Use of Automated Medication Dispensing Technology (Pyxis®) to Help Identify Trigger Medications and Concurrent Adverse Drug Events

The Quality Colloquium

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Virtua Health

- Four Hospital System in Southern New Jersey
- Two Long Term Care Facilities
- Two Home Health Agencies
- Two Free Standing Surgical Centers
- Ambulatory Care – Camden
- Fitness Center
- 8000 employees and 2000 Physicians
- 7,500 infant deliveries
- $650 million in revenues
- STAR Culture

Adverse Events

- Adverse events in the healthcare setting are often called incidents.
- Incidents may include both non-medication related events and medication related events.

The Pharmacist

- The focus of the Pharmacist is on the medication related adverse events.
  - Identification
  - Improvement
    - Process
    - Knowledge base
  - Prevention

Adverse Drug Events

- Significant problem facing all hospitals
  - Only 10-20 percent of errors are reported.
- The Institute for Healthcare Improvement (IHI) has established “trigger tools” for measuring ADEs (identifies patients retrospectively).
- Utilizing automated technology in conjunction with Nursing and Pharmacy identifies potential ADEs in a concurrent fashion.*

* Institute for Healthcare Improvement, 2004.

Definitions of Medication Safety terms

- Confusion exists over correct terminology.
  - No universally accepted definition for “adverse drug reaction.” *
  - Each institution establishes their own standards.
- Adverse Drug Events include medications errors (preventable by definition) and adverse drug reactions (not preventable by definition).

* Qual Safe Health Care, 2005; 14: 358-363.

Accepted Definitions

- **Adverse reaction:** In pharmacology, any unexpected or dangerous reaction to a drug. An unwanted effect caused by the administration of a drug. The onset of the adverse reaction may be sudden or develop over time. *
- **Adverse event:** In pharmacology, any unexpected or dangerous reaction to a drug.*
- No definition was listed for either **adverse drug event** or **adverse drug reaction**.

Definition of an Adverse Drug Reaction

- Any unintended, undesirable or unexpected effect of a prescribed medication that:
  - Requires discontinuing a medication or modifying the dose
  - Requires treatment with a prescription medication
  - Requires initial or prolongation of hospitalization
  - Results in a disability or is life threatening
  - Results in death or results in a congenital anomaly

Cost of ADRs in the Hospitals*

- 4.2-6.7 events per 100 regular hospital admissions ($2162/admission)
- 3.2% of all admissions caused by adverse drug event ($6685/event)
- 1.9-2.2days increase the length of stay($1900-5900/patient/hospital stay)

* Senst,B, Am J Health Syst Pharm:58 (12): June 15, 2001.1126-32.

Cost of ADRs in the Hospitals*

- 15% of hospital ADEs and 76% of ADEs causing admission were judged preventable.
- Annual cost for events occurring during hospitalization was 1.7 million dollars.
- Patient noncompliance was judged to be the cause of 69% of the ADEs causing admission.
- 71% of the serious medication errors occurred at the prescribing stage of the medication use process.

* Senst,B, Am J Health Syst Pharm:58 (12): June 15, 2001.1126-32.

Common Offenders

- Virtually all drugs have the potential to cause unwanted effects. Some of the commonly reported offenders include:
  - Antibiotics
  - Anticoagulants
  - Antineoplastic drugs
  - Insulin
  - Thrombolytic agents

Reporting Methods

- Traditionally adverse events have been identified using incident reporting.
  - Voluntary
  - Often non-automated
  - May include a telephone hotline
- Studies imply that only 6% of adverse drug events are identified through traditional incident reporting or a telephone hotline.*

* Cullen D, Bates D, Small S, Cooper J, Nemeskal A, Leape L. The incident reporting system does not detect adverse events: a problem for quality improvement. *Jt Comm J Qual Improv* 1995;21:541-548.

