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The Use of a Checklist in a Pediatric Oncology Clinic

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Abstract

Background—Errors and near misses are common in medicine. significant reduction of errors in our clinic. The total number of errors Checklists and similar interventions are feasible and can reduce the (including documentation errors) decreased from 133 in month 1 to incidence of errors and improve patient outcomes. This study 39 in month 5 (P <0.0001). In addition, checklist use decreased the assessed the feasibility and efficacy of a checklist in a pediatric rate of encounters with at least one error from 34% to 15% oncology clinic.

Procedure—Errors and near misses of all types were (P <0.001). The reduction in errors occurred despite the checklist not systematically tracked for 1 month in a pediatric oncology clinic. being used for each encounter. The majority of practitioners were Following the initial 1 month time period (baseline), a 10-item satisfied with the use of a checklist and think that the use of a checklist checklist was implemented for each patient encounter during a 4- is a good way to reduce errors.

Conclusions—A checklist is potentially month period. During month 5 of the study while the checklist was a feasible, safe, inexpensive, and simple method to lower the rate of being used, errors and near misses were again systematically tracked medical errors in a pediatric oncology clinic. Pediatr Blood Cancer for 1 month.

Results—The use of a checklist was associated with a 2013;60:1855–1859.

Keywords

checklist; children; medical errors; oncology; pediatric; safety management

INTRODUCTION

Errors and near misses are common in all fields of medicine. Medical errors have been defined as “failure of a planned action to be completed as intended or use of a wrong plan to achieve an aim [1]. Errors may or may not cause harm. Many errors are minor and cause no patient harm, but a substantial number are serious and can even be lethal. It has been estimated that tens of thousands of deaths occur every year in the U.S. due to preventable

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errors [1]. Gandhi et al. found a 3% rate of medication errors in a pediatric chemotherapy infusion clinic, and 60% of those errors had the potential for adverse drug events. Most were intercepted before they reached the patient [2]. Including errors in the clinic plus at home, Walsh et al. reported an error rate of 18.8% of pediatric oncology visits. In that study, medication ordering and home administration of medicines were the most common types of errors [3]. Another study showed a 9.9% error rate in oral outpatient chemotherapy medication in children with acute lymphoblastic leukemia, as well as at least one medication error in 18.8% of study patients [4].

Checklists have been implemented in a number of environments in safety critical industries, including healthcare. They can be relatively easy to implement, can reduce the incidence of errors, and improve patient outcomes. Examples include reducing catheter-related bloodstream infections in intensive care settings [5–7] and reducing morbidity and mortality in surgical patients [8]. Checklists appear effective in detecting certain errors in a simulated oncology infusion unit [9]. Preventable harms are still common in North Carolina hospitals and little, if any, improvement was made from 2002 through 2007, despite national and state efforts to improve patient safety [10].

Studies have shown, and we have observed in our own practice, that errors are relatively common in pediatric oncology. We hypothesized that the use of a checklist in a pediatric oncology clinic would reduce the number of errors made in the outpatient setting. Furthermore, we hypothesized that health care providers would be satisfied with the use of a checklist.

METHODS

This study was implemented in the outpatient Pediatric Oncology Clinic at Wake Forest Baptist Medical Center, Winston-Salem, North Carolina (USA). Errors and near misses of all types in clinic were systematically tracked daily for 1 month in 2011 using an error documentation form for each patient encounter. Following the initial 1 month time period (baseline), a 10-item checklist was implemented for every patient encounter during a 3-month period. After the 3-month checklist implementation period, errors and near misses of all types in clinic were again systematically tracked for 1 month (month 5 of the study). The checklist continued to be used during month 5.

The checklist consisted of 10 items on a single sheet of paper (five items on the front and five on the back). The first five items (under the header “Patient Encounter”) were to be completed during the patient encounter, before the patient left clinic. The second five items (under the header “Documentation”) were to be completed before the clinic note was electronically signed. Each item had check boxes for “done,” “not done,” or “N/A” (not applicable; Supplementary Material). The checklist was created by the investigators based on perceived areas for greatest impact, while keeping it short and user friendly. The costs were minimal including monetary costs (paper and printing) and time. During month 1 and month 5, immediately after each patient encounter the health care provider was briefly interviewed by a study investigator (GMW or AFB) using a four page data form to capture all errors, regardless of severity, as well as near misses and documentation errors. The interview was conducted immediately so that the details of each encounter would be fresh for the provider. The checklist was completed by each provider but the investigator did not verify the accuracy of the providers’ answers (checks). Demographic information was also collected from the medical records and health care providers, who determined race/ethnicity for each patient to assess for potential associations with errors. Error occurrence (yes/no) and severity (serious/minor/near miss/documentation error only) were judged by the health care provider who saw the patient. Near misses were caught before reaching the patient and

were not assigned a severity. A documentation error was defined as an error or mistake in the medical records (written or electronic) but the patient's care was unaffected by the error. After the clinic note had been completed and signed, a study investigator (GMW or AFB) screened the clinic note for other documentation errors including but not limited to errors in the medication list, past medical history, family history, and social history. The use of the checklist was voluntary and compliance was not tracked. Rather, practitioners were surveyed at the end of months 2 and 5 about how often they used the checklist, as well as their satisfaction levels and opinions of efficacy.

