JPPT | Retrospective Chart Review

Medication Discrepancy Risk Factors for Pediatric Patients With Epilepsy at Hospital Admission

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BACKGROUND Children with epilepsy are at increased risk of medication errors due to disease complexity and administration of time-sensitive medication. Errors frequently occur during transitions of care between home and hospital, a time when accuracy of medication history lists is difficult to ascertain. Adverse events likely from medication discrepancies underscore the importance of improving medication reconciliation upon inpatient intake. This quality improvement project was designed to evaluate and optimize the current medication history process in epileptic patients upon hospital admission at a pediatric academic hospital.

METHODS A retrospective chart review was conducted on 30 patients with epilepsy admitted in during April, July, and October 2018 to identify unintentional medication discrepancies among 6 sources: documented medication history, inpatient orders from the electronic medical record, outpatient clinic notes, inpatient history and admission document, phone message records, and external insurance claims.

RESULTS A total of 63% percent of patients had at least 1 unintentional medication discrepancy. Most discrepancies occurred with daily maintenance anticonvulsants (63%). The most common types were omission of medication history (31%) and inpatient order omissions (27%). The number of medication histories completed with at least 1 discrepancy varied across pharmacists, nurses, and physicians, yet differences were not statistically significant.

CONCLUSIONS Our study found a higher incidence of anticonvulsant discrepancies compared with previous studies. This quality improvement initiative identified the absence of a standardized process as the root cause for the high incidence of anticonvulsant discrepancies in pediatric patients with epilepsy at hospital admission.

ABBREVIATIONS BPMH, best possible medication history; ED, emergency department; EMR, electronic medical record; PICK, Possible, Implement, Challenge, Kick-Out; QI, quality improvement; SEIPS, Systems Engineering Initiative for Patient Safety

KEYWORDS anticonvulsants; epilepsy; medication discrepancy; medication history; patient safety; pediatrics; quality improvement

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Introduction

A medication discrepancy is an unexplained difference among documented regimens across different sites of care.[1] Medication discrepancies are the leading cause of inpatient adverse drug events that may cause significant patient harm.[2] Erroneous medication histories obtained at hospital admission may lead to interrupted or inappropriate drug therapy during hospitalization, many of which persist through to hospital discharge. As many as 60% of hospitalized adults experience at least 1 discrepancy on their admission medication history.[3] Current literature on medication discrepancies in the pediatric population is limited compared with the adult population. However, more frequent hospital admissions and transitions of care translate to an increased risk of medication discrepancies for both populations. A total of 24% of children with epilepsy experienced an error in anticonvulsant therapy while transitioning from home to a tertiary pediatric hospital.[4] In addition, 26% of hospitalized pediatric patients experienced a discrepancy, of which anticonvulsants had the highest incidence.[5] Administrative errors in medication histories, including incorrect dosages, inaccurate time of administration, or missed administration, increase the risk of subtherapeutic levels of medications and increased seizure episodes, status epilepticus, and mortality.[6] Additionally, children with epilepsy experience increased risk of medication discrepancies due to disease complexity,[6,7] administration of time-sensitive medication,[6] and increased number of medications.[7]

Minimizing medication discrepancies requires obtaining accurate medication histories and remains critical during transitions of care. The Joint Commission recom-

mends that providers complete medication reconciliation, the process of obtaining a complete and accurate list of each patient's current home medications, at all transitions of care.[2,8] Furthermore, the Joint Commission mandates hospitals conduct medication reconciliation as part of hospital accreditation standards in an effort to improve patient safety.[2] However, no standard exists for how or by whom medication reconciliation should be completed. A critical piece of completing medication reconciliation requires obtaining accurate and complete medication histories. Barriers to obtaining a complete medication history include language differences, severity of illness, cognitive status, patient/caregiver familiarity with medication regimen, and availability of health care personnel.[3] Pediatric populations have unique issues that complicate tracking medication changes accurately, including weight-based dosing, liquid medication formulation, the need for compounded medications, and alteration of doses, such as splitting or crushing tablets.[9]

To ensure patient safety and high-quality care for this high-risk patient population, we convened an interdisciplinary team of health care providers and health services researchers to evaluate and optimize the current process for obtaining accurate medication histories for children with epilepsy upon hospital admission. This article reports the methodology and findings from the first phase of this quality improvement (QI) initiative. The primary objective of this project was to identify process-specific factors associated with medication discrepancies upon hospital admission. The secondary objective was to identify countermeasures to be used in future QI interventions.

Methods

Setting. This tertiary hospital is a comprehensive, 367-bed, free standing pediatric hospital in the Midwest region of the United States. As one of the nation's largest pediatric outpatient centers, this hospital provides care in more than 40 subspecialty areas, including a neurology division with an active epilepsy program. This is also the region's only level 1 pediatric trauma center, with more than 100,000 ED visits per year. The pharmacy department provides a 24-hour distributive and clinical patient-care service, including in the ED.

