PURDUE PHARMACY

CENTER FOR MEDICATION SAFETY ADVANCEMENT

Promoting Patient Safety Through Integration of Large Data Sets, Metrics, and Dashboards

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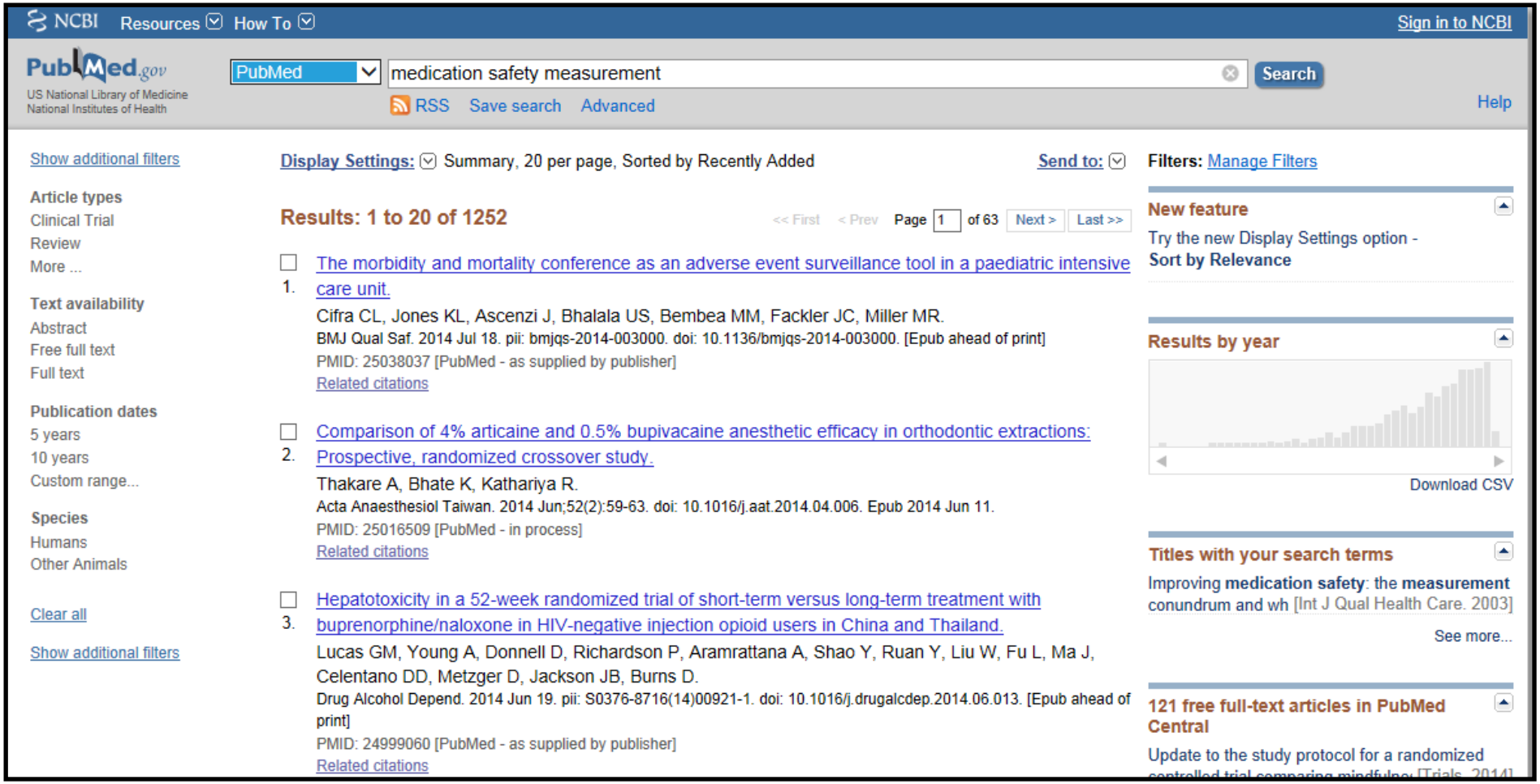
Objectives

- Summarize various sources that can be used to collect data on medication use
- Design a medication safety dashboard for use in a health system setting
- Describe large data set analysis and how it may be used to improve the medication use process

