Readability of patient discharge instructions with and without the use of electronically available disease-specific templates

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ABSTRACT

Objective Low health literacy is common, leading to patient vulnerability during hospital discharge, when patients rely on written health instructions. We aimed to examine the impact of the use of electronic, patient-friendly, templated discharge instructions on the readability of discharge instructions provided to patients at discharge.

Materials and Methods We performed a retrospective cohort study of 233 patients discharged from a large tertiary care hospital to their homes following the implementation of a web-based “discharge module,” which included the optional use of diagnosis-specific templated discharge instructions. We compared the readability of discharge instructions, as measured by the Flesch Reading Ease Level test (FREL, on a 0–100 scale, with higher scores indicating greater readability) and the Flesch–Kincaid Grade Level test (FKGL, measured in grade levels), between discharges that used templated instructions (with or without modification) versus discharges that used clinician-generated instructions (with or without available templated instructions for the specific discharge diagnosis).

Results Templated discharge instructions were provided to patients in 45% of discharges. Of the 55% of patients that received clinician-generated discharge instructions, the majority (78.1%) had no available templated instruction for the specific discharge diagnosis. Templated discharge instructions had higher FREL scores (71 vs. 57, P < .001) and lower FKGL scores (5.6 vs. 7.6, P < .001) compared to clinician-generated discharge instructions.

Discussion The use of electronically available templated discharge instructions was associated with better readability (a higher FREL score and a lower FKGL score) than the use of clinician-generated discharge instructions. The main reason for clinicians to create discharge instructions was the lack of available templates for the patient’s specific discharge diagnosis.

Conclusions Use of electronically available templated discharge instructions may be a viable option to improve the readability of written material provided to patients at discharge, although the library of available templates requires expansion.

Keywords: health literacy, care transitions, hospital medicine, health information technology

BACKGROUND AND SIGNIFICANCE
Low levels of literacy are common in the US adult population, with a reported 21–23% of adults exhibiting inadequate literacy proficiency.¹ Further, an additional 27% of adults find it difficult to understand written health education materials, reflecting a widespread lack of health literacy in the general population.² In our current healthcare system, providers often communicate instructions to their patients in written form, which includes consent forms, educational pamphlets, medication instructions, legal forms, and discharge instructions, among others. Given the importance of these types of communications, patients with low literacy are vulnerable during interactions with the healthcare system. Indeed, much research has demonstrated the association between low literacy and poor clinical outcomes.³⁻⁹

Given the demonstrable safety concerns related to literacy and patient outcomes, in 2007, the Joint Commission on Accreditation of Healthcare Organization added health literacy benchmarks for hospitals to achieve.¹⁰ As stated by the Commission, a multi-faceted solution is necessary to adequately address the health literacy problem and make healthcare safer for the general population, including contributions from policy makers, hospital administration, as well as individual practitioners.¹¹ As part of this approach, it is incumbent on providers to improve the readability of written healthcare information and offer patient-friendly educational material to help patients understand their medical condition and its treatment.² To this end, a number of government-sponsored health literacy sites recommend providing easily readable written health information materials, ideally written at a level below a seventh grade reading level.¹¹⁻¹³

Discharge from the hospital to home, at which time patients are provided written discharge instructions detailing their clinical condition, medication changes, and other instructions as to how to maintain their health once they are at home, is a point during their interaction with the healthcare system when patients are particularly vulnerable. Many physicians rely on the written materials they send home with their patients to reinforce or further explain information reviewed with patients during their hospitalization, although this information is often written at a grade level that is too high for most patients to
understand. This is further substantiated by recent data demonstrating patients’ lack of understanding of provided discharge instructions.

**OBJECTIVE**

To implement an electronic discharge module that includes optional use of diagnosis- or procedure-specific, patient-friendly, templated discharge instructions and to study its impact on the readability of discharge instructions provided to patients.

**MATERIALS AND METHODS**

**Study Design**

We performed a retrospective cohort analysis of patients discharged from Brigham and Women’s Hospital (BWH), a 700-bed tertiary care center in Boston, Massachusetts. Data were obtained from a review of electronic medical records. Our study protocol was approved by the Partners Healthcare Human Subjects Review Committee.

**Study Population**

Patients were eligible for study inclusion if they were 18 years of age or older and discharged from any service at BWH to their home between October 2011 and September 2012. Patients were only included in the study if they received discharge instructions at the time of their discharge. Patients were excluded from the study if they died prior to hospital discharge, were transferred to another acute care hospital, were discharged to a rehabilitation facility or hospice, or left the hospital against medical advice. Of the patients meeting these criteria, 245 patients were randomly selected for inclusion in this study.

