Netherlands
The Journal of Medicine

ORIGINAL ARTICLE

The implementation of a comprehensive discharge bundle to improve the discharge process: a quasi-experimental study

K.J. Verhaegh[1], B.M. Buurman[1]*, G.C. Veenboer[2], S.E. de Rooij[1], S.E. Geerlings[3]

[1]Section of Geriatric Medicine, [2]Division of Renal Diseases and [3]Division of Infectious Diseases, Department of Internal Medicine, Academic Medical Center, University of Amsterdam, Amsterdam, the Netherlands, *corresponding author: tel.: +31 (0)20-5665991, e-mail: b.m.vanes@amc.nl

ABSTRACT

Background: Hospitalised patients are especially vulnerable in times of transitions in care. Structured discharge planning might improve patient outcomes. We implemented and assessed the effect of a multidisciplinary discharge bundle to reduce 30-day readmission.

Methods: A pre-post-test design study with a follow-up of one month at four internal medicine wards in a Dutch university teaching hospital. Eligible patients were 18 years and older, acutely admitted and hospitalised for at least 48 hours. The discharge bundle consisted of (1) planning the date of discharge within 48 hours after admission, (2) a discharge checklist, (3) a personalised patient discharge letter, and (4) multidisciplinary patient education. The primary outcome measure was unplanned 30-day readmission.

Results: Participants in the post-test group (n = 204) did not have a lower rate of unplanned hospital readmission than those receiving usual care (n = 224) (12.9 vs. 13.2%, p = 0.93). The medical discharge summaries were sent to the general practitioner faster in the post-test period (median of 14 days pre-test vs. 5 days post-test, p < 0.001) and this group also had a trend towards a longer time to first readmission (14 vs. 10 days, p = 0.06). Patient satisfaction was high in both groups (7.5 and 7.4 points, (p = 0.49)).

Conclusions: The comprehensive discharge bundle was not effective in reducing the rate of readmission and increasing patient satisfaction, but medical discharge summaries were sent faster to the general practitioner and a trend to a longer time to readmission was present.

KEYWORDS

Hospital readmission, patient satisfaction, discharge planning, patient education, healthcare utilisation

INTRODUCTION

Over 20% of the patients who have been recently discharged from the hospital are readmitted within 30 days.[1,2] One in five patients experience an adverse event after discharge. Almost half of the adverse events are potentially preventable[3] and are likely to be associated with discontinuities in the discharge period, such as the lack of a standardised discharge planning,[4] pending test results at discharge,[5] medication changes during hospitalisations,[6] poor communication between hospital professionals and primary care providers[7,8] and between inpatient and outpatient pharmacies.[9] Furthermore, patients and their caregivers are often not prepared to perform self-care at discharge because they might have an inadequate understanding of their diagnosis, medications, and follow-up needs.[10] Currently, in the USA unplanned hospital readmission within a 30-day period is used as an outcome indicator for hospitals to assess quality of care and for some diagnoses, readmissions are not reimbursed under the Affordable Care Act.[11]

Research on improvement of the hospital discharge process[12-16] showed that structured discharge planning,[12] patient education,[13,14] medication reconciliation,[15] and programmed care follow-ups[16] are associated with a decrease of adverse events including readmission. Most of these studies were focused on specific patient populations or diagnoses or consisted of single-component interventions offered by one discipline.[12,15,16] Multidisciplinary interventions, joined in a so-called bundle of interventions addressing patient-centredness, effective communication and a standardised discharge process, seem to be more promising in reducing post-discharge emergency department visits and unplanned hospital readmissions together with increased patient satisfaction.[13,14,17,18]

The primary aim of this study in medical patients was to evaluate whether the implementation of a comprehensive discharge bundle was associated with a reduction of hospital readmission within 30 days of discharge. The secondary aim of our study was to evaluate the effect of the discharge bundle on duration of the readmission, time to readmission, length of stay, total number of general practitioner (GP) and emergency department visits, mortality, time until sending the medical discharge letter to the GP and patient satisfaction on the overall discharge process.