QI Methodology and Team. QI projects conducted at this institution employ an "A3 problem-solving methodology," a process incorporating frameworks driven by the philosophy of continuous QI.[10,11] Team members for this QI project include inpatient and outpatient pharmacists, a neurology clinical pharmacy specialist, QI personnel, a medication safety coordinator, and a health services researcher employed at a pharmacy school. The team investigated this problem by collecting baseline patient data, identifying the individuals involved in the process and factors contributing to the problem, setting a target, and identifying root causes. After completing these actions, the team brainstormed possible countermeasures to be piloted in a future QI project phases using iterative tests of change.[11]

Evaluation of the Problem. ***Process Map***. A process map[11] was used to map out the admission process for patients with epilepsy, such as key steps and personnel involved within the current process (Figure 1). Patients were shadowed from initial presentation to arrival to the inpatient unit. The process map was created by observing the admission process, interviewing physicians and nurses, incorporating team members' clinical experiences, and reviewing institutional policies. We randomly selected and interviewed at least 5 clinicians from 5 different provider disciplines (e.g., nurses, medical residents, pharmacy interns, pharmacists, nurse practitioners, and attending physicians) who were capable of completing medication histories and were familiar with inpatient admission processes.

Baseline Data. Medication discrepancy data were collected through retrospective chart review for 30 patients admitted to the hospital from April 2018 to November 2018 with an ICD-10 code G40.919 for epilepsy. To select these 30 patients, 10 patients each were randomly selected from the months of April, July, and October. Spacing out our sampling helped achieve a more representative pool of patients across a variety of care practice patterns occurring in the teaching hospital setting during the course of 12 months. For example, selecting all 30 patients from July would have captured patients from a relatively "atypical" practice pattern partially driven by how pharmacy and medical residents begin their training in July. Additionally, the spacing allowed for variation of seasonal illness contributing to patient hospitalization.

Demographic data collected included patient age. Health status data collected included admission weight, documented allergies, comorbidities, and number of home medications. Health care use data collected included reason for admission, admission source, and number of clinic visits, ED visits, and hospital admissions 1 year prior to date of admission. In addition, multiple data sources were manually reviewed to determine the sources of medication discrepancies within these 30 patients if they existed. The following sources were compared to identify existing medication discrepancies: documented medication history, inpatient orders from the EMR, outpatient clinic notes, inpatient history and admission document, phone message records, and external insurance claims. The institution requires that any health care provider (e.g., physician, pharmacists, nurses, interns, residents) perform a medication history and medication reconciliation for all patients within 24 hours of admission to an inpatient unit. When multiple medication histories were documented within the first 24 hours of admission, the last medication history conducted prior to when inpatient medication orders were placed was used. A medication discrepancy was defined as unintentional mismatched information

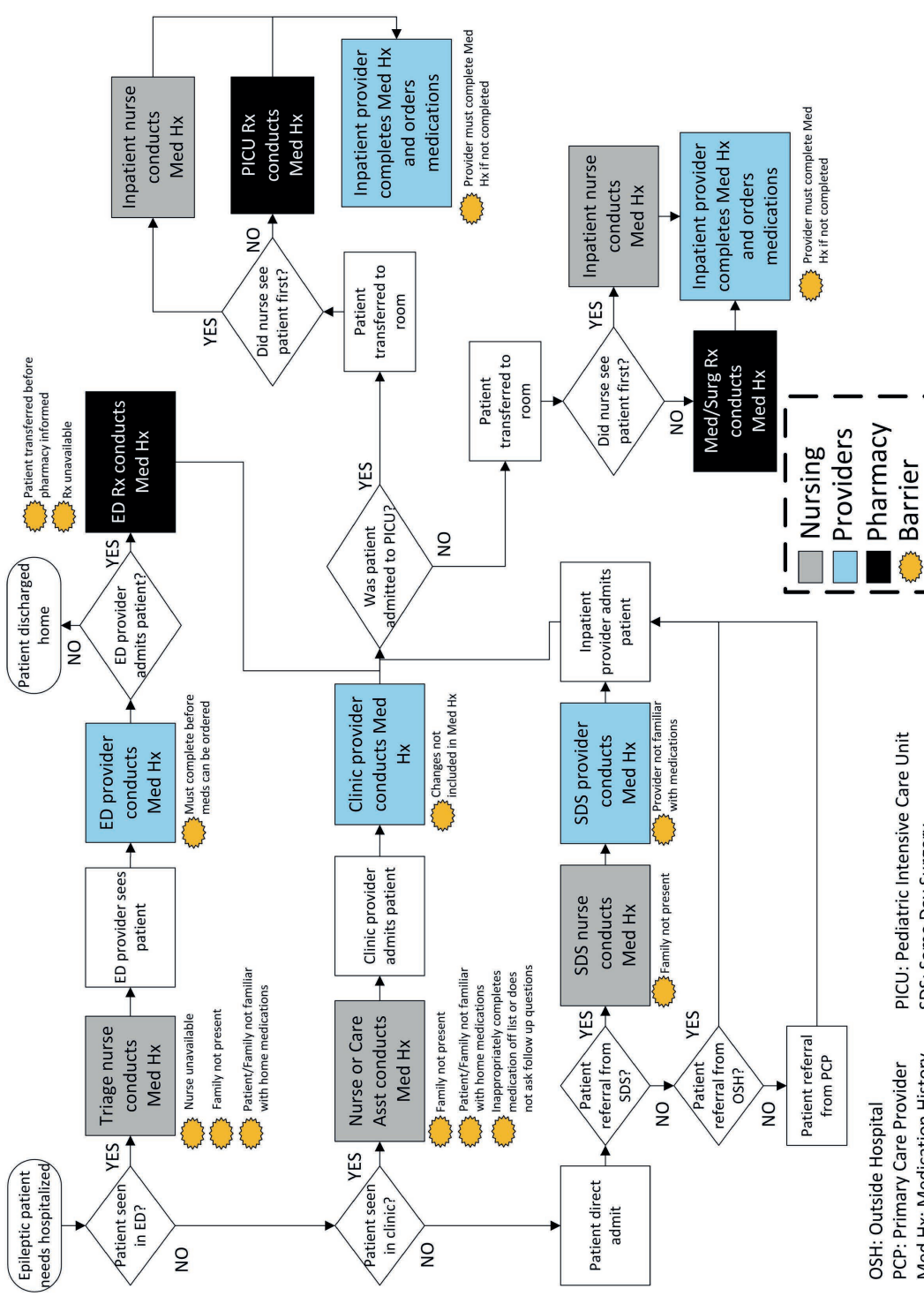
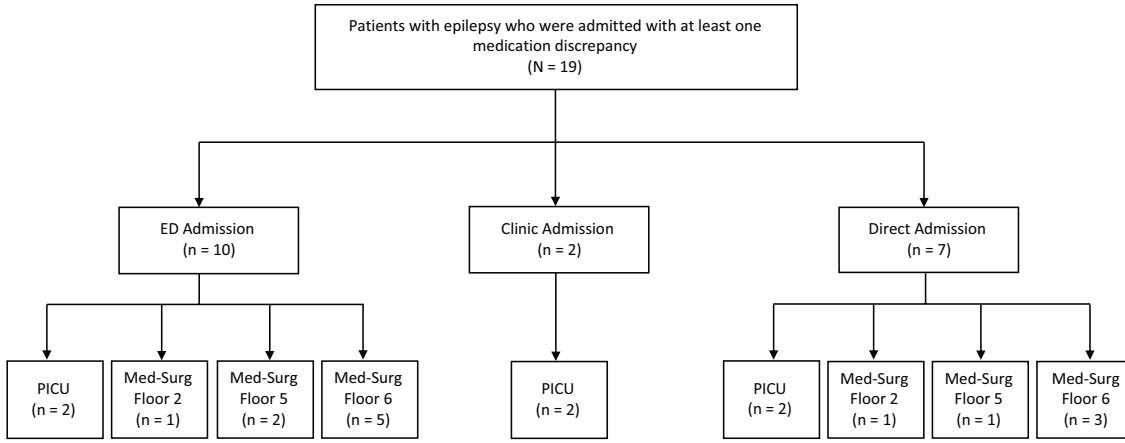


