A Discharge Planning Template for the Electronic Medical Record Improves Scheduling of Neurology Follow-up for Comanaged Seizure Patients

abstract

OBJECTIVE: We examined whether the addition of a standardized discharge planning template (DPT) for the electronic medical record facilitated scheduling of outpatient neurology follow-up appointments in children hospitalized with seizures.

METHODS: We reviewed medical records of patients discharged from a children's hospital with a diagnosis of seizures between January 2012 and June 2013. The study cohort included children who were admitted to the hospitalist service with neurology service comanagement. To facilitate interdisciplinary communication around discharge planning, a DPT was added to the neurology consult note in July 2012. Multivariate regression was used to determine whether the postimplementation time period was associated with the primary outcome (scheduling of outpatient neurology follow-up before discharge).

RESULTS: The final cohort included 300 patients, of whom 101 (34%) were discharged before implementation of the DPT, and 199 (66%) were discharged postimplementation of the DPT. The odds of having a neurology follow-up appointment scheduled before discharge was significantly higher after implementation of the DPT (adjusted odds ratio 2.8, 95% confidence interval 1.7–4.8) and for weekday as compared with weekend discharges (adjusted odds ratio 2.2, 95% confidence interval 1.2–3.9).

CONCLUSIONS: A discharge planning template for the electronic medical record can standardize the flow of discharge-related information between disciplines and may help expedite transitional care planning for hospitalized children, especially those with multiple consultants involved in their care. Given the inherent barriers to arranging outpatient services over the weekend, additional strategies may be necessary to enhance transitional care planning for patients going home over the weekend.

Failure to adequately prepare hospitalized patients and their caregivers for transition to the outpatient setting can lead to medication errors, overlooked test results, and unnecessary readmissions.1–5 Effectively transitioning children from hospital to home has become more challenging as pediatric inpatients become increasingly complex.6,7

The American Academy of Pediatrics clinical report on physicians’ roles in coordinating care of hospitalized children includes the recommendation to make referrals for all outpatient services before discharge.8 Scheduling outpatient follow-up appointments before discharge may actually improve outpatient follow-up attendance as shown in studies from the inpatient and emergency department settings.9,10 In the case of some pediatric patient populations, outpatient follow-up or
receipt of outpatient subspecialist services has been associated with lower likelihood of readmission. Efforts to improve coordination of subspecialist outpatient services before patients leave the hospital may therefore result in improved outcomes.

As part of a national discharge collaborative, a quality improvement (QI) team at our children’s hospital examined discharge processes for children hospitalized with seizures. One of the focuses of this work was to evaluate discharge-related communication between hospitalists and consulting neurologists and to develop a standardized approach to interdisciplinary information transfer. The resulting product was a standardized discharge planning template (DPT) for the neurology consult note within the electronic medical record (EMR). The DPT was designed to include information about patient discharge criteria, outpatient neurology follow-up, and needed outpatient tests. The objective of this study was to examine whether use of the DPT was associated with an increase in scheduling of outpatient neurology follow-up appointments before discharge.

**METHODS**

**Study Setting and Population**

This study occurred at Children’s Hospital Colorado, a 413-bed freestanding tertiary care teaching hospital with >13000 inpatient admissions,~300 nonelective admissions for seizures annually. We participated in a Children’s Hospital Association Discharge Collaborative from October 2011 through October 2012, and this project was 1 of several process improvement initiatives that emerged during the collaborative. Key aims of the collaborative were to create a safer, more efficient, and effective discharge process and to facilitate communication and transparency between disciplines regarding transitional care planning. The study was deemed to be a QI project and was approved by the Children’s Hospital Organizational Research Risk and Quality Improvement Review Panel, precluding the need for institutional review board approval. We included all patients admitted to a Children’s Hospital Colorado hospitalist service with a diagnosis of seizure, comanaged with a neurologist, and discharged from the hospital between January 2012 and June 2013. We excluded electively admitted patients and those discharged from intensive care, subspecialty services, or the epilepsy monitoring unit. To ensure that only comanaged patients were studied, we also excluded patients whose chart did not have any written documentation from neurology or whose only neurology written documentation included a procedure note (EEG interpretation).