METHODS

Design and setting

This pre-post-test design study was conducted between September 2010 and December 2012 at four general medicine wards in the Academic Medical Center (AMC) in Amsterdam, the Netherlands, as in a previous comparable project.[19] The AMC is a 1024-bed university teaching hospital. The attending staff consisted of residents, registered nurses, and medical specialists. The study was subdivided into three time periods. The pre-test period ranged from September 2010 to March 2011, the intervention was implemented between April 2011 and January 2012, and the post-test period ranged from January 2012 to December 2012. After the post-test phase the discharge bundle was implemented on all wards throughout the whole hospital.

Patients

Eligible patients had to meet the following criteria: (1) 18 years or older, (2) acutely admitted at one of the four general medicine wards for more than 48 hours, (3) discharged home, (4) able to speak or understand Dutch, (5) have a working telephone, (6) showed no notification of cognitive impairment in the medical record, and (7) had an estimated life expectancy of more than three months. Written informed consent was obtained prior to enrolment. The study was approved by the Medical Ethics Committee of the Academic Medical Center, University of Amsterdam, the Netherlands.

Data collection procedure

Data collection, performed by a trained research nurse, was equal in the pre-intervention and post-intervention period. The research nurse identified eligible patients daily before hospital discharge for the index admission and approached them in the hospital or by telephone within 48 hours of discharge to obtain informed consent. At discharge, a questionnaire was sent to their home address consisting of questions addressing (1) demographic variables, (2) patient satisfaction on the overall discharge procedure, (3) communication of the date of discharge, (4) the personalised patient discharge letter and (5) topics that were included in the verbal patient education before discharge. Four weeks after discharge patients were contacted once again for a follow-up telephone survey to assess the patient's hospital readmission and healthcare utilisation over a four-week period after hospital discharge. Baseline data of participants, including length of index hospital stay, admission diagnoses and comorbidities, were obtained at the time of recruitment by review of the hospital medical electronic file and discharge summaries. We determined the number of hospital admissions and emergency department visits in the six months before index admission through medical record review (AMC hospital utilisation) and calculated the Charlson Comorbidity Index (CCI) score by using primary and secondary diagnoses recorded on the index admission discharge summary.[20]

The pre-test group received standard level of personal health information and communication during hospital stay and discharge. This included a protocolised telephone follow-up within 48 hours after discharge to address critical questions or health problems of the patient and sending a medical discharge letter to the GP.

Construction of the discharge bundle

The discharge bundle was constructed based on focus group meetings with professionals, patient satisfaction surveys, and literature.[12-14,17,21,22] The bundle consisted of four elements: (1) planning the date of discharge within 48 hours after admission, (2) a discharge checklist for residents and nurses, (3) a personalised patient discharge letter and (4) patient education.

Concerning the first element, in collaboration with a nurse, the medical resident had to plan and communicate the date of discharge within 48 hours after admission to the patient and his/her caregiver, which was reviewed on a daily basis. The second element was a discharge checklist for residents and nurses in order to provide a uniform and standardised discharge procedure, which was developed in collaboration with residents and medical specialists and nurses of all four medical wards. A clear distinction was made between tasks and responsibilities for either physicians or nurses. The checklist contained all the proceedings organised in time schedules from admission to hospital discharge, which had to be completed in the electronic patient medical record before hospital discharge and took the planned date of discharge as the starting point.

Patient education was improved in two ways. Patients and their caregivers received a personalised patient discharge letter at discharge, the third element of the discharge bundle, which was a plain language handover and consisted of personalised information about diagnosis, tests, results, diet, medication, daily activities, warning

signs, date of clinical follow-up, home-based care, and contact information. Residents and interns were trained monthly in the use of this discharge letter. As part of the intervention, the personalised patient discharge letter was built into the electronic patient medical record and could also be sent digitally to the GP at discharge.

The fourth element, verbal patient education about diagnosis and treatment during hospital stay, lifestyle advice, (changes in) medication and early warning signs after discharge took place by the resident and nurse as a team. Topics of education were derived from the personalised patient discharge letter and discharge checklist, as a combination of written and verbal information has been shown to be most effective in educating patients how to manage their care at home.[23] Medication reconciliation was performed when providing the personalised patient discharge letter and during patient education.