**BWH Discharge Module and Templated Discharge Instructions**

In September 2011, BWH initiated a web-based “discharge module,” a hospital-wide quality improvement initiative to improve discharge documentation and communication of the post-discharge care plan to patients discharged from the hospital as well as their post-discharge providers. The module incorporates a number of features that aim to enhance the quality of the hospital discharge, including, but not limited to, optional inclusion of diagnosis-specific templated discharge instructions.

The diagnosis-specific templated discharge instructions were created in coordination with the discharge instruction patient education committee, consisting of physicians and nurse educators with expertise in plain-language principles. This committee created a discharge template design, which was then distributed to specialty-appropriate providers who drafted the content for each specific discharge diagnosis and/or procedure. The most common diagnoses at discharge were the first to be drafted, with an expansion of the work to include more diagnoses thereafter. Each draft was then re-reviewed by the discharge instruction committee, and each drafted set of templated discharge instructions was further edited and formatted using plain-language principles. Then, the templated discharge instructions were sent back to the submitter for review. If submitters made any additional changes to the instructions, the discharge instruction committee would edit them again, and this process was repeated until a consensus on the instructions was reached. The final draft of the disease-specific templated discharge instructions was then uploaded to the web-based discharge module.

Once available in the module, providers completing the electronic discharge paperwork were free to access the templated discharge instructions via a drop-down or searchable menu. There were no incentives, financial or otherwise, for providers to use the templates, other than their ease of use and the quality of the materials. If accessed, these templated instructions were available for inclusion without modification or were able to be modified via free-text, at the discretion of the discharging provider (Figure 1). At the time of the study, templated discharge instructions were available for 140 different diagnoses and/or procedures.

**Literacy Outcomes**

The readability of discharge instructions was measured using the Flesch Reading Ease Level (FREL) scale and the Flesch-Kincaid Grade Level (FKGL) scale, as reported by Microsoft Office Word®, v2007 (Microsoft, Redmond, WA, USA), which has been shown to have high correlation to manual computation of these scores.

The FREL test measures the readability of text written between a fifth grade level and a college-graduate level by utilizing a mathematic formula based on two variables: average sentence length (the number of words divided by the number of sentences) and average number of syllables per word (the number of syllables divided by the number of words). The score derived from the formula ranges from 100 (very easy to read) to 0 (unreadable). The FKGL test is a modified version of FREL, which utilizes the same two variables (average sentence length and average number of syllables per word), but generates a readability score in the format of a grade level. For example, a document that received an FKGL score of “8” would indicate an eighth grade reading level. The FKGL test is the standard readability test of the United States Department of Defense. These measures of readability demonstrate high correlation with other readability formulas, including Fry and SMOG, among others.

**Data Analysis**

Frequency of use of the templated discharge instructions was first measured by manually comparing each patient’s discharge instructions with the templated instructions available in the discharge module. Each set of discharge instructions was then categorized into one of four categories: (1) clinician-generated discharge instructions, no templated instructions available for the specific discharge diagnosis; (2) clinician-generated discharge instructions, templated instructions available for the discharge diagnosis and not used; (3) templated discharge instructions used with modification; or (4) templated instruction used without modification. Categories of discharge instructions were then dichotomized into clinician-generated discharge instructions (1 and 2) and templated discharge instructions (3 and 4).

We examined patient characteristics, including sex, age, race, and readmission status between discharges that provided templated discharge instructions versus clinician-generated discharge instructions, using the t-test for continuous variables and the chi-square test for categorical variables (SAS statistical software, v9.3; SAS Institute, Cary, NC, USA). We then evaluated readability (using the FREL and FKGL test) in templated versus clinician-generated discharge instructions, using t-test statistics. Sub-group analyses compared the readability of templated discharge instructions and clinician-generated discharge instructions, excluding discharges in which templated instructions were unavailable for the specific discharge diagnosis. This was done to eliminate confounding due to the possibility that patients with diseases that did not have templated instructions available may have had more complex conditions. An additional sub-group analysis compared readability between discharge instructions that used modified and non-modified templated instructions.

