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Enhanced readability of discharge summaries decreases provider telephone calls and patient readmissions in the posthospital setting☆,☆☆

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ABSTRACT

Introduction: Hospital discharge instructions provide critical information necessary for patients to manage their own care; however, often they are written at a substantially higher readability level than recommended (ie, 6th-grade level) by the American Medical Association and the National Institutes of Health. We hypothesize that improving the reading level of discharge instructions will decrease the number of patient telephone calls and readmissions in the posthospital setting.

Methods: We conducted a prospective observational study. Patient discharge instructions were edited and incorporated to enhance the readability level in August 2015. Return telephone call and readmissions of patients admitted before the intervention from August 1, 2014, to January 31, 2015, were compared with the prospective cohort studied from September 1, 2015, to September 30, 2016.

Results: A total of 1,072 patients were included (preintervention: $n = 493$, postintervention: $n = 579$). Patient demographics, injury characteristics, and education level were similar among both groups. The median discharge instruction readability level in the postintervention group was significantly lower (10.0, 95% CI 10.0–10.2 vs 8.6, 95% CI 8.8–8.9; $P < .0001$). The proportion of patients calling after hospital discharge was significantly reduced after the intervention (21.9% vs 9.0%; $P < .0001$). Monthly hospital readmissions were decreased by 50% for every 100 patients discharged after the intervention (1.9% vs 0.9%; $P = .002$). The proportion of patients calling and readmissions for poor pain control significantly decreased after the intervention (7.1% vs 2.59%; $P = .0005$ and 2.8% vs 1.0%; $P = .029$, respectively).

Conclusion: Enhanced readability of discharge instructions was associated with a decrease in the number of telephone calls and readmissions in the posthospital setting, enhancing health literacy and simultaneously reducing the burden on providers. Improved patient instructions written to an appropriate level may also allow for better pain control in the posthospital setting.

Introduction

At a time when there is an abundance of health information available to patients, seemingly little attention is paid to ensuring that the content is written at an appropriate reading level for the average adult in the United States.[1–9] Poor health literacy has been identified as a barrier for patient autonomy and an educational disparity not conducive to appropriate patient care.[10–12] The average adult in the United States reads 5 grade levels lower than their highest educational level obtained.[8,13] The National Adult Literacy Survey demonstrated that close to half of the adult

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population in the United States is either "functionally illiterate," with reading grade levels of 0 to 5, or "marginally literate," with reading grade levels of 6 to 8.[14] The American Medical Association (AMA) and the National Institutes of Health (NIH) recommend that medical information be written at a 6th-grade level or lower.[8,13,15] Adherence to such recommendations is critical because patients with poor health literacy have greater disease burden,[6,16,17] with adverse events as high as 20% in the immediate posthospitalization period.[18,19] Adverse events can be prevented or minimized by improving care at the time of discharge or early in the acute postdischarge transitional phase.[20,21] In particular, improving interpretation of the information patients are discharged with may enhance their understanding of their hospital course and postdismissal requirements.[22–24]

We have demonstrated that the information given at our institution to trauma patients at discharge was written an average of 4 grade levels higher than recommended.[25] Based on literacy status, only 24% of patients had the comprehension skills needed to understand their discharge information and instructions. Consequently, we amended our trauma discharge summaries to reflect a lower reading level. The aim of this study, therefore, is to assess the impact that enhanced readability of patient discharge information has, hypothesizing that improved readability would be associated with fewer postdischarge telephone calls and decreased hospital readmission rates.

Methods

Institutional review board approval was obtained before conducting this study. In August 2015, we instituted a quality improvement change in hospital discharge templates at our trauma center. Participants in the preintervention group (August 1, 2014, to December 31, 2014) were compared with participants in the postintervention group (September 1, 2015, to August 31, 2016). We included all adult patients (≥18 years of age) admitted to and discharged from the trauma service at our institution who had been given hospital discharge summaries. Exclusion criteria included all inhospital mortalities, patients who died within 30 days from the date of discharge, patients discharged with no dismissal summary, and English as a second language (ESL) patients.

Editing of discharge templates

At our institution, discharge summaries are composed of two sections: the first section is meant for medical providers and details the patient's hospital course, pertinent medical information related to the care received, and medications prescribed and to be continued on discharge. The second section is written for the patient and consists of discharge information related to posthospital care. Enhancing the readability of the patient-centered section was the target of our study.