Figure 1. Process map of admission process for patients with epilepsy. The colored boxes indicate each step within the process a medication history may be conducted.

Figure 2. A fault tree of the 19 patients who experienced medication discrepancies revealed that most were admitted through the ED (10), followed by patients who were admitted directly (7), and then those admitted from an ambulatory clinic (2). The highest incidence of discrepancies (61.5%) occurred in patients admitted to medical-surgical floor 6 (grey).



ED, Emergency Department; Med-Surg, medical and surgical; PICU, pediatric intensive care unit

between the medication history upon admission and one of the aforementioned data sources. Discrepancies were classified as duplication; omission on medication history; inpatient order omission; or incorrect frequency, dose, or formulation. Hospital formulary therapeutic interchange and documented inpatient modifications within the EMR were not considered a discrepancy. For instance, if a patient was prescribed rectal diazepam for seizure rescue at home but had an inpatient order for an alternative appropriately dosed seizure rescue medication, this was not considered a discrepancy. REDCap, version 9.3.7 (Vanderbilt University, Nashville, TN) was used to collect medication discrepancy data; Microsoft Excel, version 16.0 (Microsoft Corp, Redmond, WA) was used to compute frequencies and means; and SAS version 9.4, (SAS Institute Inc., Cary, NC) was used to conduct Fisher exact tests to test for differences between provider type and rate of discrepant medication histories.

Fault Tree. A graphical representation of patients with medication discrepancies was created to display patient data based on admission source and further organized according to locations to which patients were admitted (Figure 2). This fault tree was used to identify subpopulations contributing most to the problem.

Identifying Root Causes. ***Cause-and-Effect Diagram***. A cause-and-effect diagram[11] was constructed to document possible factors contributing most to the problem (Figure 3). The team identified potential factors contributing to medication history discrepancies based on the team's own clinical experience at the hospital, observations of the admission process, and interviews with physicians and nurses. Factors were organized according to the Systems Engineering Initiative for Patient Safety (SEIPS) model domains: people, environment, organization, task, and technology.[12]

