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“A core interdisciplinary medication event huddle team is particularly valuable for ensuring consistency and identifying trends across the organization.”

—Medication Event Huddles: A Tool for Reducing Adverse Drug Events (p. 40)

Using a Medication Event Huddle to Reduce Adverse Drug Events

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Tool Tutorial

Medication Event Huddles: A Tool for Reducing Adverse Drug Events

Readers may submit Tool Tutorial inquiries and submissions to Steven Berman, sberman@jcrinc.com. Sommer Alexander, MS, serves as Tool Tutorial editor.

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In fall 2008 the leadership of Nationwide Children's Hospital (NCH; Columbus, Ohio) embarked on a major initiative to eliminate preventable harm by 2013. Preventable harm is tracked using the internally developed Preventable Harm Index (PHI),¹ which reflects an emphasis on the numerator rather than the rate of untoward events. Adverse drug events (ADEs) that cause any degree of harm to a patient represent one of seven domains reported in the PHI. An analysis of our preventable harm events, which we conducted in May 2009, indicated that preventable medication errors or ADEs accounted for two thirds of reported patient harm.²

An ADE may simply be defined as "an adverse event (that is, injury resulting from medical care) involving medication use."³ Takata et al. reported that 11.1% of hospitalized pediatric patients experience ADEs, of which 22.2% are preventable.⁴ For the purpose of this article, the term *adverse drug event* refers to the subset of ADEs that are preventable—such as anaphylaxis to cefazolin in a patient with known anaphylaxis to cephalosporins. We exclude consideration of nonpreventable ADEs, such as anaphylaxis to cefazolin in a patient with no known drug allergies.

At NCH, we have identified ADEs via a voluntary reporting system, trigger tool analysis,^{4,5} reversal agent review, and reports from pharmacist interventions during the medication use process. As part of our initiative to decrease ADEs, we used the Model for Improvement⁶ to establish aims, key drivers, and interventions to drive change. Although we believe that our methods for detecting and reporting ADEs were effective, we noted that hospital staff and nurse managers varied in their ability to identify apparent causes of medication errors and struggled to dedicate time for coordination of huddles. Therefore, in March 2010 we trialed an interdisciplinary team—the Medication Huddle Team—to conduct medication event huddles. This intervention facilitated analysis of each ADE or near-miss ADE and the identification of process improvement opportunities.

Huddles can be used to promote a culture of safety, increase involvement of frontline staff, and speed improvement efforts.⁷

Wilbur and Scarborough described a pilot project in which regularly scheduled medication safety huddles constituted a general medication "safety round," at which patient care staff were encouraged to express their medication safety concerns and make recommendations for possible improvement.⁸ Gerke et al. described safety huddles prompted by actual events, perceived risks, or events that occurred at other institutions.⁹ In this article, we describe our medication event huddle tool and its impact on ADEs and preventable harm at NCH.

Tool Development

In July 2009 NCH's chief medical officer [R.J.B.] convened an interdisciplinary quality collaborative initially composed of representatives from all NCH critical care units, the surgery unit, and the hematology/oncology unit. The collaborative was chaired by the medical director for Quality Improvement Services (QIS) [R.E.M.] and vice president, Clinical Services [C.C.] Unlike harm events such as central line-associated bloodstream infections, which have been reduced by employing best-practice bundles for central line care,¹⁰ there is no reported "bundle" of care practices known to eliminate ADEs. The quick investigation or huddle tool was proposed as a means to engage frontline staff in identifying process improvements that might contribute to ADE elimination. Before implementing the huddle process, a common-cause analysis of our ADEs indicated that 50% occurred on our critical care units (pediatric, cardio-thoracic, neonatal, hematology-oncology, and surgical)—units that routinely administer a large volume of high-alert medications.¹¹ As a result, in March 2010 we piloted the huddle process in those patient care areas. We found that it was well received, and in 2011, after making only minor changes, we spread the process to all inpatient units and some ambulatory clinics. We have subsequently spread the medication event huddle process to ADEs that occur anywhere in the organization, including all ambulatory clinics, the emergency department, perioperative areas, and interventional radiology.