We focused on analyzing the information given to patients at the time of discharge from the trauma service. This analysis included templates referencing care related to abdominal injury, back injury, spine injury and precautions, overall general discharge information detailing pain control medication use, surgical site care, continuing activity, medical testing, follow-up care, and other health information. For example, we amended the following phrase: "You had an Inferior Vena Cava (IVC) filter placed during this hospitalization: this was done for the prevention of respiratory sequelae of thromboembolic disease which commonly occurs after extremity trauma" to read, "You had an Inferior Vena Cava (IVC) filter placed during this hospitalization. This was done to prevent the formation of clots in the blood vessels of your lungs. This is common after an injury to your extremities." As a result of breaking the sentence up into multiple sentences and changing the complex terminology into more easily interpreted phrasing, we decreased the reading level from the 19th-grade to the 6th-grade reading level. The original templates were analyzed using the Flesch Kincaid Grade Level (FKGL) readability calculator built into Microsoft Word 2013 (Microsoft Corporation, Redmond, WA). The FKGL and Flesch Reading Ease Score (FRES) are validated tools used to assess the readability of medical literature.[25,26] A reviewer (A.J.C.) analyzed each sentence of the templates and edited the content to reflect a 6th-grade reading level. Methods to enhance readability included breaking up larger, complex sentences into 2 or more smaller sentences, removal of complex words (with multiple syllables) and replacing them with 1 or more simple words (with fewer syllables), and ensuring the edited templates conveyed an equal meaning. The new version of the templates was analyzed by clinical providers to ensure similar intent of the text and no addition or subtraction of information that could have affected our analysis. The new templates were incorporated into patient discharge instructions starting in September of 2015, with no change in the way the discharge information was provided.

Patient population

The trauma population within our catchment area as a Level 1 trauma center, including regions of southeastern Minnesota, northern Iowa, and western Wisconsin, was studied. At the time of discharge, patients are instructed to call a 24-hours-a-day, 7-days-a-week telephone number available to them for any questions related to their care. In addition, just before discharge each patient discharge summary is reviewed by the patient with the assistance of nursing and ancillary hospital staff to ensure the information for continuing care is clear and well understood. If questions arise, patients are directed to various portions of the discharge summary for revision at a later time if required. The trauma center has a mandatory policy to document all patient interactions via telephone call or in person in the electronic medical record (EMR).

Definitions

Discharge disposition was divided into dependent (eg, nursing home, swing facility, rehabilitation center, at home with health assistance) versus independent (home without health assistance) locations. We identified patients with a traumatic brain injury (TBI) and calculated their Glasgow Outcome Score (GOS) based on physical assessment at the time of discharge.[27] A GOS score of 5 represented good recovery from the TBI; whereas a score of 4 and 3 represented moderate and severe disability, respectively. ESL patients were excluded and were defined as patients who voluntarily stated English was not the primary language of communication. Education level for each patient was based on a questionnaire filled out by patients during a scheduled follow-up, detailing their highest level of schooling completed. Reading skills of each patient were estimated by subtracting 5 grade levels from their highest education level obtained.[28] For this analysis, education level was divided into General Equivalency Diploma (GED) or a higher level education versus non-GED status.[29]

Outcomes

Our primary outcomes were total 30-day postdischarge telephone calls and readmission rates to our institution. Our secondary outcomes included FKGL and FRES assessments of the discharge summaries.

Statistical methods

Continuous data are presented in percentages or mean ± standard deviation or median (interquartile range [IQR]), where appro-

Table 1
Patient characteristics comparing preintervention and postintervention groups

Variables	Preintervention (n = 493)	Postintervention (n = 579)	*P* value*
Age, mean ± SD	56 ± 22	54 ± 23	.23
Male sex, number (%)	310 (63)	374 (65)	.56
Marital status (single of any kind), number (%)	243 (50)	330 (58)	**.01**
Caucasian race, number (%)	463 (94)	535 (92)	.33
ISS median (IQR)	9 (4–14)	10 (6–17)	**< .001**
Blunt mechanism of injury, number (%)	468 (95)	553 (96)	.74
GCS score on admission, median (IQR)	15 (15–15)	15 (15–15)	.87
TBI, number (%)	186 (38)	207 (36)	.50
GOS = 5	178	135	**<.001**
GOS = 4	6	36	
GOS = 3	2	36	
GOS = 1, 2	0	0	
Hospital LOS, median (IQR)	3 (1–7)	4 (2–9)	**< .001**
Independent discharge disposition, number (%)	316 (64)	329 (57)	**.02**

* Statistically significant (**bold**). *GCS*, Glasgow Coma Score; *GOS*, Glasgow Outcome Score; *ISS*, injury severity score; *LOS*, length of stay; *MOI*, mechanism of injury; *TBI*, traumatic brain injury.

priate. Categorical data are presented as proportions and percentages. The Pearson χ^2 square test and analysis of variance were used for categorical data. Analyses of number of telephone calls before and after the intervention were adjusted for patients' GOS at hospital discharge and for independent versus dependent patient disposition. Uniformly and nonuniformly distributed continuous data were compared between the 2 groups using the Student *t* test and Wilcoxon test, respectively. All tests were 2-sided, with statistical significance set at .05. Data analysis was performed using JMP v 9.0 (SAS Institute Inc, Cary, NC).