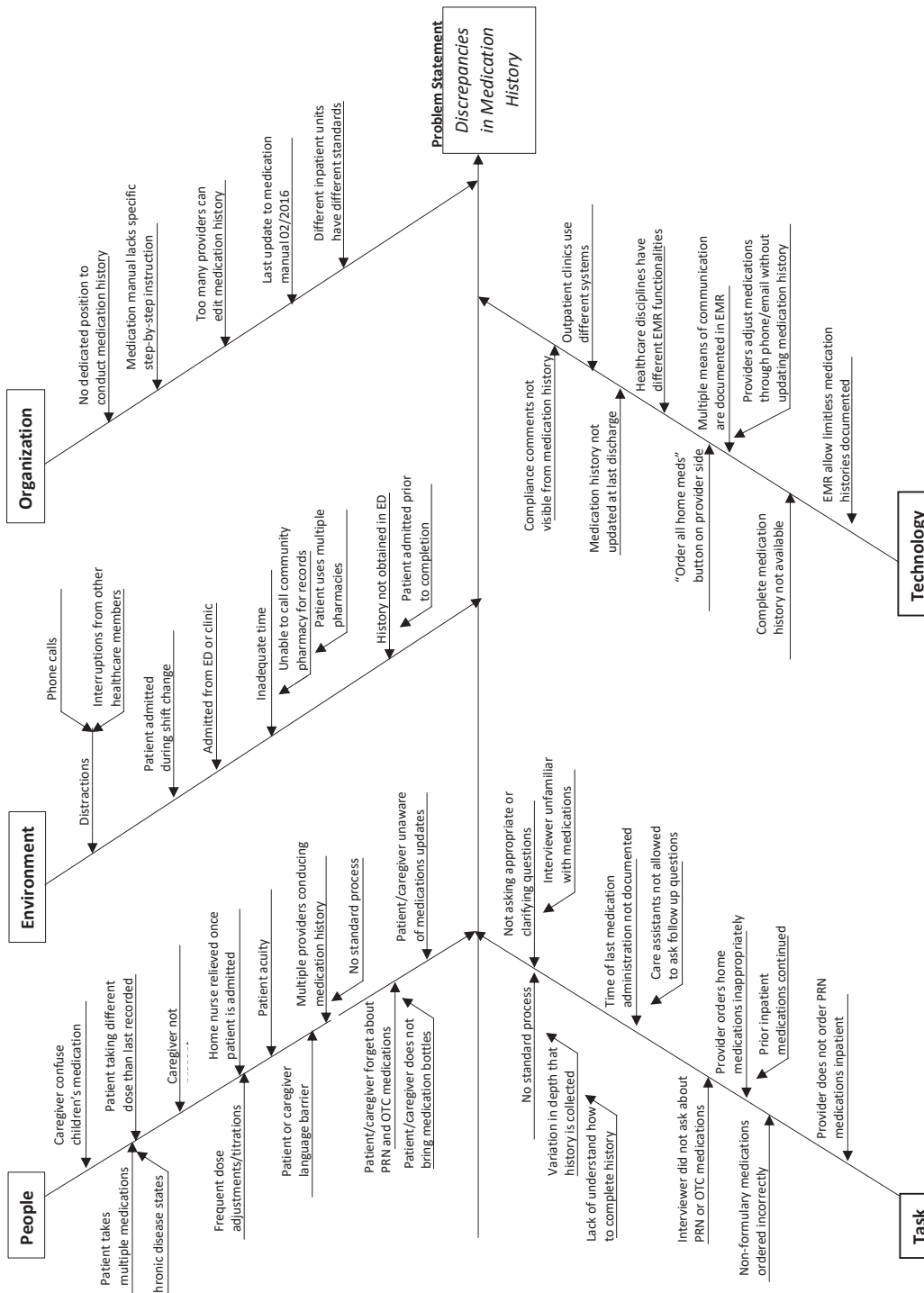
Root Cause Analysis and Countermeasure Identification. A root cause analysis was performed. Using results from the root cause analysis, the project team generated 76 potential countermeasures to improve the medication history process. These ideas were grouped into 16 categories of countermeasures. All postulated categories were organized into a prioritization matrix, which organizes countermeasures based on difficulty of implementation and reliability into 4 quadrants of Possible, Implement, Challenge, Kick-Out (PICK).[13]

Driver Diagram. The team constructed a driver diagram[11] to help determine which interventions should be prioritized based on which primary drivers were perceived to have the greatest impact on achieving the overall goal (Figure 5). We selected 2 countermeasures similar to those used in a recent hospital-wide EMR update: 1) removing the option for providers to select "continue all home medications" as part of the medication reconciliation process, and 2) retaining manually entered comments on the medication history obtained between patient encounters instead of removing comments after each hospital encounter like previously.