Automated Medication Dispensing Technology at Virtua

- Pyxis® machines were first utilized at Burlington Memorial Hospital around 1995.
- Implementation occurred at the other divisions of Virtua Health in 2005.
- Common medications used to treat adverse drug reactions were identified as trigger or tracer drugs.

Trigger Drugs

Examples of selected tracer drugs include:

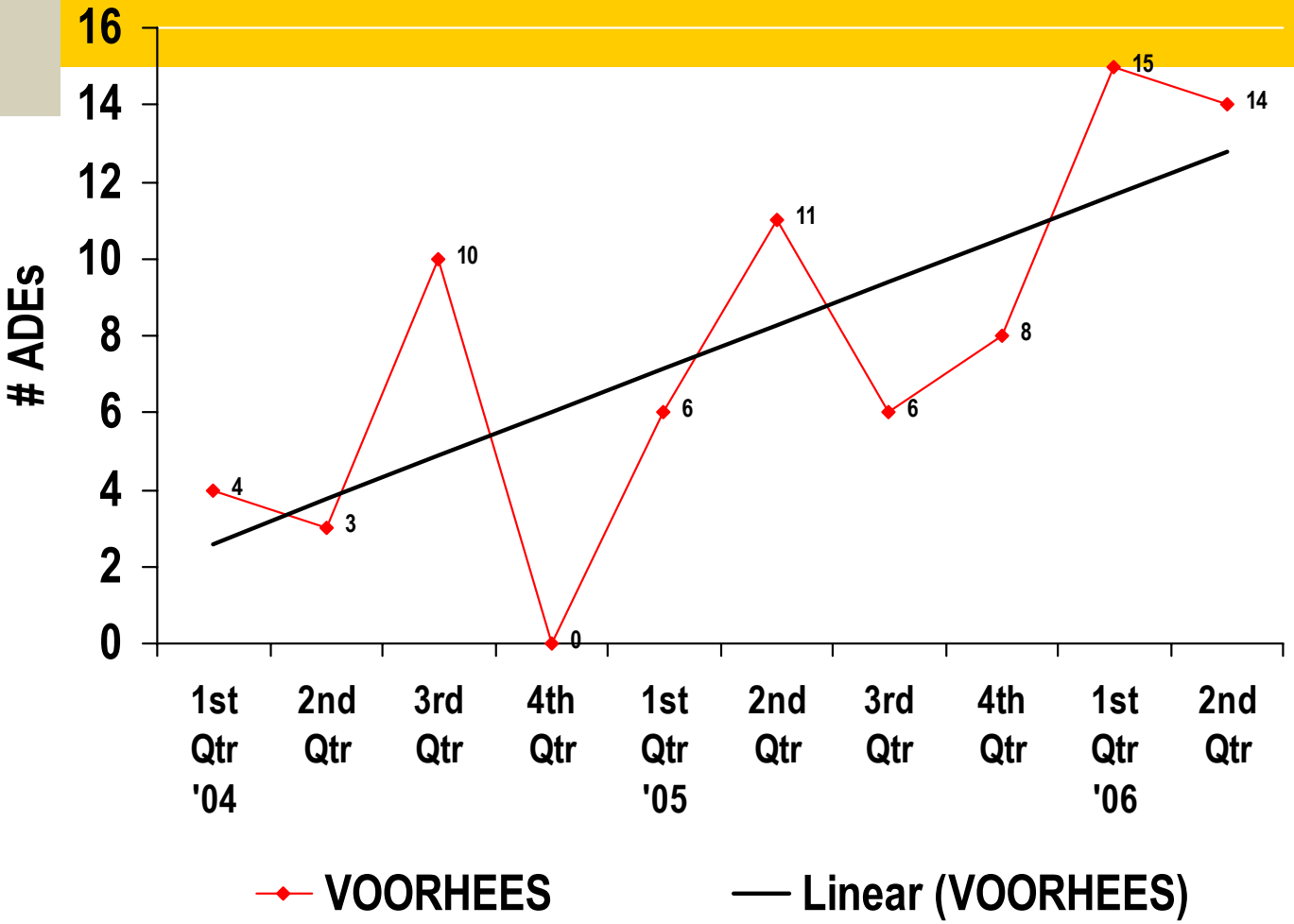
- Diphenhydramine (Benadryl®)
- Dextrose 50%
- Flumazenil
- Naloxone
- Methylprednisolone
- Protamine
- Sodium Polystyrene Suspension (Kayexalate®)