**Study Timeline**

The study occurred between January 2012 and June 2013 (Fig 1). The study time period coincided with the Discharge Collaborative and availability of process improvement specialists and information technology resources to support data collection and analysis.

**Process Mapping and Intervention**

Process mapping and development of the DPT occurred between January and June 2012. An initial version of the DPT was implemented in July 2012, and the DPT was amended in October 2012 (Fig 1).

During the development phase, we elicited feedback from hospitalists, pediatric residents, and neurologists about potential problems with discharge-related communication between the consulting neurology service and the primary hospitalist team. Process mapping (Fig 2) revealed that discharge-related communication often occurred at the end of hospitalization, making it difficult for the primary team to arrange outpatient follow-up. Discharge-related information exchange was sometimes verbal rather than written, and pediatric residents or hospitalists sometimes called neurologists to clarify discharge criteria or to ask whether the patient needed to be seen by the inpatient neurologist on the day of discharge. Outpatient neurologists reported that some families were receiving unrealistic neurology clinic follow-up scheduling instructions and that tests recommended for the outpatient setting were not always completed before the follow-up neurology visit.

To standardize transfer of information and facilitate discharge-related communication between the neurology and hospitalist teams, we designed a DPT for the existing neurology consult note template within the EMR. The DPT was designed with input from both neurologists and hospitalists, specifically for use in the setting of hospitalist service patients for whom...
the neurology service was consulted. We established consensus on the final design of the DPT by presenting it for review at both neurology and hospitalist department meetings.

The template initially comprised 2 parts: “neurology criteria for discharge” and “outpatient planning.” (Fig 3) The neurology criteria for discharge section provided the primary team with parameters on when a patient might be ready to go home from the neurologist’s perspective and whether the neurologist needed to see the patient on the day of discharge. The outpatient planning section provided guidance on outpatient neurology follow-up and recommendations for additional outpatient imaging studies or other tests. The latter section solicited inputs on timing of neurology follow-up and choices of specific neurology provider types or names. This would allow primary team residents and resident liaisons to schedule appropriately through the neurology clinic or at least to include accurate scheduling advice in the discharge instructions.

Introduction of the DPT coincided with a bedside nursing QI initiative to add or update the patient’s seizure action plan (SAP) before hospital discharge. Three months after its initial implementation, the DPT was amended to include a third section, which provided the nurses with more guidance on accurately completing the patient’s SAP (Fig 2).

Data Collection and Outcomes

Monthly reports were generated for all hospitalist service patients with a diagnosis-related group of seizure (APR-DRG-053), discharged between January 2012 and June 2013. The reports also included primary admitting service and admission/discharge date from which we were able to delineate different inpatient teams and to determine length of stay (LOS) as well as weekend versus weekday discharge.

For each patient’s hospitalization, use of the DPT in neurology consult documentation was determined by chart review. Although the DPT automatically populates neurology consult note templates, the note writer has the ability to manually delete the DPT so that not all finalized neurology consult notes necessarily include the DPT. The note writer may also use an alternative note template that does not include the DPT.

We determined whether neurology follow-up was scheduled before discharge from review of discharge instructions to the parents of each discharged patient. These instructions include all actual scheduled appointments or recommendations for the family to schedule appointments and are documented within the EMR. A printed version is provided to the family at discharge. We counted documentation of a follow-up date and time with the neurology clinic/provider in the discharge instructions as a scheduled appointment. Instructions such as “neurology schedulers will be contacting you to schedule follow-up” or lesser/absent details about follow-up were counted as appointment not scheduled.
The primary outcome was whether a follow-up neurology appointment had been scheduled before hospital discharge (yes/no). The primary predictive variable was time period: 6 months preimplementation or 12 months postimplementation of the DPT. Covariates included LOS categories and weekday versus weekend discharge.

**Analysis**

We conducted bivariate analysis using the χ² test. Multivariable logistic regression was used to test the association between the primary predictive variable (time period pre- or post-DPT implementation) and the primary outcome (scheduling of outpatient neurology follow-up before discharge), adjusting for available covariates. For the purpose of the analysis, the postimplementation period combined the time period of both initial DPT and amended DPT use because we did not find a significant difference in rates of DPT use before and after the amendment occurred (see Results). Given the skewed distribution of the LOS variable, we performed the analysis with the log-transformed LOS as a continuous variable versus LOS categories and found no difference in the results. LOS categories were used in the final analysis for ease of interpretation. Analysis was performed by using SAS v.9.3.