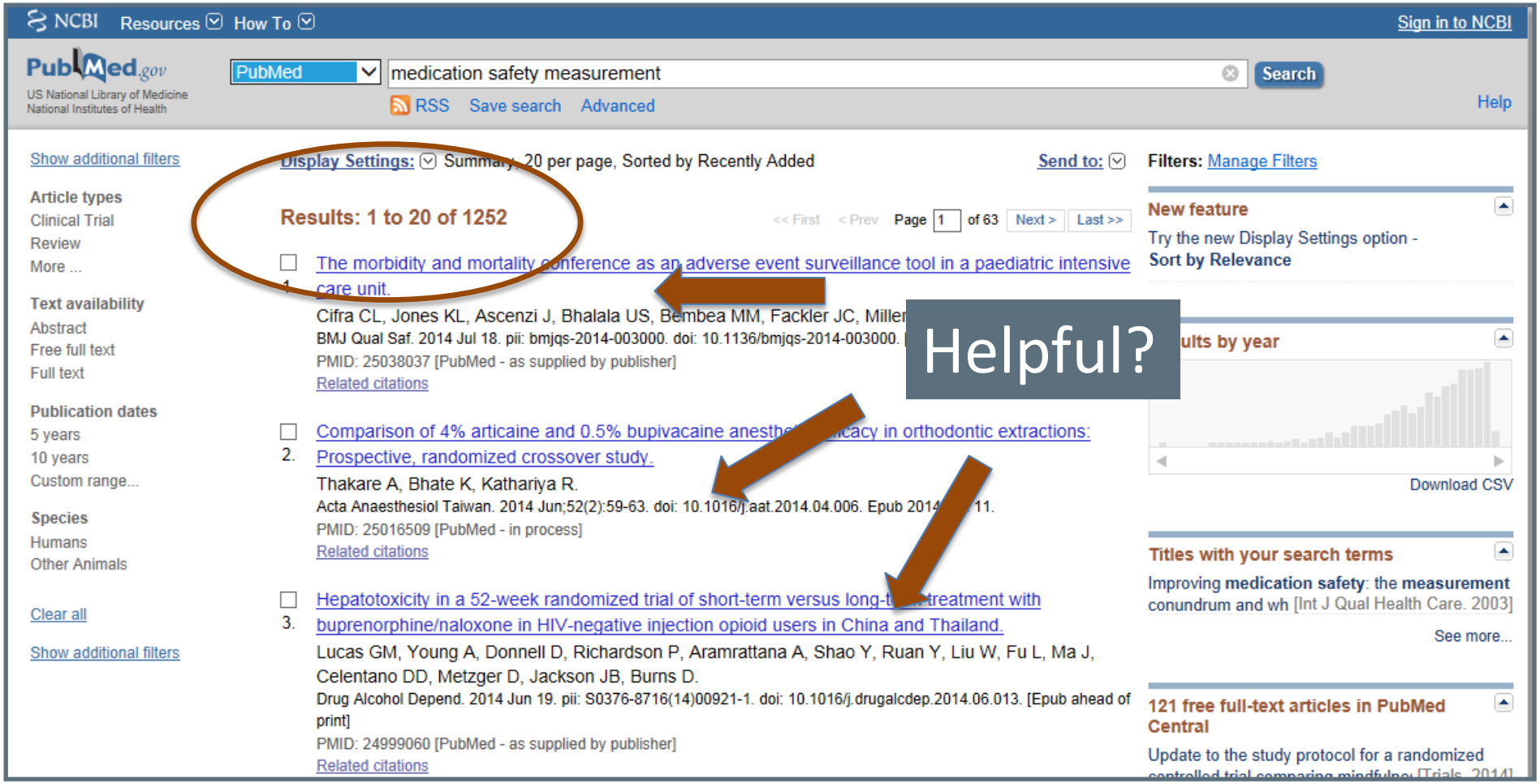
Case Study

A 250 bed hospital that has an electronic medical record is looking to understand how safe their medication use process is. The currently utilize ADCs and are bringing smart pumps (intelligent infusion devices) online in the near future. They feel like they have lots of data but are not sure how to interpret it in order to make a determination on safety. How would you instruct them to proceed?