Implementation strategies

Several activities were planned to ensure thorough implementation.[24] Firstly, the medical and nursing staff were educated about all four elements of the discharge bundle by the project coordinator (KV). Secondly, focus group meetings were held on a monthly basis with the leadership team to evaluate the implementation process. The leadership team consisted of the project coordinator, the staff nurses and medical specialist, one senior level registered nurse and three residents. Furthermore, personal visits to residents and their supervisors took place every two months to explain the bundle. The final purpose was to create a combination of tailored change strategies to sustain involvement in the implementation of the interventions and provide optimal support for the other nurses and residents. Thirdly, the personalised patient discharge letter was developed in collaboration with the leadership team, and it was included in the education of all medical Masters students. The checklist and personalised patient discharge letter were made electronically available.

Outcomes and definitions of outcomes

The primary endpoint was an unplanned hospital readmission within 30 days after discharge from the index hospitalisation. This was measured in two ways: (1) with data from the medical records and (2) with self-reports by the patients. Any emergency department visit in which a participant was subsequently hospitalised was counted as an unplanned readmission.

Secondary outcomes included length of initial hospital stay, time to readmission, number and duration of readmissions, total number of GP and emergency department visits, mortality, overall patient satisfaction of discharge process, and time until sending the medical discharge letter to the GP. Furthermore, patients reported on the topics that were covered during verbal patient education with closed and open questions using a standardised questionnaire. We assessed if participants who could not be reached by telephone were alive 30 days after hospital discharge through medical record review.

We conducted a structured process evaluation during the implementation of the discharge bundle with predefined process indicators[25,26] focused on the discharge process (e.g. number of patients in which the discharge checklist was completed and the personalised patient discharge letter and verbal patient education was provided). The results of these rates were discussed during the focus group meetings.

Data analysis

Descriptive statistics were obtained on the patient characteristics, differences between the pre- and post-test group were examined using Chi-square or Student t-tests. A two-sided p-value of < 0.05 was considered to be statistically significant. As we observed significant difference between the pre-test (control) and post-test (intervention) group at baseline, we adjusted the outcome analyses on unplanned 30-day readmission for important covariates. We performed a logistic regression analysis in which unplanned readmission (data from the medical records) served as dependent variable and the group allocation (pre-test or post-test) was the independent variable. Based on the literature,[27,28] the following variables as well as those which significantly differed between the two groups were treated as covariates: age, sex, ethnicity, living arrangements, discharge diagnosis, CCI score, total number of readmissions in the six months before the index admission, and length of stay. Because it is known from other studies that patients with a previous admission in the six months before the index admission are at increased risk for a readmission, we also performed a subgroup analysis on outcomes only including those high-risk patients. All analyses were conducted using SPSS 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.).

RESULTS

Patient characteristics

During the study period, 2678 patients from the four medical wards were assessed for eligibility. As listed in *figure 1*, 61% did not meet the study criteria because they were not admitted more than 48 hours (28%), were not discharged home (15%), could not speak or understand Dutch (3%), had a notification of cognitive impairment in the medical record (5%), or did not have an estimated life expectancy of more than three months (10%). Ultimately, 428 patients (224 in the pre-test period and 204 in the post-test period) were included in our study of which

30-day readmission data were complete for all 428 (100%) participants. *Table 1* compares the demographic and clinical characteristics of the study population. The pre- and post-test study groups showed significant differences in country of birth (p = 0.01), education level (p = 0.02), living arrangements (p = 0.04), and discharge diagnosis (p ≤ 0.001). No differences were present between the two groups on the number of hospital admissions in the preceding six months.