Results

In this study, a total of 1,072 patients were included: 493 (46%) before implementing the intervention and 579 (54%) afterward. Data for the preintervention group was derived from our earlier study, except for 4 patients who were excluded (death ≤30 days from discharge).[25] Table 1 summarizes the distribution of patient baseline characteristics (including demographics), injury characteristics (Injury Severity Score (ISS), mechanism of injury, Glasgow Coma Scale, TBI, and GOS), hospital length of stay (LOS), and patient disposition for both the preintervention and postintervention groups. There were no differences among the 2 groups with respect to patient age, sex, or race (all $P > .05$). Compared with the preintervention group, the postintervention group had a higher proportion of patients who were single, sustained more severe traumatic injuries, and had a longer hospital LOS (all $P < .05$). Although the proportion of patients with TBI in the postintervention group was not significantly different (38% vs 36%; $P = .50$), there were more patients with GOS less than 5 at hospital discharge (35% vs 4%; $P < .0001$), indicating greater TBI burden, and fewer patients with independent disposition overall (57% vs 64%; $P = .02$). Per study design, there were statistically significant differences in the FKGL and FRES on dismissal summaries and discharge instruction notes between the preintervention and postintervention groups (all $P < .0001$; Table 2).

Education data

Education data were available for most patients: preintervention (310 [63%]) versus postintervention (354 [61%]) groups. A total of 278 patients (90%) in the preintervention group had a GED or higher education level compared with 300 patients (85%) in the postintervention group ($P = .059$). A total of 70 patients (22%) in the preintervention group had a college degree or higher versus 61 patients (17%) in the postintervention group ($P = .084$).

Table 2
Differences in readability scores between preintervention and postintervention groups

Variables, mean ± SD	Preintervention	Postintervention	*P* value*
FKGL total summary	10 ± 1	9 ± 0.9	**< .0001**
FRES total summary	44 ± 7	49 ± 6	**< .0001**
FKGL patient instructions	10 ± 1	8 ± 0.9	**< .0001**
FRES patient instructions	45 ± 10	52 ± 7	**< .0001**

* Statistically significant (**bold**). *FKGL*, Flesch Kincaid Grade Level; *FRES*, Flesch Reading Ease Score.

30-day return telephone calls

A total of 108 telephone calls (21.9%) were made before implementing the intervention, compared with 52 telephone calls (9.0%) after the intervention (OR, 2.8; 95% CI, 1.99–4.06; $P < .00001$). Calls were made by the patient (58% of cases), a family member (20%), a nurse/secretary/medical assistant (20%), or a physician (2%). For every 100 patients discharged, the trauma center would receive an average of 6 telephone calls per month before the intervention, significantly higher than an average of 1 telephone call per month after the intervention ($P < .0001$). The proportion of patients (or patient representatives) calling regarding pain control also decreased (7.1% vs 2.59%; $P = .0005$). There was no significant difference in the number of monthly telephone calls per 100 patient participants with GED versus non-GED status in the preintervention group (7 vs 9; $P = .557$) and the postintervention group (1 vs 1; $P = .892$). There was no significant difference in the FKGL (median [IQR]) of discharge instructions when the patient versus patient representative (eg, spouse, nurse, child, physician) called in both the preintervention group (10.1 [9.0–11.8] vs 10.2 [9.2–11.0]; $P = .537$) and postintervention group (8.3 [8.1–9.4] vs 8.3 [7.9–9.0]; $P = .634$). Also, there was no significant difference in the FKGL (median [IQR]) of discharge instructions between those who called once versus multiple times (9.5 [8.3–11.0] vs 9.4 [8.6–10.3]; $P = .94$).

30-day readmission

Monthly readmissions decreased by 50% for every 100 patients discharged after the intervention (1.9% vs 0.9%; $P = .002$). In particular, readmission attributable to poor pain control significantly decreased after the intervention (2.8% vs 1.0%; $P = .029$). There was no significant difference in the readmission rates between GED versus non-GED status in the preintervention group (1.7% vs 2.5%; $P = .53$) and postintervention group (1.0% vs 1.7%; $P = .21$). More telephone calls were received from patients (or patient representatives) who

were ultimately readmitted compared with those not readmitted before the intervention (14% vs 6%; $P < .0001$) and after the intervention (3% vs 1%; $P < .0001$). Patients who called (or had someone call on their behalf) were more likely to be readmitted compared with those who did not call (OR, 2.3; 95% CI, 1.4–3.8).

