caregivers can create an important care gap.[44] Therefore, the use of patient-centered tools to engage patients at discharge in their own care is needed. How to engage patients consistently and effectively is perhaps less evident, as demonstrated in this review of the literature in which different levels of patient engagement were found. Many of the tools tested placed attention on patient education, sometimes in the context of bundled care along with home visits or follow-up, all of which can require extensive resources and time. Providing patients with information that the patients themselves state is of value may be the easiest refinement to a discharge educational tool, although this was surprisingly

TABLE 1. Summary of Discharge Educational Instruction Tools Being Tested (N = 28) *(continued)*

Study	N and Study Population	Content of Intervention Tool	Method of Teaching	Additional Use of Media[a]	Degree of Patient Centeredness		
					Patient Involved in Design/Content	Patient Involved in Process/ Delivery	Visual Aids[b]
Haerem et al., 2000[9]	50 Adults with acute coronary syndrome	Medications, lifestyle, risk factors	One-on-one	Audio	Personalized content included	No	No
Jenkins et al., 1996[24]	123 Families of children with burns	Burn care, optional sections	Multidisciplinary	Written	Content tailored to patients based on age group	No	Written at grade school level with numerous diagrams
Shieh et al., 2010[33]	59 Parents of premature newborns	Need for screening, follow-up, emergency management, medication, and other	One-on-one	Written	Mothers used to develop content	Mothers had to demonstrate skill	Photos included
Sabariego et al., 2013[32]	213 Adults with stroke undergoing rehab	Functional difficulties	Group	No	Patients independently identified select topics for discussion	Patients encouraged to identify personal solutions	No
Hoffmann et al., 2007[23]	138 Adults with stroke	Ranges from risk factors, management of complications, treatment	One-on-one	Written	Content and design tailored	No	Attention to font and layout, use of illustrations
Whitby et al., 2007[35]	588 Adults postsurgery	Signs and symptoms of surgical site infection	One-on-one	Written	No	No	Pictorial education
Nonrandomized Controlled Studies							
Eshah, 2013[20]	104 Adults with acute coronary syndrome	Signs, symptoms, diet, lifestyle related to ischemic heart disease	One-on-one	No	No	Perceived barriers and benefits discussed with each patient and questions addressed.	No
Reynolds, 2009[31]	146 Adults postsurgery	Pain management and follow-up	One-on-one	Written	No	No	No
Drenth-van Maanen et al., 2013[19]	85 Elderly	Medications	One-on-one	No	No	No	No
Steinberg et al., 1996[34]	50 Adults with organ transplant	Transplant-specific signs, symptoms of complication, medications, diet/exercise and follow-up	One-on-one	Video	Videos developed using patient testimonials	No	No
Lucas, 1998[27]	115 Adults from medical and cardiology wards	Medications	One-on-one	No	No	No	No
Moore, 1996[29]	82 Adults post-CABG	Expected experiences during recovery and instructions for coping	None	Audio	No	No	No
Zernike et al., 1998[37]	40 Adults with hypertension	Risk factors (lifestyle)	One-on-one	Written	Relevance verified through pilot interviews	Interactive process	No
Louis-Simonet et al., 2004[26]	809 Adults on medical ward with ≥1 medication	Medications	One-on-one	Written	No	Clarification of patients treatment plan and questions	Attention to use of nonmedical terms

[a]Written handouts, audiotape, or videos.

[b]Use of pictograms, large font, translated materials, or materials devised for limited literacy.

NOTE: Abbreviation: CABG, coronary artery bypass grafting.