Table 1. Criteria for Initiating a Medication Event Huddle

Conduct a medication event huddle if one or more of the following is true:

- Event severity score 4 to 9 (NCC MERP categories D to I*)
- High-alert medication is involved
- Event has capacity to cause significant harm
- Multiple disciplines contributed to the event
- A new process or new equipment is involved
- Unique or not previously reported event or circumstance
- Event appears to fit an identified trend
- Variance in controlled substance handling
- Manager requests a huddle

* National Coordinating Council for Medication Error Reporting and Prevention. About Medication Errors. Accessed Dec 3, 2013. <http://www.nccmerp.org/medErrorCatIndex.html>.

Tool Description

CRITERIA FOR INITIATING MEDICATION EVENT HUDDLES

We conduct medication event huddles whenever an ADE reaches the patient and causes harm or has the potential to cause harm (Table 1, above). We score ADEs (on a scale from 1 to 9) on the internally developed Clinical Severity Scoring System (Table 2, page 41), which is similar to the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) medication error category index.¹² However, whereas the NCC MERP index stipulates that minor injuries due to an ADE that require increased monitoring be scored as a 4 or D, we consider an ADE level 4 or D as evidence of patient harm; it often requires additional venipuncture or blood sampling—minor but significant to a child.

Importantly, medication event huddles do not replace either a formal root cause analysis (RCA) if the ADE resulted in severe patient harm or daily safety walkrounds by leadership wherein medication safety concerns are often identified and discussed. Yet the huddle, compared to an RCA, enables more rapid identification of the cause and subsequent intervention, thereby increasing the efficiency with which potential process improvements can be identified and addressed. The huddle is also less resource intensive in terms of time for the unit staff and entails input from the actual providers at the unit level, including the person directly involved in the ADE. If an RCA is needed, the huddle findings are forwarded to the RCA team (as, for example, in the case of a huddle conducted for an oral potassium adverse event that occurred earlier that day).

A core interdisciplinary medication event huddle team is particularly valuable for ensuring consistency and identifying trends across the organization. The core team members are as follows:

1. A nurse quality coordinator, who functions as huddle team leader
2. A medication safety pharmacist
3. A quality expert assigned to the specific patient care unit where the ADE occurred
4. The vice president for clinical services and/or the medical director for QIS

IDENTIFICATION OF MEDICATION EVENT HUDDLE PARTICIPANTS

In addition to the core huddle team, huddle participants include the following:

- Managers, supervisors, or clinical leaders from the area where the event occurred
 - The staff member who reported the ADE
 - Staff members responsible for the patient's care at the time the event occurred
 - Prescribing practitioners and their respective leaders are included in huddles involving prescribing errors.
 - Nurses, pharmacists, pharmacy technicians, nurse practitioners, residents, attending physicians, medical assistants, respiratory therapists, and informatics specialists have all participated in ADE huddles. Residents or nurse practitioners participate in an estimated 30% of huddles, while the attending physician participates in an estimated 5% of huddles.

SCHEDULING THE MEDICATION EVENT HUDDLE

When an ADE is identified, the nurse quality coordinator schedules the huddle with unit leadership on the basis of the involved parties' earliest possible availability. In best-case scenarios, the huddle takes place within 24 hours of the identification of the event. However, because of scheduling challenges and the fact that advanced notice is required to provide coverage for staff members with patient care responsibilities, the majority of huddles occur within two weeks of the event. Individuals are not mandated to participate in huddles during their off-duty time.