Results

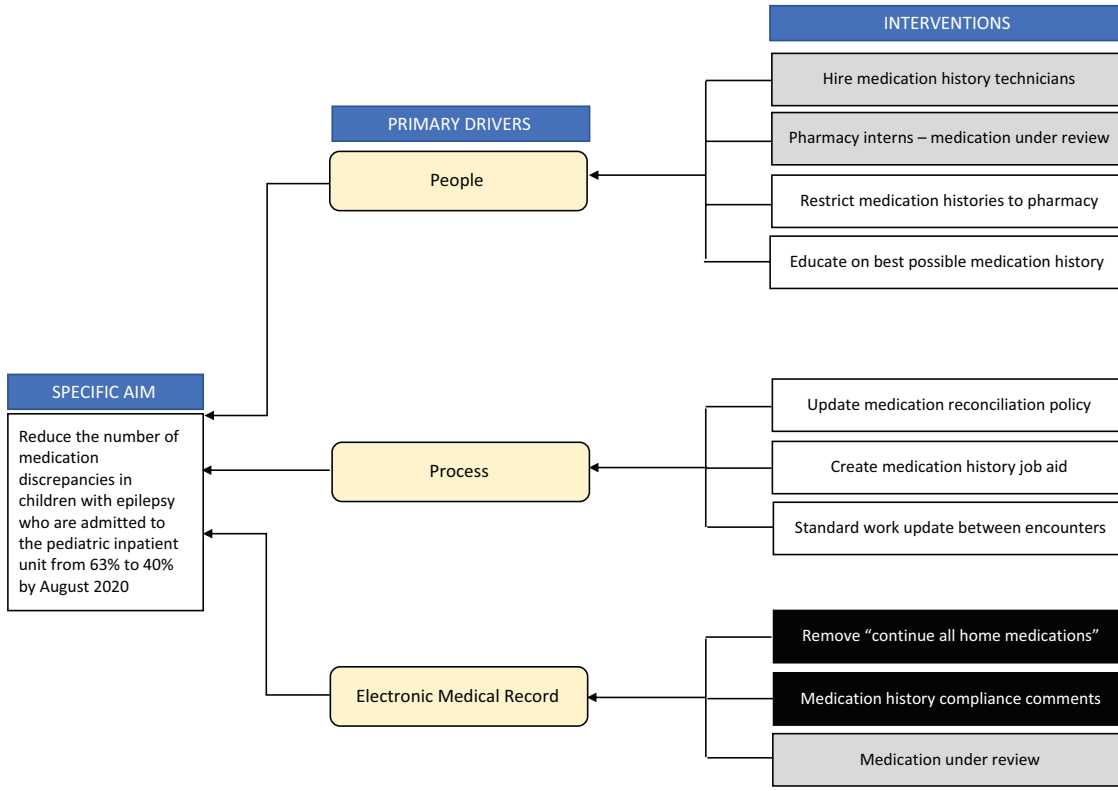
Evaluating the Problem. Developing a process map helped identify key steps and personnel associated with the medication history process (Figure 1). The 3 sources of admission to the inpatient floor included the ED, the ambulatory clinic, or direct admission co-

Figure 3. Cause-and-effect diagram to identify possible causes of variation within the medication history process on hospital admission and organized by the Systems Engineering Initiative for Patient Safety (SEIPS) model domains.



PRN, as needed.

Figure 5. Driver diagram for quality improvement initiative.



Black = QI initiative completed
Grey = QI initiative in process
White = QI initiative planned for future

ordinated by the transfer center operator. Irrespective of admission source, patients had multiple medication histories conducted by numerous health care professionals at varying steps throughout the admission process prior to seeing their inpatient provider. For example, a patient admitted through the ED may have had their medication history conducted 5 times by the triage nurse; a physician resident, pharmacy intern, or pharmacist in the ED; or a nurse, pharmacist, or physician in the inpatient unit before seeing their primary provider. In contrast, a different patient may have had no medication histories conducted prior to seeing their primary provider. This inconsistent frequency of histories taken across patients illustrates an absence of a standardized process.

In addition to the absence of a standardized process, multiple barriers undermined providers' ability to complete accurate medication histories. For example, if a family member or child was unfamiliar with home medication lists, or the member familiar with home medication lists was not available, health care providers could not obtain accurate histories or even detect discrepancies existing between home lists and current lists in the EMR record. In other cases, patients may have been transferred to an inpatient unit before pharmacy personnel were informed, causing a missed opportunity for trained pharmacists to complete timely and thorough admission medication histories. Finally, in other cases, medication changes occurring before patient admissions may not have been documented in the patient's EMR medication list, creating difficulties when providers need to place or adjust inpatient medication orders upon admission.

Medication Discrepancies Among Patient Sample. The average age of the 30 patients included was 8.47 ± 5.6 years. An average of 2 medication histories (ranging from 1 to 5) were documented per patient. Registered nurses completed the most medication histories (40%), whereas advanced practice registered nurses completed the least (6.7%). Registered nurses also had the highest proportion of medication histories with at least 1 medication discrepancy (83%), followed by pharmacy interns (75%). Physicians and pharmacists had an equal proportion of discrepancy medication histories (50%). The frequency of medication histories with at least 1 discrepancy did not significantly differ between

Table 1. Admission Medication History Completed by Discipline

Discipline That Completed the Medication History	Medication History, n (%)			
	Total Completed (N = 30)	At Least 1 Medication Discrepancy (n = 19)	No Discrepancies (n = 11)	p-value*
Advanced practice nurse	2 (6.7)	0 (0)	2 (100)	0.13
Nurse	12 (40.0)	10 (83.3)	2 (16.7)	0.12
Pharmacist	8 (26.7)	4 (50.0)	4 (50.0)	0.24
Pharmacy intern	4 (13.3)	3 (75.0)	1 (25.0)	1
Physician	4 (13.3)	2 (50.0)	2 (50.0)	0.61

* p-values from 2-sided Fisher exact tests, testing differences in discrepancy rates between each respective profession versus all others (e.g., nurse versus all other professions).

provider disciplines (Table 1). Of the 30 patients, 33% (n = 10) were directly admitted versus 53% (n = 16) and 13% (n = 4) who were admitted through the ED or from an ambulatory clinic, respectively. Although 63% (n = 19) of the patients had at least 1 medication discrepancy, the highest proportion of discrepancies occurred in 8 of the 13 patients (61.5%) admitted to 1 specific general medical-surgical unit, 3 of whom were admitted to the inpatient unit directly and 5 of whom were admitted to the inpatient unit via the ED (Figure 2).