uncommon.[6,9,10,17,23,33,37] Only 2 studies were found that engaged patients in the initial stage of design of the discharge tool, by incorporating information of interest to them.[23,32] For example, a study testing the impact of a computer-generated written education package on poststroke outcomes designed the information by asking patients to identify which topics they would like to receive information about (along with the amount of information and font size).[23] Secondly, although most of the discharge tools reviewed included the use of one-on-one teaching and the use of media such as patient handouts, these tools were often used in such a way that patients were passive recipients. In fact, studies that used additional video media that incorporated person-

alized content were the most likely to demonstrate positive outcomes.[17,34] The next level of patient engagement may therefore be to involve the patient as an interactive partner when delivering the tool in order to empower patients to self-care. For example, 1 study designed a structured education program by first assessing lifestyle risk factors related to hypertension that were modifiable along with preconceived notions through open-ended questions during a one-on-one interview.[37] Patients were subsequently educated on any knowledge deficits regarding the management of their lifestyle. Another level of patient engagement may be to use visual aids during discussions, as a well-known complement to verbal instructions.[45,46] For example, in a controlled study

that randomized a ward of elderly patients with 4 or more prescriptions to predischarge counseling, the counseling session aimed to review reasons for their prescriptions along with corresponding side effects, doses, and dosage times with the help of a medicine reminder card. Other uses of visual aid tools identified in our review included the use of pictograms or illustrations or, at minimum, attention to font size.[7,8,16,29,33,35] In the absence of a visual aid, asking the patient to repeat or demonstrate what was just communicated can be used to assess the amount of information retained.[18,33]

An important result discovered in our review of the literature was also the lack of studies that tested the impact of discharge tools on usability of discharge information once at home. Conducting an evaluation of the benefits to patients after discharge can help objectify vague outcomes like health gains or qualify benefits in patient's views. This might also explain why many studies with documented patient engagement at the time of discharge were able to demonstrate improvements in comprehension but not adherence to instructions. Although patients and caregivers may understand the information, this comprehension does not necessarily mean they will find the information useful or adhere to it once at home. For example, in 1 study, patients discharged with at least 1 medication were randomized to a structured discharge interview during which the treatment plan was reviewed verbally and questions clarified along with a visually enhanced treatment card.[26] Although knowledge of medications increased, no effect was found on adherence at 1 week postdischarge. However, use of the treatment card at home was not assessed. Similarly, another study tested the effect of an individualized video of exercises and failed to find a difference in patient adherence at 4 weeks.[28] The authors suggested that the lack of benefit may have been because patients were not using the video once at home. This is in contrast to 2 studies that involved patients in their own care by requiring them to request their medication as part of a self-medication tool predischarge.[16,30] Patients were engaged in the process such that increasing independence was given to patients based on their demonstration of understanding and adherence to their treatment while still in the hospital, a learning tool that can be applied once at home. Feeling knowledgeable and involved, as others have suggested, may be the intermediary outcomes that led to improved adherence.[47] It is also possible that adherence to discharge instructions may vary based on complexity of the information provided, such that instructions focusing solely on medication use may require less patient engagement than discharge instructions that include information on medications, diet, exercise modifications, and follow-up.[48]

Our review has a few limitations. Previous systematic reviews have demonstrated that bundled discharge interventions that include patient-centered education have a positive effect on outcomes postdischarge.[2,5] However, we sought to describe and study the individual and distinct impact of patient engagement in the creation and delivery of discharge tools on outcomes postdischarge. We hoped that

TABLE 2. Early Postdischarge Outcomes Measured Among Studies (N = 30)