How-To

Each huddle begins with an explanation by the core huddle team leader of the huddle process. The fact-finding, nonpunitive nature of the huddle is emphasized, with the goal of identifying system changes to prevent future ADEs. The ADE is reviewed by simulating the event using the actual electronic medical record, infusion pump, pharmacy labels, and other equipment or supplies to the greatest extent possible. In the recognition that frontline staff are essential for identifying error-prone processes, we encourage huddle participants to bring ideas for improve-

Table 2. Comparison of Nationwide Children’s Hospital Clinical Severity Scoring System and National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Scoring System

Score	Clinical Severity Scoring System	Score	NCC MERP*
1	Circumstances or events that have the capacity to cause error or harm	A	Circumstances or events that have the capacity to cause error
2	An event occurred but did not reach the patient	B	An error occurred but the error did not reach the patient
3	Event occurred that reached the patient but was not followed by patient harm	C	An error occurred that reached the patient but did not cause patient harm
4	An event occurred that was followed by increased patient monitoring and/or minimal patient harm or minor injury	D	An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm
5	An event occurred that was followed by treatment or intervention and/or by temporary patient harm	E	An error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention
6	An event occurred that was followed by initial or prolonged hospitalization and temporary patient harm	F	An occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization
7	An event occurred that was followed by permanent patient harm	G	An error occurred that may have contributed to or resulted in permanent patient harm
8	An event occurred that was followed by a near-death event	H	An error occurred that required intervention necessary to sustain life
9	An event occurred that was followed by patient death	I	An error occurred that may have contributed to or resulted in the patient’s death

* National Coordinating Council for Medication Error Reporting and Prevention. About Medication Errors. Accessed Dec 3, 2013. <http://www.nccmerp.org/medErrorCatIndex.htm>

ment to the huddle. A standard list of questions (Table 3, right) is asked of huddle participants to help identify environmental or practice factors that may have contributed to the event. These environmental or practice factors were known to contribute to ADEs on the basis of our common-cause analysis conducted in 2009.

In an ADE huddle, which lasts approximately 30 minutes, the huddle team uses a standardized tool to collect the huddle information (Figure 1, page 42). Although not specifically listed on the tool, we routinely track involvement of factors such as look-alike/sound-alike medications or intravenous fluids and calculation errors in our event reporting system. Also, such errors are minimized with use of the electronic medical record and pharmacy profiling of automated dispensing cabinets. The data are then transferred to a computer database for monitoring and tracking.¹³

Interventions identified during the huddle that might prevent future ADEs are assigned to the appropriate huddle participant(s) as “tests of change.” Anticipated dates of completion are codified. These interventions may be applicable to an individual’s practice, a specific patient care unit, or across the

Table 3. Standard Questions Asked During Every Medication Event Huddle

- What happened?
- Was an accurate handoff performed?
- What time did the event occur relative to the duration of the shift?
- Was the patient care assignment typical, busy, slow, unusual or difficult?
- Were staff members physically tired? Emotionally tired? Hungry? Were there other significant staff considerations?
- Were difficulties with the computer system, supplies, or equipment involved?
- What is the experience level of the staff involved?

entire organization. Factors contributing to the ADE are tracked in the huddle database. Follow-up communication regarding the “tests of change” is shared by e-mail. Sample interventions generated by the huddle process are shown in Table 4 (page 43).

Huddle participants are encouraged to talk with colleagues about the specific ADE and the huddle experience. We believe that the culture of safety is enhanced when the event details and improvement opportunities are shared by peers instead of hos-

Medication Event Huddle Data Collection Form

Patient Name: _____ MRN: _____ Event Reporting System # _____ - _____

Date of Event Occurrence: _____ Date Event Reported: _____

Unit: _____ Scheduled for : _____

Huddle Participants: _____

Medication/Fluid Involved: _____

Brief Summary of Event: _____

Staff Involved:

Name	Discipline	Years on Unit

Was accurate handoff performed? Yes No NA _____

When did it occur: _____ Was it near end of shift? (last 1–2 hours) Yes No

What was your assignment like during shift? Usual for unit Busy Slow Unusual/difficult patient

Other: _____

Other staff factors: NA Physically tired emotionally tired hungry Other: _____

Equipment/computer difficulties: NA _____

Themes Identified:

Action didn't match order	Double check inaccurate	Distracted/interrupted	End of shift	Feed/TPN wean order
Five Rights inaccurate	Handoff	Order confusion—multiple conflicting orders	Rate/VTBI switch	Rushed
Staff covering/helping	Tired	Verbal order given but not entered	BCMA	