We had missing data on some outcomes; only 342 (80%) patients (161 pre-test and 181 post-test) provided data on GP and emergency department visits after 30 days and 237 (55%) patients (121 pre-test and 116 post-test) rated their satisfaction with the discharge procedure. No differences were present regarding age, sex, and comorbidity between the group with complete data, those

Figure 1. *Study flow diagram*

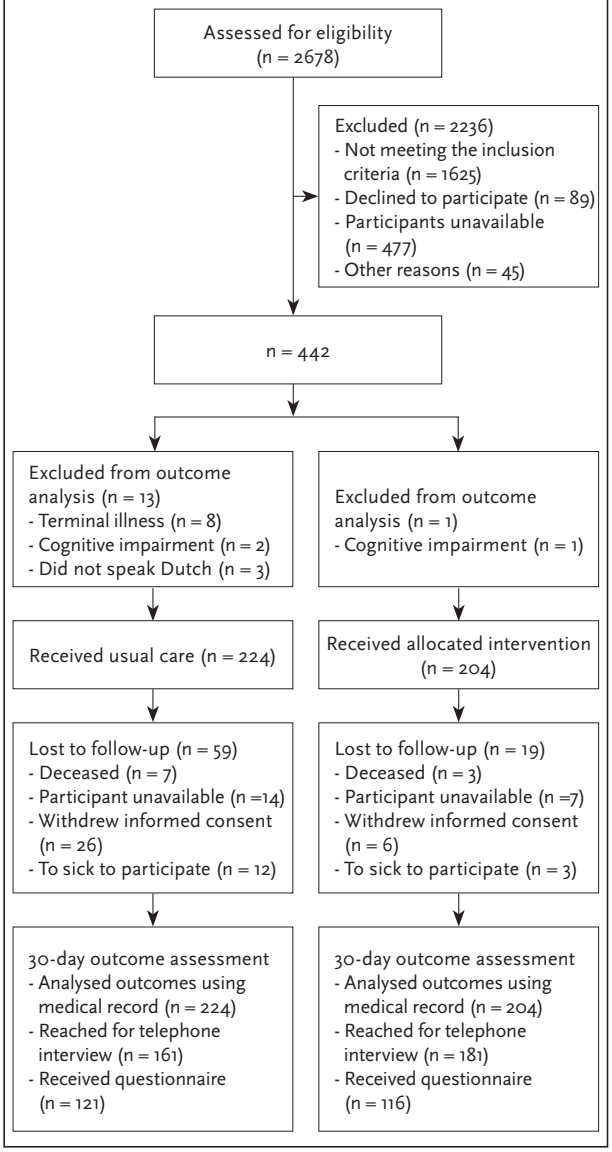

Table 1. *Baseline characteristics of the study population*

Characteristics	Pre-test n (%)	Post-test n (%)	P value[1]
Patients, n	224	204	
Age, mean (SD), years	55 (17)	58 (16)	0.20
Female, n (%)	101 (45)	95 (47)	0.77
Country of birth			0.01
- The Netherlands	136 (85)	123 (70)	
- Other	25 (15)	54 (30)	
Education level, n (%)			0.02
- Less than 6 classes of primary school	1 (1)	9 (5)	
- 6 primary school classes	9 (6)	17 (10)	
- More than primary school/ primary school with uncompleted further education	5 (3)	2 (1)	
- Practical training	18 (11)	23 (13)	
- Secondary vocational education	77 (48)	73 (42)	
- Pre-university education	11 (7)	23 (13)	
- University/higher professional education	39 (24)	29 (17)	
Social status, n (%)			0.70
- Alone	41 (25)	55 (31)	
- Living with partner	109 (67)	109 (62)	
- Other	12 (7)	13 (7)	
Living arrangement, n (%)			0.04
- Independent	159 (98)	166 (94)	
- Other	3 (2)	11 (6)	
Socio-economic status, mean (SD)[2]	-.1995 (1.24)	-.2208 (1.46)	0.87
Discharge diagnosis, n (%)			≤ 0.001
- Internal medicine	69 (31)	51 (26)	
- Infectious disease	32 (14)	35 (18)	
- Rheumatology	16 (7)	4 (2)	
- Disease of the digestive system	44 (20)	44 (23)	
- Chronic kidney disease	16 (7)	56 (29)	
- Malignancy	14 (6)	5 (3)	
- Cardiovascular disease	33 (15)	0 (0)	
CCI score, mean (SD)[3]	1.77 (1.95)	1.75 (1.56)	0.91
Readmitted ≤ 6 months before initial hospitalisation, n (%)	66 (30)	64 (31)	0.68
Length of index hospital stay, median (range)	6 (2-75)	7 (2-46)	0.04