Outcome	N	N (%) With Impact Demonstrated	Study
Knowledge/comprehension	16	10 (63)	Louis-Simonet et al., 2004,[26a] Zernike et al., 1998,[37a] Reynolds, 2009,[31] Steinberg et al., 1996,[34a] Morice et al., 2001,[8a] Kommuri et al., 2005,[25a] Al-Rashed et al., 2002,[18a] Pereles et al., 1996,[30] Williford et al., 1995,[36b] Lowe et al., 1995,[16a] Haerem et al., 2000,[9a] Jenkins et al., 1996,[24a] Shieh et al., 2010,[33] Hoffmann et al., 2007,[23] Manning et al., 2007,[14] Perera et al., 2012[15]
Patient Experience			
Patient satisfaction	4	2 (50)	Lysack et al., 2005,[28] Hoffmann et al., 2007,[23a] Manning et al., 2007,[14] Osman et al., 2002[6a]
Usefulness of information	0	0	—
Functional status: self-efficacy (physical)	2	2 (100)	Moore, 1996,[29a] Sabariego et al., 2013[32a]
Functional status: mental (including behavior)	6	2 (33)	Eshah, 2013,[20a] Mahler et al., 1999,[17] Moore et al., 1996,[29] Ho et al., 2009,[22a] Pereles et al., 1996,[30] Shieh et al., 2010[33]
Health Outcomes			
Unplanned visits/ readmissions/LOS	5	2 (40)	Lucas, 1998,[27] Osman et al., 2002,[6] Gwadry-Sridhar et al., 2005,[21] Al-Rashed et al., 2002,[18a] Legrain et al., 2011[10a]
Adherence[c]	12	4 (33)	Louis-Simonet et al., 2004,[26] Drenth-van Maanen et al., 2013,[19] Gwadry-Sridhar et al., 2005,[21] Mahler et al., 1999,[17a] Cordasco et al., 2009,[7] Al-Rashed et al., 2002,[18] Press et al., 2014,[38] Lysack et al., 2005,[28] Pereles et al., 1996,[30a] Williford et al., 1995,[36b] Lowe et al., 1995,[16a] Manning et al., 2007[14]
Mortality	1	1	Gwadry-Sridhar et al., 2005[21d]

[a]Significant findings in this study.
[b]Significant differences found among subgroup of population.
[c]Medication, diet, exercise, or follow-up.
[d]Combined with readmission.
NOTE: Abbreviations: CHF, congestive heart failure; LOS, length of stay.

this may provide others with key information regarding elements of patient engagement that were particularly useful when designing a new discharge tool. The variability of the studies we identified, however, made it difficult to ascertain what level of patient engagement is required to observe improvements in health outcomes. It is also possible that a

higher level of patient engagement may have been used but not described in the studies we reviewed. As only primary outcomes were included, we may have underestimated the effect of patient-centered discharge tools on outcomes that were reported as secondary outcomes. As we were interested in reviewing as many studies of patient-centered discharge tools as possible, we did not assess the quality of the studies and cannot comment on the role of bias in these studies. However, we excluded studies with study designs known to have the highest risk of bias. Lastly, we also cannot comment on whether patient-centered tools may have an effect on outcomes more than 3 months after a hospital discharge. However, several studies included in this review suggest a sustained effect beyond this time period.[8,25,32,37]

Patient-centered discharge tools in which patients were engaged in the design or the delivery were found to improve comprehension of but not adherence with discharge instructions. The perceived lack of improved adherence may be due to a lack of studies that measured the usefulness and utilization of information for patients once at home. There was also substantial variability in the extent of patient involvement in designing the style and content of information provided to patients at discharge, as well as the extent of patient engagement when receiving discharge instructions. Future studies would benefit from detailing the level of patient engagement needed in designing and delivery of discharge tools. This information may lead to the discovery of barriers and facilitators to utilization of discharge information once at home and lead to a better understanding of the patient's journey from hospital to home and onwards.