Suggested Interventions:

What?	Category? I = Individual U = Unit C = Corporate	Who?	Due Date?	Ongoing Progress	Completed or Declined

Medication Bundle Omissions (circle all that were omitted/inaccurate/contributed):

Medication Reconciliation Two RN Independent

Double Check for High-Alert Meds

Use of Smart Pump Library Weight on Admission

Five Rights During Prescribing, Dispensing, Administration

Figure 1. Each medication event huddle lasts approximately 30 minutes, with the huddle team using this standardized tool to collect the huddle information. MRN, medical record number; NA, not applicable; TPN, total parenteral nutrition; VTBI, volume to be infused; BCMA, bar-code medication administration.

Table 4. Sample of Interventions Resulting from Medication Event Huddles*

- **Formation of task forces to address complex issues such as orders for “total fluid” rates, replacement fluid rates, titration and wean orders, medication reconciliation, and prioritization of alerts viewed in the electronic medical record.** During a huddle, it was discovered that prescribers sometimes used ambiguous instructions for replacement fluid orders. Language for replacement fluid instructions was standardized to “Replace xx output xx per 1 mL every xx hours. Infuse over xx hours” in which the prescriber fills in the “xx.”
- **Medication administration record (MAR) changes, including the addition of information required to correctly program infusion pumps, removal of extraneous information, and electronic links to policies and procedures.** Review of the MAR during a huddle illustrated that the information needed to program a patient-controlled analgesia pump was not clearly grouped together on the MAR. The MAR was adjusted so that all programming elements appear in the order necessary to program the pump.
- **Pharmacy medication label changes such as addition of the patient weight used to calculate the medication dose, removal of the daily patient weight, removal of the patient account number, and redesign of the label to make the syringe expiration date visible while the syringe is in the syringe pump.** Huddle discussion revealed that the 12-digit patient account number was a possible source of confusion. Because the account number was not necessary for patient care, it was removed from the pharmacy label, leaving only the patient’s medical record number and numbers associated with the medication order or patient location.
- **Electronic medical record changes, including revision of medication dose alerts, easier access to prescribe medications needed for specific patient populations, and limited access to prescribe high-risk medications that are indicated only for specific patient populations.** Huddle participants identified overalerting of the electronic medical record as a contributing factor for overlooking relevant alerts. Medication dose alerts are customized when possible to diminish the overall alert appearance rate and minimize alert fatigue. “Low-dose” alerts for opioids that are weaned slowly to prevent withdrawal symptoms were removed from the system.
- **Staff coaching regarding use of the dose history feature on the MAR, verification of Five Rights prior to medication administration, double checks for high alert medications, use of smart infusion pump libraries.** Huddle discussion revealed variation in the manner in which nurses completed the Five Rights check prior to medication administration. This led to systemwide reeducation on how to complete the checks. Audits were conducted to assess compliance and the policy and procedure was revised to clarify the Five Rights check.
- **Nurse change of shift handoff process changed to include safety checks for infusions.** Most nursing units have switched to bedside shift handoffs, during which one nurse reads the infusion order from the electronic medical record, while the other nurse checks the pump settings. This enables pump programming errors to be identified more quickly and assures the oncoming nurse that all settings are correct.
- **Transparent discussion, both formal and informal, between staff and managers about ADE and error prevention tools.** Staff are encouraged to speak truthfully to identify barriers to advancing the culture of safety on the individual units. One nurse identified resistance to performing bedside handoff during the early stages of implementation. All staff were reminded of this procedure change and were encouraged to insist on bedside handoffs for patient safety.

* ADE, adverse drug event.

pital or unit leaders. For example, if a medication administration error occurs when the smart infusion pump is not used correctly, we ask the involved nurse to discuss the event with his or her unit colleagues. We encourage this communication so that everyone can learn from the experience and avoid making the same mistake. An experienced staff member’s description of his or her own contribution to an error can have a particularly large impact, reinforcing the reality that even the “best” or most seasoned performers can make mistakes. Huddle “lessons learned” are also shared at separate meetings with frontline staff from all patient care areas. The purpose of these meetings is to review harmful adverse events and discuss potential process changes.