Twenty-four medication discrepancies were identified across 10 different anticonvulsant therapies (Table 2). Most (63%) of the discrepant anticonvulsant therapies were daily maintenance medications, whereas 33% were as-needed seizure cessation therapy prescriptions, and 4% were classified as unknown (Table 2). Twenty-six discrepancies were discovered across 24 anticonvulsants, 2 of which had 2 discrepancies. The most common discrepancy was omission from medication history (31%), whereas the least common were therapeutic duplication (3.8%) and incorrect formulation (3.8%; Table 3). The 26 discrepancies were discovered by comparing 5 data sources (e.g., inpatient orders, external insurance claims, outpatient clinic notes, etc.) with the documented medication history. A discrepancy could have multiple inaccurate data sources. For example, 1 discrepancy could originate as a mismatch between the documented medication history *and* outpatient clinic notes *and* phone message records. Consequently, 38 data source mismatches were identified across the 24 anticonvulsant medications. The most common data source where discrepancies

Table 2. Discrepancies by Anticonvulsant and Schedule Type

Medication	Total discrepant anticonvulsants, n (col %)	PRN anticonvulsants, n (col%)	Maintenance, anticonvulsants, n (col %)
Clobazam	1 (4.2)	0 (0)	1 (6.7)
Clonazepam	1 (4.2)	0 (0)	1 (6.7)
Diazepam	8 (33.3)*	8 (33.3)	0 (0)
Divalproex sodium	3 (12.5)	0 (0)	3 (20.0)
Gabapentin	2 (8.3)	0 (0)	2 (13.3)
Levetiracetam	3 (12.5)	0 (0)	3 (20.0)
Oxcarbazepine	2 (8.3)	0 (0)	2 (13.3)
Phenobarbital†	2 (8.3)	0 (0)	1 (6.7)
Vigabatrin	1 (4.2)	0 (0)	1 (6.7)
Zonisamide	1 (4.2)	0 (0)	1 (6.7)
Total (row %)	24 (100)	8 (33.3)	15 (62.5)

* As needed order (33% of all discrepancies).

† Order schedule unknown for 1 phenobarbital medication order.

Table 3. Classification of Medication Discrepancies

Classification	n (%)
Anticonvulsant medications with at least 1 discrepancy	24
Discrepancy by type (n = 26)*	
Omission on medication history	8 (30.8)
Inpatient order omission	7 (26.9)
Incorrect dose	6 (23.1)
Incorrect frequency	3 (11.5)
Incorrect formulation	1 (3.8)
Duplication	1 (3.8)
Discrepancy by source (n = 38)*	
Inpatient order	16 (42)
External insurance claims	8 (21)
Outpatient clinic note	7 (18)
History and admission document	4 (11)
Phone message record	3 (8)

* Some discrepancies are noted in more than 1 category.

occurred was inpatient orders (42%), whereas the least common was phone message records (8%; Table 3). No associations were observed in relation to the day and time of hospital admission, month of hospital admission, or number of home medications.

Setting a Target. The specific aim for both phases of this QI initiative was to reduce the number of medication discrepancies in children with epilepsy who were admitted to the inpatient unit from 63% to 40% by August 2020.

Cause-and-Effect Diagram. The top contributing factors were organized into a cause-and-effect diagram (Figure 3). Factors included the ability of multiple providers to conduct the medication history, the variation in the processes of how providers conducted medication histories, no dedicated employee position dedicated to conducting medication histories, different standards among nursing units, and providers not updating medication history after clinic appointments, phone, or email communications.

Root Cause Analysis. The team identified the absence of a standard medication history process at the institution as the likely cause of medication discrepancies occurring during hospital admissions.

Identifying Countermeasures. The team postulated countermeasures in the implement quadrant (i.e., the lower right quadrant of the PICK chart; Figure 4) to help systematically prioritize solutions that were both feasible and likely effective in achieving the targeted outcome. Final countermeasures included 1) hiring and training medication history technicians; 2) standardizing medication history process; 3) creating standardizing workflows between encounters; and 4) educating health care providers on the best possible medication history (BPMH). The BPMH is a comprehensive medication history obtained by a clinician that includes a thorough history of all medication use.[14]

The SEIPS categories in which the most factors occurred were identified as the primary drivers; as such, the team targeted people, process, and EMR (Figure 5). Potential interventions aimed at improving people's involvement in the process could include configuring EHRs to restrict the medication history to pharmacy personnel or to flag medications on the patient profile as "medication under review" for pharmacy interns to investigate further. Potential process-driver interventions could include the institution updating medication reconciliation policies or designing standardized workflows for providers to update medication histories to reflect prescribing changes occurring between patient encounters.