**RESULTS**

The final cohort included 300 patients, of whom 101 (34%) were discharged before implementation of the DPT and 199 (66%) were discharged postimplementation of the DPT. For the overall patient cohort, 171 (57%) had a DPT in the chart, and 106 (35.3%) had a neurology follow-up appointment scheduled before discharge. The most common LOS category was 1 to 2 days (53.3%), followed by 3 to 4 days (30.3%) and ≥5 days (16.3%); there were 89 (29.7%) weekend discharges.

For the 199 postimplementation patients, 171 (85.9%) had a DPT in the chart. In the 28 charts without a DPT, neurology providers had used an alternative note template that did not include the DPT in 18 (64%) cases and had manually deleted the DPT from the consult note template in 10 (36%) cases. There was no difference in rates of DPT use after the DPT was modified to include SAP content (89% vs 84%, P = .4).

Before DPT implementation, 22 (22%) of the 101 patients had an outpatient neurology appointment scheduled before discharge. Postimplementation, 84 (42%) of the 199 patients had an outpatient neurology appointment scheduled before discharge. In bivariate analysis, postimplementation time period (P < .001) and weekday discharge (P = .02), but not LOS (0.4), were significantly associated with scheduling of outpatient neurology follow-up before discharge (Table 1). In multivariable logistic regression analysis, the odds of having a neurology follow-up appointment scheduled before discharge was significantly higher in the postimplementation period (adjusted odds ratio 2.8, 95% confidence interval 1.7–4.8) and for weekday discharges compared with weekend discharges (adjusted odds ratio 2.2, 95% confidence interval, 1.2–3.9; Table 1). There was no significant association between LOS and scheduling of follow-up appointments.

**DISCUSSION**

We developed a DPT for the EMR to facilitate discharge-planning communication between consulting neurologists and hospitalists. In a population of co-managed children who were discharged with a diagnosis of seizures, we found an almost 3 times increase in the odds of having an outpatient neurology appointment scheduled before discharge after implementation of the DPT. Not surprisingly, given the barriers to organizing clinic follow-up over the weekend, we found an independent association between weekday discharge and outpatient neurology appointment scheduling. Children who were discharged during the week had more than twice the odds of having a neurology appointment scheduled before discharge.

**TABLE 1 Factors Associated With Scheduling of Neurology Appointments Before Discharge**

<table>
<thead>
<tr>
<th>Category</th>
<th>Appointment Scheduled</th>
<th>P</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (n = 106)</td>
<td>No (n = 194)</td>
<td>&lt;.001&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Postintervention&lt;sup&gt;a&lt;/sup&gt;, n (%)</td>
<td>84 (42.0)</td>
<td>116 (58.0)</td>
<td>Ref</td>
</tr>
<tr>
<td>Preintervention</td>
<td>23 (22.8)</td>
<td>78 (77.2)</td>
<td>Ref</td>
</tr>
<tr>
<td>Day of discharge&lt;sup&gt;b&lt;/sup&gt;</td>
<td>84 (39.4)</td>
<td>129 (60.6)</td>
<td>.02&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weekday, n (%)</td>
<td>22 (25.3)</td>
<td>65 (74.7)</td>
<td>Ref</td>
</tr>
<tr>
<td>Weekend</td>
<td></td>
<td></td>
<td>.4</td>
</tr>
<tr>
<td>LOS, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–2 d</td>
<td>57 (35.6)</td>
<td>103 (64.4)</td>
<td>Ref</td>
</tr>
<tr>
<td>3–4 d</td>
<td>28 (30.8)</td>
<td>63 (69.2)</td>
<td>0.7 (0.4–1.3)</td>
</tr>
<tr>
<td>≥5 d</td>
<td>21 (42.9)</td>
<td>28 (57.1)</td>
<td>1.2 (0.6–2.3)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Time period relating to implementation of the DPT.
<sup>b</sup>Weekend is defined as Saturday or Sunday.
<sup>c</sup>Significant P value.
before going home than children discharged on the weekend. This result suggests that children who are going home over the weekend may need additional strategies to ensure safe and effective transitions from the hospital. Examples of such strategies include use of dedicated discharge planning facilitators, creation of mechanisms to schedule appointments on weekends, and implementation of postdischarge telephone follow-up to assist families with care transitions. We did not find a relationship between LOS and neurology appointment scheduling. We expected to find a positive association between longer LOS and neurology appointment scheduling given the advantage of extra time to arrange follow-up. Possible explanations for our null finding with regard to LOS include (1) a persistent culture of last-minute appointment scheduling and (2) lack of clarity about diagnosis, treatment, or outpatient follow-up needs until late in the hospitalization for those with longer LOS.