Estimated Cost of a Medication Event Huddle

In the recognition that there is a personnel cost associated with scheduling and conducting medication event huddles, as well as a cost associated with preventable adverse events, we estimated the costs using institution-specific salary and patient charge information. Identification, scheduling, documentation, and tracking of a huddle costs approximately \$50 in quality improvement coordinator time. Huddles involving the core huddle team (minus the medical director for QIS) but also including a nurse program manager, nurse clinical leader, and staff nurse cost approximately \$250. Huddles for prescribing events involving the core huddle team, as well as the medical director for QIS, a chief resident, the attending physician, and the resident cost approx-

Apparent Cause Themes Identified from Medication Event Huddles, March 2010–June 2013

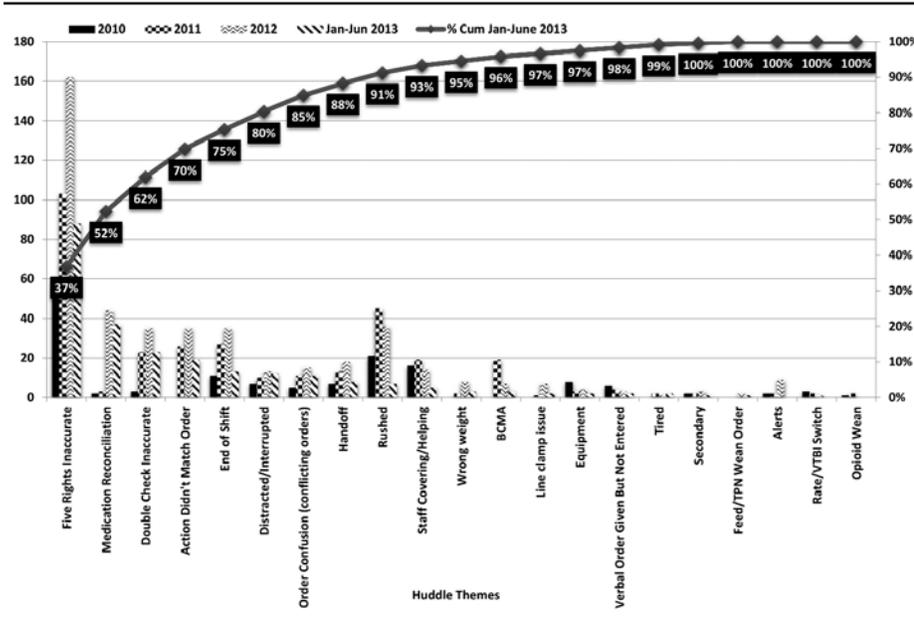


Figure 2. A Pareto analysis of the major error themes identified during medication event huddles from March 2010 through June 2013 shows that the top six themes were Five Rights, medication reconciliation process failure, double check inaccurate, action did not match order, end of shift, and distracted/interrupted. (Available in color in online article.)

imately \$315. A 60-minute interdisciplinary huddle for a complex event, including the core huddle team plus the medical director for QIS, three attending physicians, and a resident, costs approximately \$880.

We compared the cost of the medication event huddle to the estimated cost of ADEs of varying severities at our institution, with the following findings:

- A severity-4 adverse event, resulting in increased monitoring of vital signs only, costs an additional \$100.
- A severity-5 adverse event, such as failure to heparinize a central line per policy, followed by a clotted line requiring administration of two doses of alteplase for catheter clearance, costs approximately \$685.
- A severity-6 adverse event, such as readmission following omission of a medication at the time of discharge, costs approximately \$47,000.
- Finally, a severity-8 event, resulting in a code blue followed by transfer to the ICU, costs approximately \$105,000.

Results and Lessons Learned

In approximately three years, we have conducted more than 800 huddles and have identified more than 3,000 potential improve-

ments, of which 2,400 (80%) were successfully implemented. Sixty-four (2%) of the recommendations could not be implemented or were declined after further information was obtained. For example, the electronic medical record system or infusion pump may not support the desired change. The remaining recommendations are in process.