Discussion

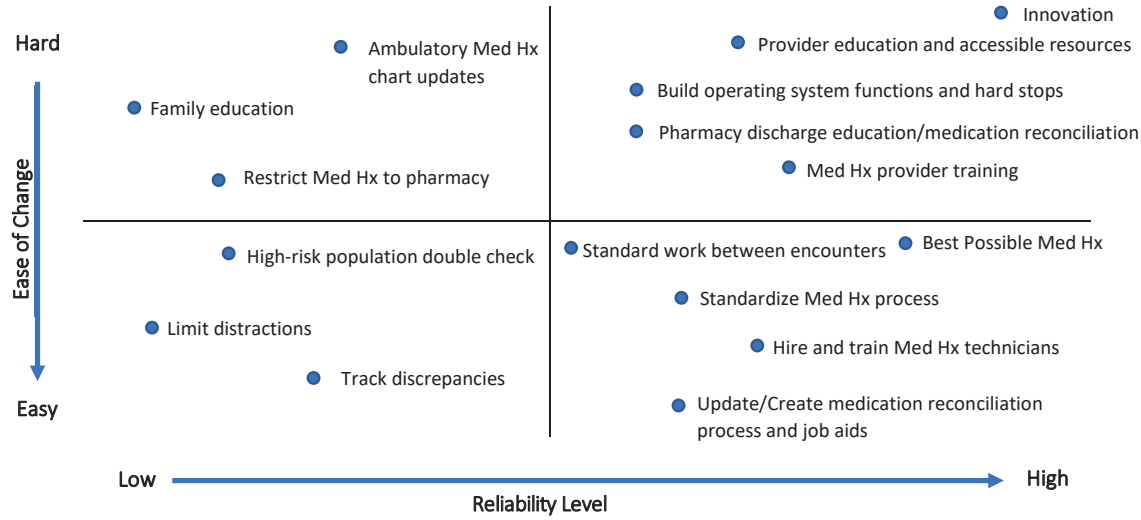
Our project is among only a few QI studies evaluating unintentional medication discrepancies for anticonvulsant therapies in pediatric patients with epilepsy. Our findings confirm the high incidence of medication discrepancy with anticonvulsant therapies for pediatric patients upon hospital admission. Our findings also illustrate the absence of a standardized process as the root cause for medication discrepancies, findings likely applicable to other institutions and complex patient populations.

More than half of the patients with epilepsy assessed in this project had at least 1 medication discrepancy with anticonvulsants upon hospital admission. The most common types of discrepancies were omission of an anticonvulsant therapy from the admission medication history (31%) or inpatient order (27%) and incorrect anticonvulsant dose (23%). The variation of which health care providers conducted the medication histories and how many histories per patient admission each provider completed revealed the absence of a standardized process.

The project team identified countermeasures that would be both feasible and effective in improving the medication history process, especially if implemented in an iterative way using PDSA cycles. Some countermeasures included creating medication reconciliation job aids, hiring and training medication history technicians, educating health care providers on the BPMH, and creating standard workstandardizing workflows forto updatinge medication histories when providers make changes to medications between encounters. Education and training countermeasures are particularly relevant to explore, especially given the variation we discovered across standardized training programs for new employees.

One proposed QI measure could include designating a primary owner for the medication history process that could help reduce the number of potentially redundant medication reconciliations conducted per patient. The varying accuracy of medication histories conducted

Figure 4. Possible, Implement, Challenge, Kick-Out (PICK) chart displaying all postulated countermeasure categories.



across providers that we observed in this study likely hinders obtaining reliable, completed, and accurate medication histories for each hospitalized patient. Designating a central owner may help improve the medication history process.

This study found similar discrepancy rates between physicians and pharmacists; however, physicians only completed half as many medication histories. The current study had a small sample size, which is more challenging to make generalizations based on this investigation alone. However, a previous QI project at the institution compared accuracy of medication histories conducted between disciplines and found pharmacy-conducted histories were more accurate in comparison with those by other health care providers (e.g., physicians, nurse practitioners, registered nurses).

Similar to the previous investigation at this institution, other studies demonstrate that pharmacist-led medication reconciliation practices produce more accurate medication histories[15-17] and fewer hospital readmissions and emergency room visits.[15-17] Because pharmacists provide conduct medication reconciliation in the ED at our institution, we hypothesized that patients admitted through the ED would have a lower risk of discrepancies. Despite pharmacists providing medication reconciliation at the ED, our results unexpectedly showed most patients with a discrepant medication were admitted to the hospital through the ED, implying potential medication failures occurring with the ED. Of the 10 patients admitted through the ED with discrepancies, nurses completed medication histories for 3 patients; pharmacists for 3 patients; and pharmacy interns for 4 patients. Of note, because medication histories in the ED are often limited to information shared by patients, families, or caregivers, who could be under stress given the situation, the medication history may not be complete. Furthermore, because medication discrepancies may result downstream after the medication history was conducted, inpatient providers conducting poor medication histories do not necessarily cause medication discrepancies. In one scenario, although a nurse completed an accurate medication history, the inpatient provider did not place an order for a rescue anticonvulsant medication once the patient was admitted. In a second scenario, a pharmacist completed a medication history on which an outpatient provider had previously modified the patient's anticonvulsant dose without updating the prescription, medication history, or clinic note. Therefore, the provider who conducts the history is not always responsible for the medication discrepancy, and, given the environment, it is plausible the circumstances as opposed to the system could likely explain discrepancies originating at admission.