Acknowledgments

References

1. Hurtado MP, Swift EK, Corrigan JM. *Envisioning the National Health Care Quality Report.* Washington DC: National Academy of Sciences; 2001.
2. Mistiaen P, Francke AL, Poot E. Interventions aimed at reducing problems in adult patients discharged from hospital to home: a systematic meta-review. *BMC Health Serv Res.* 2007;7:47.
3. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. *Arch Intern Med.* 2006;166(17):1822-1828.
4. Hansen LO, Greenwald JL, Budnitz T, et al. Project BOOST: effectiveness of a multihospital effort to reduce rehospitalization. *J Hosp Med.* 2013;8(8):421-427.
5. Hansen LO, Young RS, Hinami K, et al. Interventions to reduce 30-day rehospitalization: a systematic review. *Ann Intern Med.* 2011;155(8):520-528.
6. Osman LM, Calder C, Godden DJ, et al. A randomised trial of self-management planning for adult patients admitted to hospital with acute asthma. *Thorax.* 2002;57(10):869-874.
7. Cordasco KM, Asch SM, Bell DS, et al. A low-literacy medication education tool for safety-net hospital patients. *Am J Prev Med.* 2009;37(6 suppl 1):S209-S216.
8. Morice AH, Wrench C. The role of the asthma nurse in treatment compliance and self-management following hospital admission. *Resp Med.* 2001;95(11):851-856.
9. Haerem JW, Ronning EJ, Leidal R. Home access to hospital discharge information on audiotape reduces sick leave and readmissions in patients with first-time myocardial infarction. *Scand Cardiovasc J.* 2000;34(2):219-222.
10. Legrain S, Tubach F, Bonnet-Zamponi D, et al. A new multimodal geriatric discharge-planning intervention to prevent emergency visits and rehospitalizations of older adults: the optimization of medication in AGEd multicenter randomized controlled trial. *J Am Geriatr Soc.* 2011;59(11):2017-2028.
11. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med.* 2009;151(4):264-269.
12. Partnership NP. *National Priorities and Goals: Aligning Our Efforts to Transform America's Healthcare.* Washington, DC: National Quality Forum; 2008.
13. Effective Practice and Organisation of Care (EPOC). EPOC-specific resources for review authors. Oslo, Norway: Norwegian Knowledge Centre for the Health Services; 2013. http://epoc.cochrane.org/epoc-specific-resources-review-authors. Accessed December 21, 2016.
14. Manning DM, O'Meara JG, Williams AR, et al. 3D: a tool for medication discharge education. *Qual Saf Health Care.* 2007;16(1):71-76.
15. Perera KY, Ranasinghe P, Adikari AM, et al. Medium of language in discharge summaries: would the use of native language improve patients' knowledge of their illness and medications? *J Health Commun.* 2012;17(2):141-148.
16. Lowe CJ, Raynor DK, Courtney EA, et al. Effects of self medication programme on knowledge of drugs and compliance with treatment in elderly patients. *BMJ.* 1995;310(6989):1229-1231.
17. Mahler HI, Kulik JA, Tarazi RY. Effects of a videotape information intervention at discharge on diet and exercise compliance after coronary bypass surgery. *J Cardiopulm Rehabil.* 1999;19(3):170-177.
18. Al-Rashed SA, Wright DJ, Roebuck N, et al. The value of inpatient pharmaceutical counseling to elderly patients prior to discharge. *Br J Clin Pharmacol.* 2002;54(6):657-664.
19. Drenth-van Maanen AC, Wilting I, Jansen PA, et al. Effect of a discharge medication intervention on the incidence and nature of medication discrepancies in older adults. *J Am Geriatr Soc.* 2013;61(3):456-458.
20. Eshah NF. Predischarge education improves adherence to a healthy lifestyle among Jordanian patients with acute coronary syndrome. *Nurs Health Sci.* 2013;15(3):273-279.
21. Gwadry-Sridhar FH, Arnold JM, Zhang Y, et al. Pilot study to determine the impact of a multidisciplinary educational intervention in patients hospitalized with heart failure. *Am Heart J.* 2005;150(5):982.
22. Ho SM, Heh SS, Jevitt CM, et al. Effectiveness of a discharge education program in reducing the severity of postpartum depression: a randomized controlled evaluation study. *Patient Educ Couns.* 2009;77(1):68-71.
23. Hoffmann T, McKenna K, Worrall L, et al. Randomised trial of a computer-generated tailored written education package for patients following stroke. *Age Ageing.* 2007;36(3):280-286.
24. Jenkins HM, Blank V, Miller K, et al. A randomized single-blind evaluation of a discharge teaching book for pediatric patients with burns. *J Burn Care Rehabil.* 1996;17(1):49-61.
25. Kommuri NV, Johnson ML, Koelling TM. Relationship between improvements in heart failure patient disease specific knowledge and clinical events as part of a randomized controlled trial. *Patient Educ Couns.* 2012;86(2):233-238.
26. Louis-Simonet M, Kossovsky MP, Sarasin FP, et al. Effects of a structured patient-centered discharge interview on patients' knowledge about their medications. *Am J Med.* 2004;117(8):563-568.
27. Lucas KS. Outcomes evaluation of a pharmacist discharge medication teaching service. *Am J Health Syst Pharm.* 1998;55(24 suppl 4):S32-S35.
28. Lysack C, Dama M, Neufeld S, et al. A compliance and satisfaction with home exercise: a comparison of computer-assisted video instruction and routine rehabilitation practice. *J Allied Health.* 2005;34(2):76-82.
29. Moore SM. The effects of a discharge information intervention on recovery outcomes following coronary artery bypass surgery. *Int J Nurs Stud.* 1996;33(2):181-189.
30. Pereles L, Romonko L, Murzyn T, et al. Evaluation of a self-medication program. *J Am Geriatr Soc.* 1996;44(2):161-165.
31. Reynolds MA. Postoperative pain management discharge teaching in a rural population. *Pain Manag Nurs.* 2009;10(2):76-84.
32. Sabariego C, Barrera AE, Neubert S, et al. Evaluation of an ICF-based patient education programme for stroke patients: a randomized, single-blinded, controlled, multicentre trial of the effects on self-efficacy, life satisfaction and functioning. *Br J Health Psychol.* 2013;18(4):707-728.
33. Shieh SJ, Chen HL, Liu FC, et al. The effectiveness of structured discharge education on maternal confidence, caring knowledge and growth of premature newborns. *J Clin Nurs.* 2010;19(23-24):3307-3313.
34. Steinberg TG, Diercks MJ, Millspaugh J. An evaluation of the effectiveness of a videotape for discharge teaching of organ transplant recipients. *J Transpl Coord.* 1996;6(2):59-63.