Numbers in tables are n (%) unless otherwise indicated. SD = standard deviation. [1]Significant at p < 0.05. [2]Socio-economic scores (SES) of -1 < indicating low SES, > -1 and < 1 indicating medium SES, and 1 > indicating high SES. [3]Charlson Comorbidity Index (CCI) range of scores 0-31, 0 indicating no comorbidities, and 31 indicating presence of severe comorbidities.

without data on their healthcare utilisation and those without data on satisfaction with the discharge procedure between patients with complete and missing data on secondary outcomes.

Primary outcome after 30-days: readmission

No differences were present between the pre-test and post-test group in unplanned readmission rates within 30 days after discharge (12.9 vs. 13.2%, p = 0.93), as shown in *table 2*. Post-test patients had a trend toward a longer time to first readmission (10 vs. 14 days, p = 0.06). Logistic regression analysis, adjusted for covariates, showed that the odds ratio for readmission did not decrease for the post-test group (OR 1.28; 95% confidence interval 0.63-2.62). The self-reported readmission rate of patients was higher, but these also included planned readmissions.

Secondary outcomes: healthcare utilisation, mortality and patient satisfaction

More than half of all patients visited their GP and over 20% visited the emergency department in the post-discharge period, but no differences between the pre- and post-test groups were found (*table 2*). Mortality within 30 days after hospital discharge was only observed in the pre-test group and showed a trend towards significance compared with the post-test group (1.8 vs. 0.0%, p = 0.06). Overall satisfaction of the discharge process was high in both groups (7.5 vs. 7.4 points, p = 0.49). In the post-test period the medical discharge summaries were sent to the GP much faster than in the pre-test period (median of 5 days post-test vs. 14 days pre-test, p < 0.001).

In a subgroup analysis with patients hospitalised in the six months before study inclusion (index hospitalisation) we also found that the medical discharge letter was sent faster to the GP in the post-test group (14 vs. 5 days, p < 0.001) (*table 3*). Also in this high-risk group a trend to a decrease

Table 2. *Healthcare utilisation and patient satisfaction four weeks after hospital discharge*

Characteristics	Pre-test n (%)	Post-test n (%)	P value[1]
Patients, n	224	204	
Length of index hospital stay			
Length of index hospital stay, median (range)	6 (2-75)	7 (2-46)	0.04
Readmission			
Readmission within 30 days, % (n)	12.9 (29)	13.2 (27)	0.93
Time to first readmission, mean (SD)	10.4 (7.1)	14.2 (7.9)	0.06
Number of readmissions within 30 days, mean (SD)	0.19 (0.59)	0.19 (0.57)	0.99
Duration of first readmission, median (range)	4 (0-28)	1 (0-65)	0.52
Other healthcare utilisation			
GP visits, % (n)	52.8 (85)	59.0 (102)	0.26
ED visits, % (n)	24.9 (43)	21.0 (38)	0.39
Mortality within 30 days			
Died, % (n)	1.8 (4)	0 (0)	0.06
Patient satisfaction with discharge procedure			
Overall patient satisfaction, mean (SD)	7.5 (1.4)	7.4 (1.5)	0.49
Medical discharge letter in days, median (range)	14 (0-182)	5 (0-248)	<0.001

Numbers in tables are n (%) unless otherwise indicated. CI = confidence interval; SD = standard deviation; GP = general practitioner; ED = emergency department. [1]Significant at p < 0.05.