Sample size calculations demonstrated that we needed approximately 200 patients to have 80% power to demonstrate a difference.
in the proportion of discharge instructions with an FKGL (grade level) <7 (the recommended level of written health-related material) of 50%, without the use of templated discharge instructions, and 70%, with the use of templated instructions. These calculations assumed an alpha of 0.05 and that templates were used for one-third of the discharges in the sample set. We chose power calculations based on proportions (rather than mean FKGL score), because we did not have baseline data on the means and standard deviations. Because these calculations were based on rough estimates, we enrolled 245 patients to ensure adequate power.

RESULTS
Of the 245 randomly selected patient discharges, an additional 10 (4.9%) were subsequently excluded, due to death before discharge (n = 8), discharge to hospice (n = 1), or leaving against medical advice (n = 1). An additional two patients were excluded because the discharge instructions they had been provided with were not available. Our final cohort consisted of 233 patients discharged to home with discharge instructions available.

The mean age of the cohort was 58. In total, there were 213 distinct discharge diagnoses, although many diagnoses were related to one another (for example, “Atrial Fibrillation” versus “Atrial Fibrillation with Rapid Ventricular Rate,” or “Cellulitis of the hand” versus “Cellulitis of the foot”). Compared to patients who received templated discharge instructions, those who did not receive templated instructions were slightly younger, were more likely to be discharged from a cardiology or orthopedics service (with a cardiovascular or orthopedic diagnosis), and were more likely to be readmitted within 30 days of discharge (Table 1). There was no single diagnosis or group of diagnoses that accounted for the majority of the use of templated discharge instructions. Similarly, there was no diagnosis that accounted for the majority of clinician-generated discharge instructions, with a maximum of four clinician-generated instructions for the same diagnosis.

Of the 233 patient discharges in the study, 128 (55%) patients were provided clinician-generated discharge instructions and 105 (45%) were provided templated discharge instructions, using 94 distinct templates. Of the 128 patient discharges in which clinician-generated discharge instructions were provided, there were no available templated instructions for the specific discharge diagnosis in 100 (78.1%) discharges, and there were available disease-specific template discharge instructions that were not used in 28 (21.9%) discharges. Of the 105 patient discharges in which patients were provided templated discharge instructions, 52 (49.5%) of those instructions were modified and 53 (50.5%) were used without modification (Figure 2).

In the readability analysis, the mean FREL score of templated discharge instructions was 71, versus 57 for clinician-generated discharge instructions (P < .001). The mean FKGL score of templated discharge instructions was grade 5.6, versus grade 7.6 for clinician-generated discharge instructions (P < .001) (Figure 3). These findings did not change when we excluded discharges in which templated instructions were unavailable for the specific discharge diagnosis (an FREL score of 71 versus 58.4, P < .001, and an FKGL score of grade 5.6 versus grade 7.8, P < .001). Of the 128 clinician-generated discharge instructions, 62 (48.4%) had an FKGL score < 7 compared to 99 of the 105 (94.3%) of templated discharge instructions.

In the sub-group analysis, the FKGL score of discharge instructions did not differ significantly when templated instructions were modified versus used without modification (grade 5.8 versus grade 5.5, P = .15). We did note a slightly statistically significantly lower FREL score for modified templated discharge instructions versus templated instructions without modification (69.1 versus 72.9, P = .02).
DISCUSSION

In this evaluation of 233 patients discharged from a large academic hospital following implementation of a web-based discharge module, we found that templated discharge instructions were provided to patients 45% of the time and that templated discharge instructions had better readability statistics (a higher FREL score and a lower FKGL score) than clinician-generated discharge instructions. Discharges that used templated instructions had an average grade level of 5.6, well within the recommended reading level of written health-related material provided to patients.\(^7,11–13\) Also, we found that modification of templated instructions, which may lead to more customized messages for personalized patient care, did not appreciably detract from readability. In contrast, clinician-generated discharge instructions had an average grade level of 7.6, higher than the recommended reading level of written health-related material provided to patients.

Of all the discharges that used clinician-generated discharge instructions, in 78%, there was no available template for the specific discharge diagnosis; that is, this was the major reason for clinicians creating the discharge instructions themselves. Upon closer examination of the discharges in which templated instructions were unavailable, no single diagnosis or group of diagnoses was identified as comprising the majority (or even a substantial minority) of these