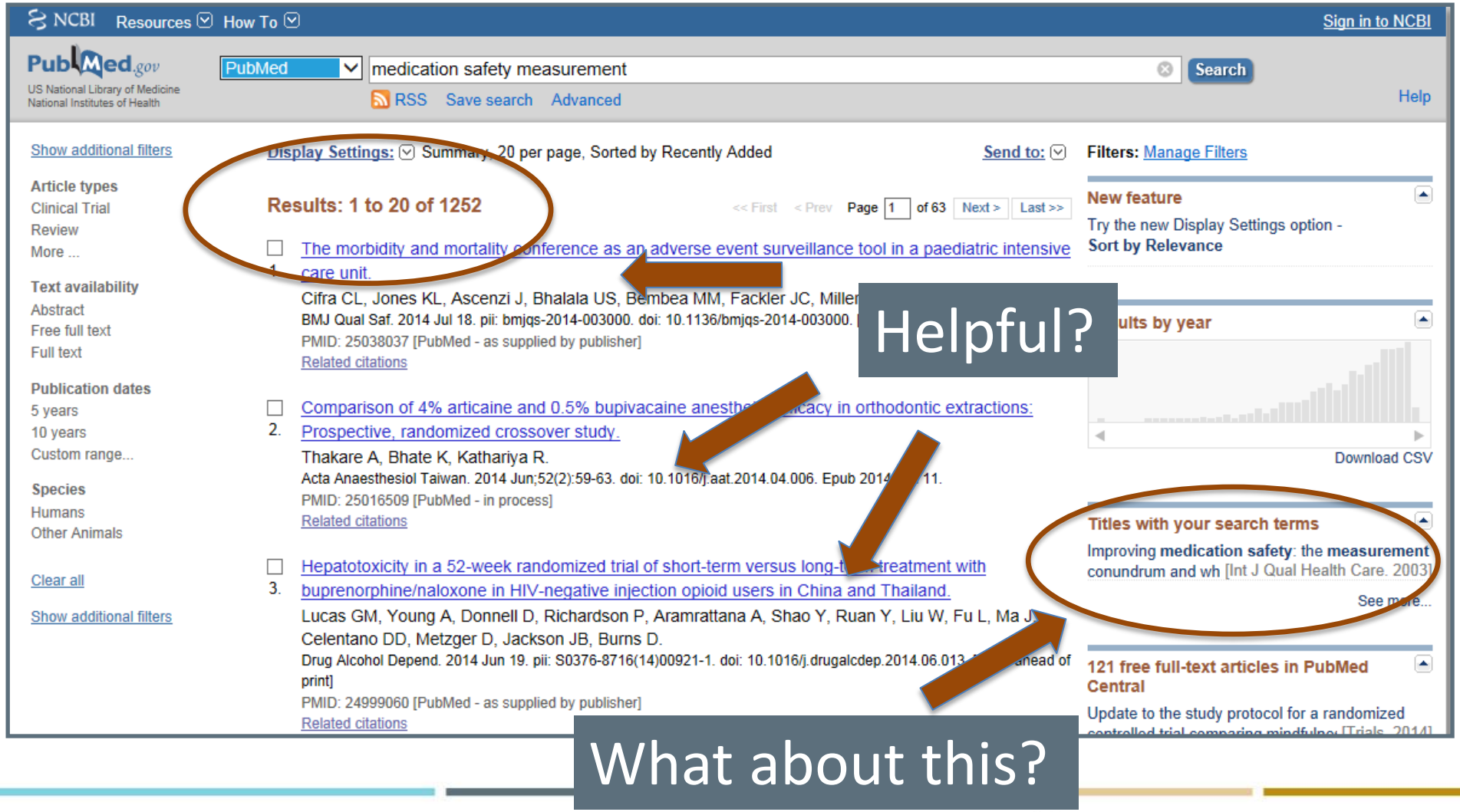
Where to start?



Where to start?



Where to start?



Medication Safety Metrics

International Journal for Quality in Health Care 2003; **Volume 15, Supplement 1**: pp. i41–i47 10.1093/intqhc/mzg083

Improving medication safety: the measurement conundrum and where to start

DAVID C. CLASSEN[1] AND JANE METZGER

The University of Utah School of Medicine, Salt Lake City, UT, [1]First Consulting Group Lexington, MA, USA

Abstract

The use of medication remains the most common intervention in health care. The complexity of both medication use and the medication management process, especially in the in-patient setting, create a significant risk for hospitalized patients. Despite the widespread recognition of the hazards that medication use poses to patients, there are no widely accepted or standardized methods to measure the safety of medication use. Where to focus measurement in medication safety is the subject of ongoing debate. Various groups have suggested measuring error-prone aspects of the medication use process such as errors in administration of medications or errors in dispensing of medications. Other groups have suggested measuring adverse drug events as a measure of the safety of medication use. Many studies in this area have outlined the great difficulty associated with getting clinicians to report either medication errors or adverse drug events voluntarily. In response to these challenges, yet more groups have developed non-voluntary reporting methods based on the use of 'triggers', in either a chart review or electronic format. Medication safety is a complex process and measurement of it needs to be a core component throughout the whole