Table 3. *Analysis in 'high-risk group': patients who were admitted to the hospital in the six months prior to the index hospital stay*

Characteristics	Pre-test n (%)	Post-test n (%)	P value[1]
Patients, n	66	64	
Readmission			
Readmission within 30 days, % (n)	18.2 (12)	18.8 (12)	0.93
Time to first readmission , mean (SD)	8.5 (6.0)	12.5 (8.3)	0.22
Number of readmissions within 30 days, mean (SD)	0.26 (0.62)	0.31 (0.77)	0.66
Duration of first readmission, median (range)	3 (0-23)	1 (0-65)	0.42
Other healthcare utilisation			
GP visits, % (n)	52.4 (22)	59.3 (32)	0.50
Emergency department visits, % (n)	32.7 (16)	25.9 (15)	0.44
Mortality within 30 days			
Died, % (n)	4.7 (3)	(0)	0.08
Patient satisfaction with discharge procedure			
Overall patient satisfaction, mean (SD)	7.6 (1.1)	7.1 (1.8)	0.10
Medical discharge letter in days, median (range)	14 (0-182)	5 (0-78)	<0.001

Numbers in tables are n (%) unless otherwise indicated. SD = standard deviation. [1]Significant at p < 0.05.

in mortality within 30 days was seen after the intervention period (3 vs. 0%, p = 0.08).

Adherence to the discharge bundle

Patients self-report on the number of topics that were covered during verbal patient education showed some improvements, but no significant differences were seen between the pre- and post-test groups, respectively: diagnosis (80 vs. 80%, p = 0.91), pain management (61 vs. 76%, p = 0.10), post-discharge care (47 vs. 59%, p = 0.14), warning signs (46 vs. 59%, p = 0.13) and medication reconciliation (60 vs. 75%, p = 0.15).

Process indicators (all started at 0% before the intervention) showed that discharge planning within 48 hours after hospital admission was performed in 67% (range 0-100%), over a period of 33 weeks during the intervention period. Nurses completed the discharge checklist in 76% (range 53-100%) and residents in 10% (range 0-43%). The personalised patient discharge letter (35%, range 0-71%) and verbal patient education (33%, range 0-80%) were provided to patients before hospital discharge.

DISCUSSION

In this pre-post-test design study we did not find that implementation of a comprehensive discharge bundle was associated with a reduction of unplanned hospital readmission within 30 days after discharge and an increase in patient satisfaction on the overall discharge process. However, we observed trends to longer time to readmission and lower mortality rate in the post-test group. In addition, the intervention was successful in reducing time until sending the medical discharge summary to the GP after hospital discharge, which might contribute to effective communication and information transfer with the GP and patient safety.[7,8,29] The discharge bundle consisted of planning the date of discharge, a discharge checklist, a personalised patient discharge letter, and patient education.

Our findings are inconsistent with other reports[14,18,30] describing a decrease of hospital readmission rates. This might be due to several reasons. Adherence to some components of the discharge bundle was low. While compliance to the discharge bundle among nurses was satisfactory, compliance of residents to the checklist was poor. A possible explanation for this could be the staff rotation system. Every six months a new group of residents started and had to be trained about the discharge bundle. In the period just after they started, the adherence to the discharge bundle was low. Studies about influences on doctors' behaviour conclude that a combination of successful methods, such as education, feedback, participation, administrative interventions, and financial incentives and penalties, could change doctors' behaviour and contribute to the patient safety climate.[31] We used a multidisciplinary multifaceted implementation strategy[32,33] consisting of these methods. Some researchers[24,34] have also found differences in compliance by nurses and doctors and suggest that different dissemination and implementation strategies are needed for generating compliance by different disciplines. Furthermore, residents and nurses were not tested on a regular basis by the management on their performance of the elements of the discharge bundle, except the personalised patient discharge letter, which might have led to a decrease of commitment and sense of urgency.[24,35,36] Future studies should adjust implementation strategies to the specific needs of participating disciplines.

Implementation of the personalised patient discharge letter, which was a plain language handover consisting of personalised information about different relevant topics, was relatively successful. The writing of this letter was structurally implemented in the medical students' Masters education program and the quality and number was examined during their internship. We hypothesise that the top-down approach, its fast electronic sending to the GP, and the examination of the personalised patient discharge letter was the reason for the successful implementation and also the faster sending of the medical discharge letter by the residents.