Comparison between pre- and post-checklist groups was evaluated using chi square tests for proportions, and *t* tests for continuous variables. We considered $P = 0.05$ to be statistically significant. Written informed consent/assent was not obtained. The decision to report and/or discuss errors with families/patients was left up to the provider, although all error disclosure was encouraged in accordance with published ethical and professional guidelines [11]. This project was approved by the Wake Forest Baptist Health Institutional Review Board.

RESULTS

For all encounters in months 1 and 5, the average age of the patients was 10.4 years, and the majority (70%) were Caucasian (17% were African-American, 11% Hispanic, 1% Asian, and 1% unknown). The most common diagnosis was acute lymphoblastic leukemia (42%).

The use of a checklist was associated with a significant reduction of errors from month 1 to month 5 in our clinic. During month 1 (pre-checklist), there were 251 patient encounters, of which 85 (34%) had at least one error (including documentation errors). During month 5 (after 3 months of checklist use and while still using the checklist), there were 230 patient encounters, of which 33 (14%) had at least one error (including documentation errors). Thus, the use of the checklist decreased the number of encounters with at least one error from 34% to 14% ($P < 0.001$; Table I). In addition to decreasing the number of encounters with at least one error, the total number of errors decreased from month 1 to month 5 ($P < 0.0001$; Table I). There were three errors judged to be serious (all in month 1). There were 61 errors were judged to be minor errors (42 in month 1 and 19 in month 5; $P = 0.008$). The remainders were documentation errors, which included errors in the patient's past medical history, family history, social history, or other part of the medical record. Documentation errors decreased from 88 in month 1 to 20 in month 5 ($P < 0.0001$).

The three errors judged (by the practitioner seeing the patient) to be serious were (1) a prescription was incorrectly filled by a hospice pharmacy; (2) a scheduled admission for chemotherapy had to be postponed because no inpatient beds were available, even though the family had traveled to clinic anticipating admission; and (3) a significant lab abnormality (marked hyperkalemia) was not noted prior to the patient leaving clinic. The patient was called and asked to return for a repeat blood test, which showed normal potassium. None of the patients was judged to be harmed by these three errors.

The use of a checklist was associated with a reduction of errors of medication accuracy of the electronic medical record from 21% in month 1 to 12% in month 5 ($P = 0.02$) and also other errors from 13.3% in month 1 to 2.6% in month 5 ($P < 0.001$). Examples of other errors included: family had not been told to keep patient NPO for scheduled procedure, prescription written incorrectly, procedure note done on wrong patient, incorrect labs ordered, rapid flu test not obtained correctly, bone marrow sample sent to lab without labels applied, patients arrived unexpectedly in clinic (not on clinic schedule), inpatient team not notified about an admission from clinic. There were not significant changes in the home

medicine errors, paper roadmap errors, and clinic treatment errors. In no cases were labs not checked prior to administering chemotherapy.

There were no associations with errors and patient demographic factors such as age, gender, or race/ethnicity. An interpreter was used less frequently during month 1 (1.2%) compared to month 5 (5.2%; P =0.01), and the error rate decreased when an interpreter was used (33% for month 1 and 0% for month 5; P =0.04). When the use of an interpreter is excluded, however, the error rate remains significantly lower for month 5 compared to month 1 (34% vs. 14% P <0.0001). Additionally, there was a non-statistically significant trend toward fewer “day hospital” and full admissions in month 5 compared to month 1 (P =0.06).

We also tracked delays in the clinic encounter, as judged by the practitioner. (Were there any undue delays in this patient’s assessment and/or therapy today?) No significant difference was found in undue delays between month 1 and month 5 (8.8% vs. 5.2%, respectively; P =0.12). The rate of near misses increased from month 1 (0.80%) to month 5 (1.30%), to a level that did not reach statistical significance (P =0.58).

Practitioners in the clinic included four physicians, one nurse practitioner, and one physician assistant. Based on self-reported surveys, only two practitioners used the checklist almost always (in at least 90% of encounters) in month 2 and month 5. Three used the checklist most of the time (50–90%) during month 2 and two used it most of the time during month 5. One practitioner used it only rarely (<10% of encounters) during month 2, and two practitioners used it occasionally (10–50% of encounters) during month 5. The majority of practitioners (five of six) reported being satisfied with the use of a checklist and think that the use of a checklist is a good way to reduce errors.

DISCUSSION

This study demonstrates that a checklist has the potential to reduce medical errors in a pediatric oncology clinic. The checklist used in our study was short and easy to complete. In addition, it was judged to be generally helpful by the practitioners, despite the fact that it was not always used. The checklist used in our study obviously did not prevent every error. But it did appear to be responsible for significant error reduction, particularly in the electronic medical records as well as other errors which generally arose from poor communication. The primary purposes of our checklist were to remind practitioners to perform certain tasks and to improve communication, both amongst clinic staff and also between practitioners and patients/families. Indeed, improved communication has been suggested as perhaps the most important intervention for reducing medical errors [3]. The goal of reducing errors is enhanced patient care and better outcomes. Although we did not formally assess outcomes, it is our opinion that reducing errors can only improve care and outcomes. The reduction in documentation errors will hopefully lead to fewer errors in the future, such as the perpetuation of incorrect medications/doses, and documentation errors in the past medical history, social history, and family history.

