An Internal Quality Improvement Collaborative Significantly Reduces Hospital-wide Medication Error Related Adverse Drug Events (ADE)

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Abstract

Objective: To reduce harmful Adverse Drug Events (ADEs) severity levels D-I from an apparent quarterly baseline of 0.24 to 0.08 ADEs/1000 doses.

Study design: A hospital-wide, quality improvement (QI) collaborative of multidisciplinary teams was implemented. High reliability concepts and QI science methods were used. ADEs were detected by a combination of voluntary reporting, trigger tool analysis, reversal agent review, and pharmacy interventions. The ADE Quality Collaborative focused on medication use processes.

Results: The rate of harmful ADEs initially increased >40% because of increased error-reporting. The average peak rate was 0.17 ADEs/1000 dispensed doses in Q1 2010. By end of Q2 2013, the rate decreased by 76.5% to 0.04 (P < 0.001). Harmful ADEs decreased from 85 to 25 per quarter (p = 0.001).

Conclusions: Using an internal QI collaborative model focused on medication use processes, we reduced harmful, preventable ADEs hospital-wide by 76.5%.

Background

• Nationwide Children’s Hospital (NCH) goal is to become a high reliability organization (HRO) and eliminate preventable patient harm.

• Harmful medication errors are 3 times more common in children.
  - Weight-based dosing may lead to miscalculations
  - Immature metabolic systems are less tolerant of errors
  - Children have limited ability to communicate symptoms related to errors

• Common cause analysis of harm events revealed that ADEs are 2/3 of preventable patient harm at NCH.
  - 50% of harmful ADEs due to administration errors (mostly failure of 5-rights)
  - 20% prescribing errors and 10% dispensing errors
  - Half of all ADEs occur in critically ill patients

• To decrease harmful but preventable ADEs, we initiated a multidisciplinary ADE quality collaborative (ADEQC) among critical care staff in July 2009.

• ADEQC was uniquely focused on failures of medication use phases (i.e. prescribing, dispensing, administration, monitoring).

• ADEQC was expanded to all inpatient and outpatient units in 2011.

Methods

Setting: NCH is an academic, non-profit, free-standing, children’s hospital
  - 450 Beds
  - Annual volume
    - 28,000 admissions
    - 25,000 surgeries
    - 1 million outpatient visits
    - 1.6 million medication doses

ADE Detection: Voluntary reporting, trigger tool analysis, 100% review of reversal drugs, and pharmacist interventions

ADE Severity Scoring: NCC MERP

Primary Metric: Harmful ADE rate = ADEs (score D-I) / 1000 dispensed doses

Secondary Metrics:
  - Potential (Non-Harmful) ADEs (Score A-C)/1000 doses

Improvement Methodology:
  - Model for Improvement
  - ADEQC established Specific Aim and Key Driver Diagram (Figure 1)

Analytic Method:
  - Statistical Process Control charting

Safety Culture Work:
  - Implementation of high reliability, safety tools & behaviors and just accountability (Zero Hero)

Results

Figure 2 shows initial rise in reporting of harmful, but preventable errors.

• Increased error reporting coincided with implementation of safety culture work.

• ADEs peaked in February 2010 at 0.24/1000 dispensed doses.

• Q1 2010 ADE rate of 0.171/1000 dispensed doses decreased 52% to 0.08/1000 dispensed doses despite expansion of ADEQC to all inpatient and outpatient units.

• As of Q2 2013, over 7500 ADEs have been reported.
  - 462 severity D (6.2%)
  - 273 severity E (4%)
  - 28 severity F or higher (0.4%)
  - No deaths have resulted from ADEs
  - Reporting of non-harmful, potential (near miss) ADEs (A-C) is ~10-20 fold higher than harmful ADEs (D-I) (Figure 3)

• Proportion of administration errors to prescribing errors reversed from 2010 to 2012 (Figure 4)

• During 2012, the most common medications associated with harmful, preventable ADEs were vaccines (29%), analgesics and narcotics (16%), insulin (9%), intravenous fluids (9%), and enteral nutrition (8%).

Summary

• 76% reduction in harmful but preventable ADEs.

• Key success factors:
  a. Internal quality collaborative model
  b. Focus on failures of medication use processes
  c. Reliable use of ADE prevention bundle
  d. ADE huddles
  e. Evolution of a “culture of safety.”

• Remaining challenges and opportunities:
  a. Medication reconciliation
  b. Insulin therapy
  c. Therapeutic drug monitoring
  d. Neonatal total parenteral nutrition
  e. Electronic medical record alert fatigue
  f. Significant physician engagement, but limited participation as a MOC project.