We included all adult medical patients who were hospitalised for more than 48 hours, which might explain the unexpected lower rate of unplanned readmissions of about 13%, compared with others who found readmission rates as high as 39% in older people or those admitted with COPD or heart failure.[37] However, in our group of high-risk patients, defined as patients who were hospitalised in the six months prior to the index admission, we found a readmission rate of 19%. Presumably, only this high-risk group of patients may specifically benefit from a multicomponent intervention targeted at reduction of hospital readmission.[13,38,39]

The strength of this study is that the discharge bundle consists of several multidisciplinary interventions and demonstrates a positive trend toward longer time until readmission and a reduction in mortality. Furthermore, the effect and adherence to the discharge bundle was measured in several ways and at several moments.

Our study has some limitations; the first concerns the relatively short duration of the follow-up period. We selected a 30-day follow-up interval based on previous studies suggesting that patients are at highest risk for adverse events in the first 30 days after hospital discharge.[27] Other studies[40] used a follow-up period of three months

to indicate the effect of interventions on patient-related outcomes. Our study might have underestimated the effect of mortality due to the restricted follow-up period.
A second limitation, due to the restricted time period of this quality improvement project, was that we could only include a certain number of patients and did not perform a sample size calculation in advance. Since we had a low rate of readmissions in the pre-test group the room for improvement was lower than expected.

CONCLUSION

In summary we conclude that the comprehensive discharge bundle was not effective in reducing the 30-day readmission rate and increasing patient satisfaction, but medical discharge summaries were sent faster to the GP and a trend to a longer time to readmission and lower mortality rate was present in the post-test group.
Future research should focus on adjusting implementation strategies to the specific needs of participating disciplines and is warranted for improvement strategies concerning the discharge process outside the hospital.

ACKNOWLEDGEMENTS

We thank all the members of the leadership team, the medical and nursing staff of the participating medical wards, Pieter Kal, Maurice Langemeijer, and Johan Geuze for their contributions with the development and implementation of the comprehensive discharge model. We thank the research team, Floor Molenaar and Lieke Rijnen.

DISCLOSURES

Funding: This study was funded by a grant from the Academic Medical Center, University of Amsterdam. Competing interests: None declared.