### Table 1: Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Entire cohort</th>
<th>Use of templated discharge instructions(^*)</th>
<th>(\text{*P-value})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 233)</td>
<td>Yes ((n = 105))</td>
<td>No ((n = 128))</td>
</tr>
<tr>
<td>Male sex, (n (%))</td>
<td>117 (50.2)</td>
<td>56 (53.3)</td>
<td>61 (47.7)</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>58.3 (17.0)</td>
<td>61.4 (16.2)</td>
<td>55.9 (17.4)</td>
</tr>
<tr>
<td>Race/ethnicity, (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>183 (78.5)</td>
<td>83 (79.0)</td>
<td>100 (78.1)</td>
</tr>
<tr>
<td>Black</td>
<td>26 (11.2)</td>
<td>12 (11.4)</td>
<td>14 (10.9)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>15 (6.4)</td>
<td>5 (4.8)</td>
<td>10 (7.8)</td>
</tr>
<tr>
<td>Asian</td>
<td>5 (2.2)</td>
<td>3 (2.9)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (1.7)</td>
<td>2 (1.9)</td>
<td>2 (1.6)</td>
</tr>
<tr>
<td>Discharge service, (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine(^2)</td>
<td>49 (21.0)</td>
<td>14</td>
<td>35</td>
</tr>
<tr>
<td>Hematology/Oncology</td>
<td>34 (14.6)</td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td>Cardiology</td>
<td>43 (18.5)</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Surgery(^5)</td>
<td>65 (27.9)</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Orthopedic Surgery</td>
<td>18 (7.7)</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>12 (5.1)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Neurology</td>
<td>6 (2.6)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Urology</td>
<td>6 (2.6)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Discharge diagnosis category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>60 (25.8)</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>Hematologic/Oncologic</td>
<td>35 (15.0)</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Infectious</td>
<td>29 (12.4)</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Neurologic</td>
<td>22 (9.5)</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>19 (8.1)</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>14 (6.0)</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Other Medical</td>
<td>33 (14.2)</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Other Surgical</td>
<td>21 (9.0)</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Length of stay, mean (SD)</td>
<td>5.4 (6.2)</td>
<td>6.0 (5.8)</td>
<td>5.0 (6.6)</td>
</tr>
<tr>
<td>Readmitted within 30 days, (n (%))</td>
<td>43 (18.1)</td>
<td>12 (11.4)</td>
<td>31 (24.2)</td>
</tr>
</tbody>
</table>

SD, standard deviation. \(^*\)\(P\)-values representative of comparison between “Yes” and “No” use of templated discharge instructions. \(^\dagger\)Use of templated discharge instructions includes use with or without modification. \(^\ddagger\)Medicine services include: General Medicine, Endocrinology, and Renal Medicine. \(^\S\)Surgery services include: General Surgery, Cardiac Surgery, Plastic Surgery, Thoracic Surgery, and Vascular Surgery.
discharges. Although this may potentially reflect an artifact of our randomly selected cohort, it is likely representative of hospital-wide discharges and, therefore, showcases the difficulty of creating disease-specific templates. With such a range of discharge diagnoses, it may be difficult to have discharge instruction templates for each potential diagnosis. Despite these difficulties, we found a variable degree of overlap between the distinct discharge diagnoses (eg, “cellulitis of the hand” and “cellulitis of the foot”). Therefore, those diagnoses with a higher degree of overlap may be leveraged to produce a single discharge instruction template (eg, a single discharge instruction template for “cellulitis”). Further, as our findings demonstrate, customization of templated discharge instructions may be accomplished without deleterious effect on the overall readability of the instructions, although understanding the readability of the modifications themselves and ensuring that our findings are consistent with broader use will require further study.

Our finding that templated instructions were more readable than clinician-generated instructions persisted even after excluding discharges that had no available templated discharge instructions for the specific discharge diagnosis. This makes it less likely that our findings were simply due to the fact that this latter group represents patients with a more complicated set of diagnoses that may falsely worsen readability scores.

Our findings add valuable information to existing data on literacy-related interventions. Much prior literature has examined the association between various literacy measures and general health outcomes, including risk of hospitalization and mortality.5,8,9 In these studies, a number of literacy-related health information technology interventions have been developed and studied and have exhibited varying degrees of success.20 However, the majority of such interventions occurred in the outpatient clinical setting, with a focus on patient education regarding preventative health measures21,22 or the development of specific disease-related information,23,24 which is a distinct process from...
developing instructional material to provide to patients at the time of discharge. Existing research has established that the observed association between low literacy and poor health outcomes, including demonstrated knowledge deficits related to discharge instructions and increased 30-day post-hospital healthcare utilization among low-literacy patients, also persists specifically at the time of discharge. Although some literature describes multi-faceted interventions at the time of discharge that include literacy-related components, there is a dearth of literature examining isolated literacy-related interventions and health information technology interventions aimed at educating patients expressly at the time of discharge. Existing data has primarily focused on the utilization of illustrated medication instructions to improve medication adherence and prevent medication-related errors, an intervention initially developed in the outpatient clinical setting but adapted for use at the time of patient discharge. Hayes et al. reported on an intervention that provided patients discharged from an emergency room with computer-generated discharge instructions, written in large print and at a fifth grade reading level, demonstrating that patients who received the intervention demonstrated significantly more knowledge of their prescribed medications than control patients. Because our intervention covers patient education beyond medications alone, our findings of improved readability statistics with the use of electronically available templated discharge instructions versus clinician-generated discharge instructions is an important contribution to this body of literature.