Figure 2 (left) shows a Pareto analysis of the major error themes identified during medication event huddles from March 2010 through June 2013. The top six themes are as follows:

1. Five Rights (of medication use [right person, right drug, right dose, right route, and right time] inaccurate)
2. Medication reconciliation process failure
3. Double check inaccurate
4. Action did not match order
5. End of shift
6. Distracted/interrupted

The “end of shift” huddle theme was the most surprising. It is well known that errors are more likely when working prolonged shifts.¹⁴ However, we were initially surprised that it did not seem to matter how long the shift lasted (that is, 8, 12, or 16 hours). Perhaps, at the end of a shift of any duration, ADEs are more likely because staff are rushed to complete their patient care obligations—treatments, medical record documentation, and so on. In addition, staff may be more fatigued at the end of a longer shift. Nevertheless, subsequent end-of-shift ADEs are mostly associated with shifts of 12 or 16 hours’ duration.

Also surprising was the huddle theme of “Staff Covering/helping” a colleague. Although committed to assisting their peers with patient care obligations, these “helpers” may not be as familiar with the patient as the primary nurse and, are therefore, more likely to make an error. “Helping” staff need to be vigilant and maintain situational awareness and be alert to attention blindness so as to maintain high process reliability.¹⁵

As a result of Nationwide Children’s evolving culture of safety, overall reporting of all adverse events, including ADEs, increased from 300–400 per month in fall 2009 to more than 500 per month by February 2010. This increased ADE reporting has been sustained during the past four years. Importantly, the absolute number of harmful ADEs has decreased by 74%, and the

ADE rate per 1,000 dispensed doses has decreased by 85% since February 2010.² The monthly average number of ADEs per 1,000 doses dispensed has been sustained through October 2013 at 0.04 (unpublished data). Although this decrease in ADEs per 1,000 doses is associated with many interventions, it is temporally associated with the initiation of the medication event huddle process in March 2010.

In March 2011—12 months after the huddle process was initiated—78 unit leaders and 156 frontline staff were asked to complete an anonymous electronic survey regarding their experience with the huddle process; the survey return rate was 58% and 57%, respectively. Ninety-six percent of the respondents reported that the huddles were nonpunitive, and 85% indicated that they made changes to their own practices.

Coordinating schedules for medication event huddles, covering for staff participating in medication event huddles, and documenting follow-up on interventions are all time-consuming. Initially, we intended to have the unit leaders take over the responsibility of conducting the medication event huddles from the core huddle team. However, we observed that unit leaders were often reluctant to ask the necessary questions required to identify the true apparent cause(s) of the medication error(s). Also, we have found that use of a core huddle team is invaluable for ensuring consistent follow-up and implementation of process changes across the organization. However, our approach currently requires a minimum of 0.5 full-time-equivalent nurses to review the ADEs, schedule the huddles, and follow up on completion of recommendations.

Summary and Next Steps

The medication event huddle process continues to evolve, with our current focus on improved efficiency for a process that still creates challenges for all staff involved. We believe the benefits from accurately identifying apparent causes, soliciting improvement suggestions from frontline staff, and the positive impact on our culture of safety far outweigh these challenges. We believe the medication event huddle is an important tool to reduce ADE-related preventable patient harm within a health care organization.

Contact Us

For additional information and discussion regarding the medication event huddle process, please contact the authors by telephone (614-722-2185) or e-mail (Shelly.Morvay@NationwideChildrens.org). 