Implementing a countermeasure related to obtaining BPMHs could enhance the quality of information included in the medication history. Studies demonstrate more complete medication histories are obtained when personnel are trained to conduct BPMHs.[18,19] The BPMH emphasizes documenting the dose and frequency for each medication, previous time of medication administration, duration, as-needed indication, special instructions, strength, route, formulation, and inclusion of over-the-counter and herbal products.[19] Obtaining a BPMH requires trained clinicians to obtain full medication histories by interviewing the patient or caregiver and reviewing all available resources, such as the patient chart, information from a community pharmacy, records from outpatient clinics, and medication administration records from previous hospital admissions.[18] Once properly trained in obtaining BPMH, dedicated

certified pharmacy technicians are ideally suited to obtain medication histories, under the supervision of pharmacists.

Our relatively higher discrepancy rate is consistent with a study evaluating the entire home medication regimen for hospitalized adults that found more than 60% of patients had a discrepant medication on their admission medication history.[3] The variation we observed for the process of obtaining accurate medication histories was consistent with that in a prior study completed at our institution supporting the addition of 2 dedicated medication history technician positions to improve and standardize the process to obtain a BPMH upon admission.[19] Our anticonvulsant discrepancy rate was higher compared with previous studies.[4,5] One study investigating anticonvulsant errors in 120 children admitted for a non–epilepsy-related diagnosis greater than 25 hours compared 2 patient sources.[4] The patient's first inpatient anticonvulsant dose was compared to their documented home regimen, which likely contributed to identifying lower discrepancy rates in comparison with the current study comparing 6 patient sources.[4] The lower discrepancy rate by Gattari et al[5] may be due to their ability to rule out in real time discrepancies due to appropriate dosage changes during the medication reconciliation process. Our retrospective design prevented us from clarifying if a discrepancy was due to a clinically appropriate dosage change. Our definition of "discrepancy" included both intentional and unintentional discrepancies, likely creating an inflated rate compared with previous studies that were able to exclude intentional discrepancies based on real-time data surveillance.

Our study has several noteworthy strengths. First, we focused on unscheduled admissions instead of scheduled admissions, the latter of which could have led to atypical discrepancy rates due to additional patient care practices taking place during patient prescreenings. For example, a QI study found increased administration of maintenance anticonvulsant therapy prior to a scheduled procedure.[6] Pre-anesthesia nurses completed parent teaching 3 to 7 days before the procedure and surgical unit nurses called parents the day before the scheduled procedure to provide preoperative instructions on anticonvulsant administration.[6] These prescreening interventions were time intensive and were not standardized across institutions. The current study assessed anticonvulsant discrepancy rates for unscheduled admissions, which represents a more realistic process for a significant number of admissions that occur for children with epilepsy, whose admissions are more likely unpredictable and unplanned. Second, our sample included patients admitted from multiple entry points in the hospital and from different months of the year, improving the representativeness of both the patients and the discrepancies identified during the course of the year. Previous studies excluded patients admitted through the ED, to the intensive care unit, or transfers from outside hospitals,[5,7] limiting the generalizability of their findings. Third, to assess medication discrepancies, we used 6 data sources that demonstrate obtaining a more complete and accurate medication history as used in standard practice to obtain BPMH.

This project has several limitations. First, the time constraints of approximately 90 minutes per patient for data collection limited the reasonable number of charts that could be sampled, reducing the power to detect differences in discrepant medication histories between providers. Second, the results from a single academic medical center focusing solely on patients with epilepsy admitted to the hospital for any indication limited the generalizability of our findings to other settings. Despite this limitation, the challenges surrounding obtaining best possible medication histories is a common barrier faced by many organizations. Furthermore, our findings could also apply to other complex disease states associated with frequent hospitalizations and medication regimen changes, all of which increase the likelihood of medication discrepancies. Third, our analysis was limited to only anticonvulsant therapies and did not include time or administrative routes as discrepancies, all of which likely underestimated our discrepancy rate. Lastly, our analysis could not assess impact on patient harm because adverse events were not collected and discrepancies were not ranked based on potential harm.

Although our study was not designed to focus on these associations, future QI studies should include these metrics in their evaluations. In hopes of identifying a solution to improve accurate and consistent medication histories across pharmacy providers, future studies should employ QI methodology to implement and test our proposed countermeasures focused on standardizing the BPHM process across pharmacy practitioners.

One proposed pilot could include training medication history technicians how to conduct BPMHs on the inpatient units where the highest medication discrepancy rates occur and then how to measure the impact of BPMH practice on medication discrepancy rates and adverse events in a larger cross section of pediatric patients.

Conclusion

This QI initiative identified the absence of a standardized process as the root cause for the high incidence of anticonvulsant discrepancies in pediatric patients with epilepsy at hospital admission. Our findings support that obtaining a complete and accurate medication history and instituting a standardized process for obtaining medication histories would likely reduce medication discrepancies and improve patient safety. Because our results indicated that most medication discrepan-

cies were identified from inpatient orders and external insurance claims, future BPMH assessments need to include these data sources.

Article Information

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Ethical Approval and Informed Consent. Given the nature of this study as "quality improvement," institution review board/ethics committee review was not required, and the project was exempt requiring patient informed consent.

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