The finding of a positive association between a standardized DPT and increased scheduling of follow-up appointments suggests that the DPT may improve transitional care. Use of standardized templates for information exchange is recognized as increasingly important to effective and safe patient care in a variety of contexts within the inpatient setting. Templates have been developed to standardize communication around inpatient handoffs for both residents and nurses. To our knowledge, this is the first study to describe use of a template in the pediatric inpatient setting that standardizes communication between consultants and hospitalists around discharge and transitional care planning.

Despite use of the DPT, all of which included recommendations for outpatient neurology follow-up, we saw a modest increase in scheduling of outpatient neurology appointment before discharge (increase from 22% to 42%). We did not explore the reasons for this attenuated result, but we can speculate at possible barriers. The medical teams at our hospital rely on resident liaisons to schedule follow-up appointments. During the study period, because of staffing limitations, resident liaisons were not available to each team on a daily basis during the week. In addition, the teams were unable to schedule any appointments over the weekend. There may also have been cases in which the recommendation for follow-up exceeded the 2- to 3-month scheduling window. Depending on the time of the month, scheduling can only occur 2 to 3 months in advance because the outpatient provider schedules are not available beyond this point.

Provider behavior may also have played a role in the lower than expected rate of scheduling after the DPT was implemented. Hospitalists or residents may have missed or ignored the documented recommendations from neurologists or failed to pass the recommendations on to resident liaisons. Neurologists had the ability to delete or ignore the DPT. In 14% of applicable cases, the DPT was not used either because it was manually removed from the neurology consult template or because an alternative note template was used for documentation by the consulting neurologist. Conceivably, some neurologists may have found the DPT to unnecessarily add time to documentation, although we did not receive such feedback. These potential barriers suggest that the DPT is likely to be less effective without an accompanying culture of awareness around transitional care, as well as sufficient manpower and infrastructure to support timely coordination of outpatient follow-up care.

There are several limitations to this study. We did not collect or analyze patient demographic or clinical variables and were unable to adjust for case mix. Differences in clinical or demographic characteristics between cohorts may have affected provider scheduling behaviors. Our analysis did not account for temporal trends. The Hawthorne effect relating to the QI initiative rather than the actual intervention may have altered provider behaviors. Other unmeasured longitudinal inputs may have affected provider practices. Although there were no other specific, ongoing interventions to address scheduling of outpatient follow-up, we were generally engaged in improvement work through the discharge collaborative, and this may have influenced provider scheduling practices over time. Finally, we did not evaluate the impact of the DPT on other metrics of interest to clinicians and researchers. Assessment of outcomes such as actual follow-up appointment attendance, completion of recommended outpatient workups, readmissions, and parent or provider satisfaction with hospital discharge planning may add evidence to support use of the DPT. Preliminarily, we plan to evaluate whether children are more likely to attend an outpatient follow-up appointment with neurology if the appointment is scheduled before discharge.

CONCLUSIONS

A discharge planning template for the EMR can standardize the flow of discharge-related information between
disciplinary and may help expedite transitional care planning for hospitalized children, especially those with multiple consultants involved in their care. Raised awareness and sufficient infrastructure around care transitions is necessary to maximize the potential benefit of this electronic tool. Given the inherent barriers to arranging outpatient services over the weekend, additional strategies may be necessary to enhance transitional care planning for patients going home over the weekend.

REFERENCES