Discussion

This study is the first to demonstrate a statistically significant decrease in postdischarge 30-day return telephone calls and 30-day readmissions after improvement in patient-centered communication provided in hospital discharge summaries. This is despite a higher disease burden with greater ISS, hospital LOS, and incidence of TBI in the postintervention period, where one would traditionally expect a greater need for provider care. Our findings suggest that this reduction in provider workload resulted from a greater patient understanding of medical information at the time of discharge, allowing for more autonomy and improved care. Telephone calls for nearly all purposes decreased, with a remarkable reduction in questions related to pain management. Our institutional policy regarding prescription of pain medications did not change during the study period. Although a cause-and-effect relationship cannot be reliably established, there remains a strong possibility that the decrease in telephone calls related to pain management may have been a result of better understanding of multimodality approaches to pain control goals and instructions related to when and how to take pain medications for effective pain relief. This is especially important given the current climate of opioid overprescribing practices.

Effective patient-centered communication can improve care.[30,31] A total of 20%, or more than 35 million patients discharged from the hospital annually in the United States, will have an adverse event within 30 days.[14,18,31] Quality improvement interventions aimed at enhancing patient–provider communication may be able to reduce the rate of adverse events after dismissal. [30,32–36] In our study, enhancing readability of hospital discharge instructions proved to be an easy and effective method in improving communication between patients and providers. To do so, we recommend the use of electronic discharge summaries with templated instructions regarding common topics of postdischarge care (eg, provisions for continued care, pain management, follow-up appointments, wound care, and instructions on use of medical/surgical equipment) written at an appropriate reading level.[37] This includes breaking up larger, complex sentences into 2 or more smaller sentences, with the removal of complex words (with multiple syllables) and replacement of 1 or more simple words (with fewer syllables) wherever acceptable. Defining new or complex terminology and using 1 idea per sentence allows readers to easily follow the thought process of the author. This is particularly helpful for the trauma population, who are more prone to cognitive impairment in the immediate posthospitalization period because of TBI.[38] TBI patients have a cerebral insult immediately after the injury that generally improves over time. Until this period of "cognitive stunning" has passed, the patient will likely have cognitive impairment, leading to an inability to understand postdischarge requirements. Earlier studies show this period of cognitive impairment can last up to 1 year after a TBI.[38–40] Failing to understand concepts of postdischarge patient requirements can lead to detrimental care, resulting in complications and potential readmissions to the hospital from missteps in postdischarge care (Table 3).

Additional methods to improve readability include breaking up long, dense paragraphs by using subheadings, bullet points, and lists, helping readers better comprehend information. Furthermore, reading supplements, such as illustrations, diagrams, and charts, can help elucidate knowledge and care of multistep processes (eg, the use and maintenance of medical equipment). Finally, audiovisual aids can be incorporated into electronic discharge instructions by providing links to online-accessible resources. Attention to the original intention of the text is critical to ensure consistency of meaning after editing.

Enhanced readability of written information is just one approach to effective communication that can improve overall patient care. Improving written communication in other ways should also be considered. Patients are often discharged with an abundance of paperwork, and it can be overwhelming to find information for continuing care that may be buried within other discharge information.[37] Where possible, information should be limited to that which is pertinent to continued postdischarge care. Attention should be paid to include critical information concisely within the discharge paperwork as one clear and quickly referenced document that can be reviewed when needed. Discharge information should be reviewed with patients, using a teach-back technique to confirm understanding.[31] This allows patients to take notes and clarify any points that they may not plainly understand while still in the hospital with access to care providers. In addition, help from family, close relatives, and other individuals involved in the patient's postdischarge care allows patients to have an immediate support group if needed (Table 4).

Amid a considerable reduction in telephone calls, we also noted a statistically significant decrease in 30-day readmissions to the hospital. Among reasons for readmissions, we noted an increase in issues related to respiratory causes, perhaps related to the increase in chest wall trauma encountered in the postintervention cohort. However, there was a statistically significant decrease in readmissions related to poor pain control despite an increase in patients with rib fractures, which are known to cause acute pain-related issues. Failures in communication can lead to avoidable complications and hospital readmission. With enhanced readability, patients may be able to avoid missteps in communication and better understand what is required of them in the posthospital setting.