However, our findings are subject to several limitations. First, and most notably, there was no patient input or review during development of the templated discharge instructions. Although these materials were created by a committee with expertise on plain-language principles, patient testing was not included in the development process, and, therefore, key measures of comprehension may have been missed, which should be incorporated with further refinement of these materials.

Secondly, because this is not a randomized controlled trial, we cannot exclude the possibility that providers chose not to use templated instructions (when available) specifically for patients with more complex disease states, hospital courses, or post-discharge care plans, which would make the FKGL score of the written materials higher. However, the more likely explanation for the difference in reading level is that it is a function of the carefully constructed language used in these templates.

Third, the FREL and FKGL test are general literacy measures of readability and do not specifically address health literacy, which often incorporates measures of comprehension (patient-centered) as opposed to readability (text-centered) and, therefore, may not be reflective of the nuances of patient comprehension of a composite text comprised of various components, as is the case with discharge instructions. Common tests used to measure a patient’s health literature comprehension include the Test of Functional Health Literacy in Adults or its shortened version, the S-Test of Functional Health Literacy in Adults. Although these tests are very useful in the clinical setting and address the nuances of patient comprehension, measures of readability are more practical in administrative and policy settings when working to design patient-friendly written material. Given the ease of measurement of readability with available computer software programs that measure FREL and FKGL, as well as their high correlation with other measures of readability, we believe these measures are good options to utilize as a first step when designing and testing literacy-friendly written health material. Next, although these measures have high correlation with other readability measures, because computer software programs recognize each period as the end of a sentence, abbreviations, numbers with decimals, and bullets may lower the FKGL score and underestimate text difficulty. Additionally, just because those providers who do customize instructions currently do so without loss of readability, this does not mean the same would be true if a hospital broadens these efforts and encourages more providers to use and customize templates. Further, we did not conduct a line-by-line analysis of the modifications to templates made by users to determine the readability of the changes themselves or qualitatively examine the kinds of changes that were made. Anecdotally, we noted that modifications included both “positive” changes (ie, personalizing the message to the patient/caretakers) and “negative” changes (ie, use of medical jargon). Future studies should include a detailed mixed methods analysis of modifications made to templated instructions.

Lastly, this is a single site study, and, therefore, our findings may not be generalizable to other institutions, particularly given site differences involving health information technology and how it is applied to the discharge process. However, although the specifics of the proprietary “discharge module” software are site-specific, the concept of having electronically available templated discharge instructions are generalizable to any electronic medical record system.

CONCLUSION

In conclusion, our findings demonstrate that the use of electronically available templated discharge instructions may be a viable option to improve the readability of the written material we provide to patients at the time of discharge. Future research is needed to determine whether our observed improvement in readability of templated discharge instructions correlates with improved patient outcomes, including patient understanding of discharge instructions as well as clinical outcomes such as adverse events and healthcare utilization. In addition, given the large number of discharge diagnoses that lacked corresponding templated instructions, it will be necessary to broaden the library of electronically available templated instructions, which will likely require increasing the modifications of these instructions, necessitating continued close examination of their readability/applicability and patient outcomes to ensure that our observed findings persist.

CONTRIBUTORS

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COMPETING INTERESTS

S.K.M. – None. K.G. – None. R.B. – None. J.L.S. – Dr. Schnipper is a recipient of a grant from Sanofi-Aventis to conduct an investigator-initiated study of a multi-faceted intervention to improve transitions of care in patients discharged from the hospital on insulin. In addition, in the past 3 years, he has been a consultant for QuantiaMD, assisting in development of patient- and provider-facing educational materials related to medication safety, and to the Society of Hospital Medicine, as a mentor in their Glycemic Control Mentored Implementation project.

PRIOR PRESENTATIONS

The findings reported in this study were presented at the Society of Hospital Medicine 2014 Annual Meeting in Las Vegas, NV.
REFERENCES


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