Question asked when a Trigger drug is removed from Pyxis®? *

- Is this medication being used to treat an adverse drug reaction?
  - Yes or no must be selected.
- A daily report prints in the pharmacy with the name of the trigger drug, patient, nurse and the Nurse' response to this question.
- Clinical Pharmacy follows up daily, on this report.

* Formulary, March 1, 2002

ADEs Reported at Virtua Voorhees



Case 1

- A 86y/o male admitted with pneumonia.
- A trigger drug for Dextrose 50% syringe was identified by the Nurse and sent to Pharmacy for follow-up.
- Blood glucose < 70 mg/dl (patient was on Diabinese®) and Crcl=35ml/min.
- Diabinese® not recommended for elderly patients, especially those with renal insufficiency.
- Physician contacted that morning and medication changed.

Case 2

- A 74 year old patient had been taking Vasotec and potassium at home but these medications were stopped soon after he was admitted to the hospital.
- He was sent home several days later and the discharge instructions made no mention of these two medications that he had been taking prior to hospitalization.

Case 2 (con't)

- The patient restarted his home medications and was readmitted to the hospital within 10 days.
- A trigger drug for kayexalate was identified by the Nurse and sent to Pharmacy for follow-up.

Case 3

- 91 y/o male admitted after collapsing at home.
- A trigger drug for D50 was identified by Nursing and sent to Pharmacy.
- Blood glucose was 20mg/dl on admission.
- Pt had been discharged the day before admission with possible pneumonia and treated with Levaquin®.

Case 3 (con't)

- Pharmacy contacted the physician and the Levaquin® was discontinued.
- On admission, his serum creatinine was 4.7 mg/dl (CrcI=10ml/min).
- His glucose remained low for approx 24 hours (43 mg/dl) but returned to normal the following day.

System Enhancements

- Pharmacist's clinical contributions via rounding with multidisciplinary team (already in place at many Hospitals but can be expanded).*
- Bar Coding
- Electronic Medication Administration Record
- Physician Computer Order Entry (CPOE)

* Leape L, JAMA. 1999;282:267-270.

Bar Coding

- One third of all medication errors are mistakes in the administration of drugs.
- If used properly, bar coding makes less than one error per one million scans.
- It is also valuable for ensuring:
  - Dispensing accuracy
  - Purchasing
  - Inventory control

(Am J Health Syst Pharm, 57(16);2000:1487-1492.)

Physician computer order entry

- 17% of physicians have completely illegible handwriting which:
  - Increases the time it takes to train personnel
  - Wastes the time of those who have to decipher the handwriting
  - Makes it difficult to ascertain what happened to the patient during their stay
- Takes 2-8 hours for a handwritten order to reach the pharmacy.

Am J Health Syst Pharm, 57(16);2000:1487-1492.

Strategies to Improve ADR Reporting

- Make reporting easy.
- Make reporting method readily available.
- Include all members of the healthcare team.
- Use automated dispensing systems to identify trigger drugs and concurrent ADEs.
- Educate, Educate, Educate.

Summary

- Utilizing automated technology to report ADRs is only a small part of implementing a good program.
- Ongoing education is essential to gain and maintain compliance with reporting.
- A Medication reconciliation program implemented throughout the Hospital will prevent some ADEs.
- Future technology will help expand a good ADE program.

Conclusions / Questions

- Hospitals should always strive to improved quality and patient safety through improving the Adverse Drug Event Program.
- Pharmacists involvement in daily rounds can be a significant contribution.
- New technology such as CPOE, electronic MAR's and bar coding can significantly improve reporting and decrease the chance of medication errors.