Table 3
Comparison of postdischarge telephone calls among preintervention and postintervention groups

Comparisons	Preintervention (n = 493)	Postintervention (n = 579)	*P* value
Patients making telephone calls, number (%)	108 (22)	52 (9)	< .0001
$\frac{\text{Number of phone calls}}{\text{100 Patients}}$ per month	6	1	< .0001
Reasons for telephone calls (%)			
Question related to the surgical site/wound	18 (12)	16 (25)	.01
Discharge care question	22 (14)	10 (16)	.75
Symptoms related to admission or new symptoms	34 (22)	11 (17)	.45
Question about medications	22 (14)	6 (10)	.35
Question regarding pain control	48 (31)	17 (27)	.56
Question about medical equipment	10 (6)	2 (3)	> .05
Other	1 (1)	1 (2)	> .05

Table 4
Methods to enhance patient-centered written communication

Enhancing the readability of a text
• Whenever possible, use electronic discharge summaries with templated discharge instructions written at an appropriate readability level
• Use simple words with 1 or 2 syllables rather than complex words with multiple syllables
• Break up large, complex sentences into 2 or more smaller sentences that present 1 train of thought, allowing readers to understand the writer's message
• Define any new or complex terminology
• Use an active rather than passive voice when writing
• Use transition words that connect sentences, allowing readers to easily navigate the text (eg, first, second, furthermore, finally, etc)
• Limit the amount of information to what is relevant to the patient's care.
• Avoid giving redundant information in multiple sources such as in pamphlets, fliers, etc
• Break up long, dense paragraphs with subheadings, bullet points, lists, etc
• Summarize important points in short sentences
• Highlight important ideas in bold font
Use additional aids to help clarify information
• Use illustrations, diagrams, and charts to help elucidate knowledge of multistep processes
• Use audiovisual aids that can be incorporated in electronic discharge information available to patients via an electronic device
Review critical information at the time of discharge
• Review discharge information with patients at the time of discharge using a teach-back method to confirm understanding
• Incorporate family and individuals closely involved in the patient's postdischarge care when reviewing key information

Limitations

Our study has several limitations. First, we had no direct way to assess patient reading-comprehension skills at the time of hospital discharge. We used the patient's highest educational level obtained on a follow-up questionnaire to estimate their reading skill; however, actual comprehension may differ from our calculations. Second, hospital discharge information from other services, such as orthopedic trauma or neurosurgery, was not edited to a 6th-grade reading level, and as a result, these portions of the summaries were written at a higher reading level, which influenced the overall readability level of dismissal summaries. Return telephone calls and readmissions that are directed toward other services were not studied in both cohorts. Care was taken to keep the rest of our dismissal process the same among the two groups to minimize confounding factors that could have affected our results. Our policy regarding discharge instructions, pain medications, and dismissal process remained the same between the two study cohorts. However, we acknowledge that unknown confounders might have potentially influenced our findings. Most of the trauma population that presents to our institution is from our catchment area as a Level 1 trauma center. Patients often follow-up within our hospital-health system, including satellite facilities for additional care as instructed. However, telephone calls and readmissions to hospitals outside our health system may still have been possible, prohibiting us from accounting for such encounters. If patients decided to call or refer to other sources, such as a primary care or a rehabilitation center provider, those instances may not have been documented and accounted for unless expressed by patients and documented on their medical records. The exact effect these undocumented queries have is undetermined, particularly because these providers would have had the benefit of interpreting an enhanced reading-level document. Last, ESL patients were not included in our study. This was by design for two reasons: the degree to which ESL patients comprehended discharge instructions was unclear, hence to study similar cohorts, this population was excluded from both cohorts. In addition, this population was <5% of the total population studied, prohibiting us from achieving enough power to effectively study a difference between these groups of patients. We acknowledge that these patients represent a considerably different patient population because language itself becomes a noteworthy barrier to patients' posthospitalization education. Our results may not be generalizable to other centers with a large ESL and non-GED population. Additional studies looking at the effect of enhanced readability in both populations is warranted.

In conclusion, our findings add valuable information to existing data on improving patient comprehension of medical information. Enhancement in discharge summary readability may lead to better patient and provider experiences, allowing for greater patient autonomy and a reduction in the provider's workload. In the current climate of opioid overprescribing practices, improved patient instructions on use of pain medications via enhanced readability may allow for fewer postdischarge follow-up pain issues. This likely can result in fewer telephone calls and hospital readmissions related to poor pain control. Future studies should be pursued to assess the generalizability of enhanced readability impact on postdischarge care.

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