REFERENCES

1. Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. Ann Intern Med. 2003;138:161-7.
2. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. N Engl J Med. 2009;360:1418-28.
3. Forster AJ, Clark HD, Menard A, et al. Adverse events among medical patients after discharge from hospital. CMAJ. 2004;170:345-9.
4. Greenwald JL, Denham CR, Jack BW. The hospital discharge: a review of a high risk care transition with highlights of a reengineerd discharge process. J Patient Saf. 2007;3:97-106.
5. Moore C, McGinn T, Halm E. Tying up loose ends: discharging patients with unresolved medical issues. Arch Intern Med. 2007;167:1305-11.
6. Coleman EA, Smith JD, Raha D, Min SJ. Posthospital medication discrepancies: prevalence and contributing factors. Arch Intern Med. 2005;165:1842-7.
7. Kripalani S, LeFevre F, Phillips CO, Williams MV, Basaviah P, Baker DW. Deficits in communication and information transfer between hospital-based and primary care physicians: implications for patient safety and continuity of care. JAMA. 2007;297:831-41.
8. van Walraven C, Seth R, Austin PC, Laupacis A. Effect of discharge summary availability during post-discharge visits on hospital readmission. J Gen Intern Med. 2002;17:186-92.
9. Tam VC, Knowles SR, Cornish PL, Fine N, Marchesano R, Etchells EE. Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. CMAJ. 2005;173:510-5.
10. Calkins DR, Davis RB, Reiley P, et al. Patient-physician communication at hospital discharge and patients' understanding of the postdischarge treatment plan. Arch Intern Med. 1997;157:1026-30.
11. Patient Protection and Affordable Care Act of 2010. Pub. L. No. 111-148, 24 Stat. 119§3025. 2010.
12. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. Cochrane Database Syst Rev. 2010:CD000313.
13. Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. Arch Intern Med. 2006;166:1822-8.
14. Jack BW, Chetty VK, Anthony D, et al. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. Ann Intern Med. 2009;150:178-87.
15. Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. Ann Intern Med. 2013;158:397-403.
16. Dudas V, Bookwalter T, Kerr KM, Pantilat SZ. The impact of follow-up telephone calls to patients after hospitalization. Am J Med. 2001;111:26S-30S.
17. Naylor MD, Brooten D, Campbell R, et al. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. JAMA. 1999;281:613-20.
18. Hesselink G, Schoonhoven L, Barach P, et al. Improving patient handovers from hospital to primary care: a systematic review. Ann Intern Med. 2012;157:417-28.
19. Janzen J, Buurman BM, Spanjaard L, de Reijke TM, Goossens A, Geerlings SE. Reduction of unnecessary use of indwelling urinary catheters. BMJ Qual Saf. 2013;22:984-8.
20. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40:373-83.
21. van Walraven C, Mamdani M, Fang J, Austin PC. Continuity of care and patient outcomes after hospital discharge. J Gen Intern Med. 2004;19:624-31.
22. Arora VM, Manjarrez E, Dressler DD, Basaviah P, Halasyamani L, Kripalani S. Hospitalist handoffs: a systematic review and task force recommendations. J Hosp Med. 2009;4:433-40.
23. Johnson A, Sandford J. Written and verbal information versus verbal information only for patients being discharged from acute hospital settings to home: systematic review. Health Educ Res. 2005;20:423-9.
24. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. Lancet. 2003;362:1225-30.
25. Brook RH, McGlynn EA, Shekelle PG. Defining and measuring quality of care: a perspective from US researchers. Int J Qual Health Care. 2000;12:281-95.
26. Hulscher ME, Laurant MG, Grol RP. Process evaluation on quality improvement interventions. Qual Saf Health Care. 2003;12:40-6.
27. Kansagara D, Englander H, Salanitro A, et al. Risk prediction models for hospital readmission: a systematic review. JAMA. 2011;306:1688-98.
28. Allaudeen N, Vidyarthi A, Maselli J, Auerbach A. Redefining readmission risk factors for general medicine patients. J Hosp Med. 2011;6:54-60.
29. 2011 National Patient Safety Goals. 2011. (Accessed 8/6/2013, 2013, at www.jointcommission.org/standards_information/npsgs.aspx.)
30. 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.

31. Greco PJ, Eisenberg JM. Changing physicians' practices. N Engl J Med. 1993;329:1271-3.

32. Grol R, Wensing M. Implementatie. Maarssen: Elsevier Gezondheidszorg; 2007.

33. Mechanic D. Improving the quality of health care in the United States of America: the need for a multi-level approach. J Health Serv Res Policy. 2002;7(Suppl 1):S35-S9.

34. Lanier DC, Roland M, Burstin H, Knottnerus JA. Doctor performance and public accountability. Lancet. 2003;362:1404-8.

35. Hesselink G, Vernooij-Dassen M, Pijnenborg L, et al. Organizational culture: an important context for addressing and improving hospital to community patient discharge. Med Care. 2013;51:90-8.

36. van Noord I, de Bruijne MC, Twisk JW. The relationship between patient safety culture and the implementation of organizational patient safety defences at emergency departments. Int J Qual Health Care. 2010;22:162-9.

37. Mudge AM, Kasper K, Clair A, et al. Recurrent readmissions in medical patients: a prospective study. J Hosp Med. 2011;6:61-7.

38. Beswick AD, Rees K, Dieppe P, et al. Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis. Lancet. 2008;371:725-35.

39. Phillips CO, Wright SM, Kern DE, Singa RM, Shepperd S, Rubin HR. Comprehensive discharge planning with postdischarge support for older patients with congestive heart failure: a meta-analysis. JAMA. 2004;291:1358-67.

40. Bootsma AM, Buurman BM, Geerlings SE, de Rooij SE. Urinary incontinence and indwelling urinary catheters in acutely admitted elderly patients: relationship with mortality, institutionalization, and functional decline. J Am Med Dir Assoc. 2013;14:147-12.