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Online-Only Content

See the online version of this article for

Figure 2. Apparent Cause Themes Identified from Medication Huddles, March 2010–June 2013 (color version)

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Figure 2. Apparent Cause Themes Identified from Medication Event Huddles, March 2010–June 2013

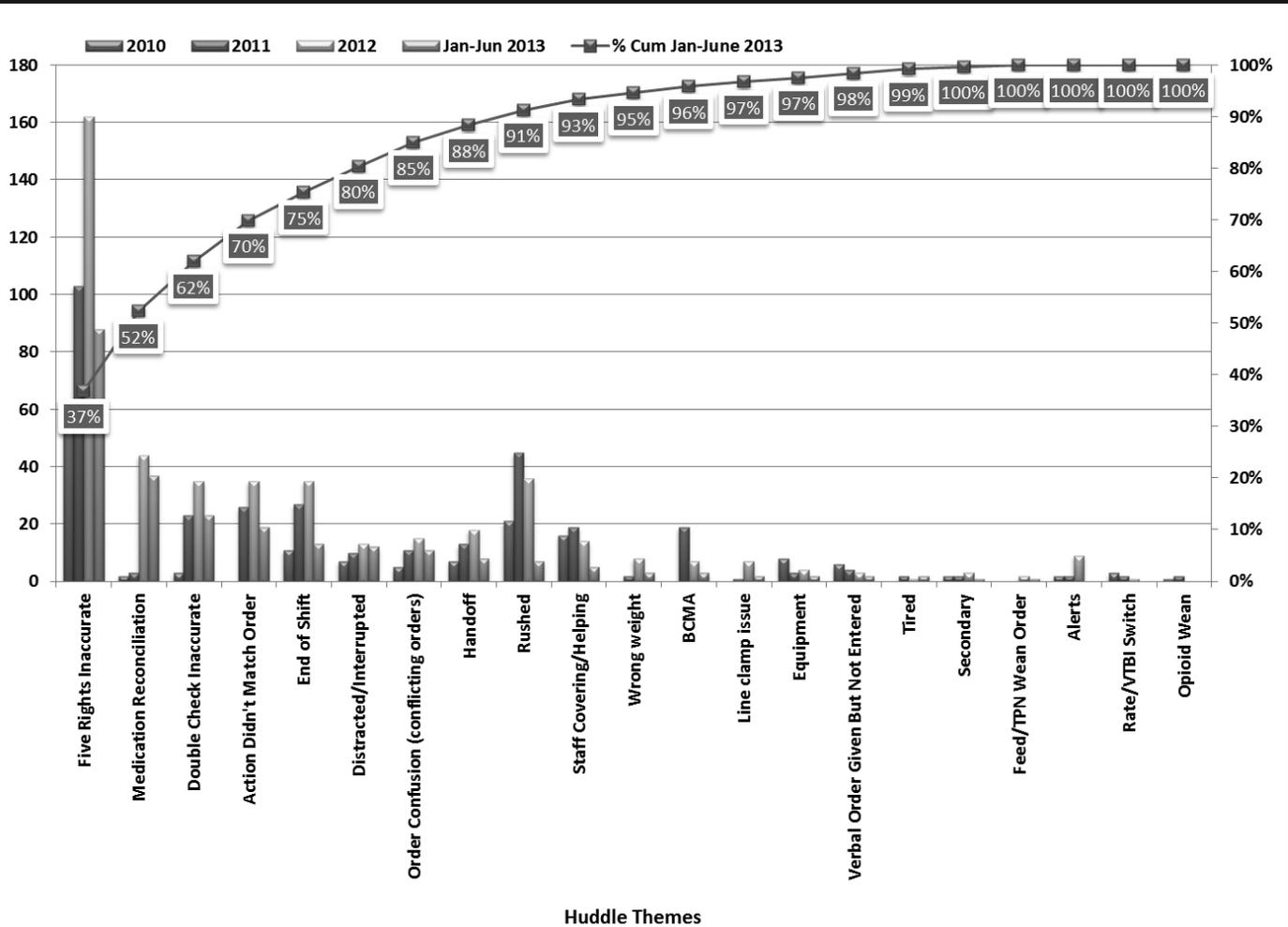


Figure 2. A Pareto analysis of the major error themes identified during medication event huddles from March 2010 through June 2013 shows that the top six themes were Five Rights, medication reconciliation process failure, double check inaccurate, action did not match order, end of shift, and distracted/interrupted.