Our clinic routinely triple checks chemotherapy drugs and doses prior to administration. This system includes checks by the prescriber, the pharmacy, and the person administering the drug(s). This triple check system predated this checklist study and continues unchanged. None of the clinic treatment errors involved any intravenous or intrathecal chemotherapy agents, and the overall rate of clinic treatment errors did not significantly change from month 1 (2.4%) to month 5 (3.9%). Examples of clinic treatment errors that occurred during this study included eutectic mixture of local anesthetic cream placed in the wrong location prior to a lumbar puncture, alteplase ordered incorrectly, and a unit of platelets that was washed unnecessarily. None of these were judged to have caused patient harm.

Since the completion of this study, our institution has transitioned to a new electronic medical record system and new pharmacy procedures which utilize computer order entry, electronic medication administration records, and bar coding, all of which may reduce medication errors [12–14]. We continue, however, to use paper roadmaps which are helpful visual symbols of patients' overall therapy and progress to date.

Perhaps the biggest challenge of implementing a checklist is not the creation of a checklist, but its implementation. Negative comments from practitioners included feelings toward paper overload and having an additional task to perform for each encounter. Another problem we encountered was that the checklist was sometimes not pre-printed and attached to the patients' charts prior to each clinic encounter, in which case the checklist was rarely used. Having a more reliable system in place to ensure checklist availability should improve compliance and implementation. Despite these challenges, most practitioners reported satisfaction and a belief of efficacy with the use of the checklist.

In our study it was occasionally difficult to decide if something was an error or not. Each practitioner judged every encounter that he/she performed and then decided about the occurrence (and severity, if applicable) of errors. It should be remembered that most errors do not cause harm. Thus, just because a patient was not harmed does not mean an error did not occur. When patient harm does occur, however, it is often the result of some type of error. During the course of the study we had several collegial discussions about the definition of medical error and whether or not something should be classified as an error. In general, we believe these discussions were healthy for the development of our team approach and helped build a sense of unity and shared responsibility.

This study is limited by its relatively small number of encounters by only six providers in a single pediatric oncology clinic, and its lack of a control group. Our study is also limited by potential recall bias on the part of the practitioners. For example, all the practitioners in the clinic knew about the study design and our hypothesis that error rate might decrease during the last month of data collection (during checklist implementation) and they may have been biased to report fewer errors during month 5. Despite these limitations, we believe the results in general are valid and lend further support to the use of checklists in medicine. In fact, our results suggest that if the checklist had been used more often, the error rate may have decreased even further. Future studies should assess making checklists even easier to use and also assess the impact of lower error rates on patient care. Electronic checklists can also be used to document achieving meaningful use requirements in response to the American Recovery and Reinvestment Act of 2009 and, more importantly, potentially improve patient safety [15]. A checklist is potentially a safe, inexpensive, and simple method to lower the rate of medical errors in a pediatric oncology clinic.

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APPENDIX: CHECKLIST

Patient Name_____ Date of encounter_____

I. PATIENT ENCOUNTER

Done	Not done	N/A	
☐	☐	☐	1. Roadmap reviewed with family (and/or patient, if age appropriate).
Done	Not done	N/A	
☐	☐	☐	2. All home medicines including doses/schedules reviewed with family (and/or patient, if age appropriate).
Done	Not done		
☐	☐	☐	3. Prescriptions provided (or confirmed to be not needed).
Done	Not done	N/A	
☐	☐	☐	4. Follow up appointment card with date, time and other instructions given to family.
Done	Not done		
☐	☐		5. Family and/or patient have been asked if they have any questions.

II. DOCUMENTATION

Yes	No	N/A	
☐	☐	☐	6. Name of primary care physician is in the Electronic Medical Record (at the time of note writing).
Done	Not done		
☐	☐		7. Past medical history, Family history, and Social history have been updated and are accurate (including whether patient is enrolled (or not) on a research protocol).
Done	Not done	N/A	

☐	☐	☐	8. Chemotherapy doses on the paper roadmap have been verified and/or updated.
Done	Not done		
☐	☐		9. Medication list in the Electronic Medical Record has been verified and/or updated.
Done	Not done	N/A	
☐	☐	☐	10. Time point of therapy has been included in the assessment of the note (e.g. “Day 1, maintenance cycle 3,” or “6 months off therapy”).

TABLE I

Encounters With At Least One Error, Including Documentation Errors, and Error Severity, by Month

	Month 1, without checklist (baseline)	Month 5, with checklist	*P*-value
Encounters with at least one error	85 (34%)	33 (14%)	<0.0001
Encounters with no errors	166 (66%)	197 (86%)	
Total encounters	251	230	
Error severity			
Serious	3	0	0.05
Minor	42	19	0.008
Documentation only	88	20	<0.0001
Total errors	133	39	<0.0001
Near misses	2	3	0.58