35. Whitby M, McLaws ML, Doidge S, et al. Post-discharge surgical site surveillance: does patient education improve reliability of diagnosis? *J Hosp Infect.* 2007;66(3):237-242.

36. Williford SL, Johnson DF. Impact of pharmacist counseling on medication knowledge and compliance. *Mil Med.* 1995;160(11):561-564.

37. Zernike W, Henderson A. Evaluating the effectiveness of two teaching strategies for patients diagnosed with hypertension. *J Clin Nurs.* 1998;7(1):37-44.

38. Press VG, Arora V, Constantine KL, et al. Forget me not: a randomized trial of the durability of hospital-based education on inhalers for patients with COPD or asthma [abstract]. *J Gen Intern Med.* 2014;29(1 suppl):S102.

39. Davis TC, Wolf MS, Bass PF, et al. Literacy and misunderstanding prescription drug labels. *Ann Intern Med.* 2006;145(12):887-894.

40. McCarthy DM, Waite KR, Curtis LM, et al. What did the doctor say? Health literacy and recall of medical instructions. *Med Care.* 2012;50(4):277-282.

41. Tarn DM, Heritage J, Paterniti DA, et al. Physician communication when prescribing new medications. *Arch Intern Med.* 2006;166(17):1855-1862.

42. Cawthon C, Walia S, Osborn CY, et al. Improving care transitions: the patient perspective. *J Health Commun.* 2012;17(suppl 3):312-324.

43. Karliner LS, Auerbach A, Nápoles A, et al. Language barriers and understanding of hospital discharge instructions. *Med Care.* 2012;50(4):283-289.

44. Enhancing the Continuum of Care. Report of the Avoidable Hospitalization Advisory Panel. http://www.health.gov.on.ca/en/common/ministry/publications/reports/baker_2011/baker_2011.pdf. Published November 2011. Accessed December 22, 2016.

45. Chugh A, Williams MV, Grigsby J, et al. Better transitions: improving comprehension of discharge instructions. *Front Health Serv Manage.* 2009;25(3):11-32.

46. Schillinger D, Machtinger EL, Wang F, et al. Language, literacy, and communication regarding medication in an anticoagulation clinic: a comparison of verbal vs. visual assessment. *J Health Commun.* 2006;11(7):651-664.

47. Epstein RM, Street RL Jr. The values and value of patient-centered care. *Ann Fam Med.* 2011;9(2):100-103.

48. Albrecht JS, Gruber-Baldini AL, Hirshon JM, et al. Hospital discharge instructions: comprehension and compliance among older adults. *J Gen Intern Med.* 2014;29(11):1491-1498.