Int J Qual Health Care. 2003

Medication Safety Metrics

- The purpose and meaning behind measurement
  - Learn and improve
  - Ensure accountability
  - Intervene
- Data to collect (suggestions)
  - Pharmacy
  - Lab
  - Medication administration
  - Prescribing

***Takeaway from Classen: Start somewhere with something and make it electronic

Int J Qual Health Care. 2003

Medication Safety Metrics

PRACTICE REPORTS

Systematic review of medication safety assessment methods

CARLA MEYER-MASSETTI, CHRISTINE M. CHENG, DAVID L. B. SCHWAPPACH, LYNN PAULSEN, BRIGID IDE, CHRISTOPH R. MEIER, AND B. JOSEPH GUGLIELMO

The health-related and economic burdens associated with drug-related problems (DRPs), including adverse drug events (ADEs), adverse drug reactions (ADRs), and medication errors (MEs), have resulted in requirements to ensure

Purpose. The accuracy, efficiency, and efficacy of four commonly recommended medication safety assessment methodologies were systematically reviewed.

Methods. Medical literature databases were systematically searched for any comparative study conducted between January

showed a higher specificity compared to the other methods and most effectively captured severe DRPs. In contrast, the sensitivity of incident report review was lower when compared with trigger tool. While trigger tool was the least labor-intensive of the four methodologies, incident report

Am J Health-Syst Pharm: 2011; 68:227–40

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Medication Safety Metrics

- A robust picture of medication safety
  - Voluntary reports
  - Automated trigger tool data
  - Direct observation
  - Chart review – electronic or manual
  - Data from technology (Smart Pumps, Automated Dispensing Cabinets, Electronic Medical Records)

***Takeaway from Meyer-Masseti: Strengths and weaknesses with various data sources. Multiple data sources necessary to get full picture of medication safety

Medication Safety Metrics

- Significant focus on definitions
  - Keep this for yourself and stick to it
- Consensus based adoption of definition
  - Sometimes just move on
- Surveillance or Reporting . . . . . or both
- Be open to benchmarking and sharing best practice

Incident Reports

- Take many different forms
  - Free text
  - Drop down boxes
  - Online
  - Manual
  - Verbal conversations
- Focuses on human recall of an event and includes *perception* of the facts

A practical look

PROS

- May include a narrative aspect to tell the "story"
- Firsthand knowledge of the event
- Typically only reported when an event or harm has occurred (if even then – still a dramatic under-reporting rate – see CONS)

CONS

- Under reporting
- Fear of misuse (blame) in a poor safety culture
- Perceptions may vary based upon who is reporting

Trigger Tools

ERRORS & ADVERSE EVENTS

By David C. Classen, Roger Resar, Frances Griffin, Frank Federico, Terri Frankel, Nancy Kimmel, John C. Whittington, Allan Frankel, Andrew Seger, and Brent C. James

'Global Trigger Tool' Shows That Adverse Events In Hospitals May Be Ten Times Greater Than Previously Measured

DOI: 10.1377/hlthaff.2011.0190
HEALTH AFFAIRS 30,
NO. 4 (2011): –

ABSTRACT Identification and measurement of adverse medical events is central to patient safety, forming a foundation for accountability, prioritizing problems to work on, generating ideas for safer care, and testing which interventions work. We compared three methods to detect adverse events in hospitalized patients, using the same patient sample set from three leading hospitals. We found that the adverse event detection

David C. Classen (dclassen@csc.com) is an associate professor of medicine at the University of Utah, in Salt Lake City.

Roger Resar is a senior fellow at the Institute for Healthcare Improvement, in Cambridge, Massachusetts.

IHI Global Trigger Tool

- Looking for “clues” = triggers
- These clues will tip us off to likely adverse events in patient charts
- Retrospective review of patient charts for triggers resulting in harm
- Overall goal is reduction of harm

Source for slides: IHI White Paper on Global Trigger Tools

Triggers – Medication Module

M1 – C. Diff positive stool
M2 – PTT > 100 seconds
M3 – INR > 6
M4 – Glucose > 50mg/dL
M5 – Rising BUN or SCr over 2x baseline
M6 – vitamin K administration
M7 – diphenhydramine administration
M8 – romazicon administration
M9 – naloxone administration
M10 – Anti-emetic administration
M11 – Over-sedation/hypotension
M12 – Abrupt medication stop
M13 – Other

Source for slides: IHI White Paper on Global Trigger Tools

A practical look

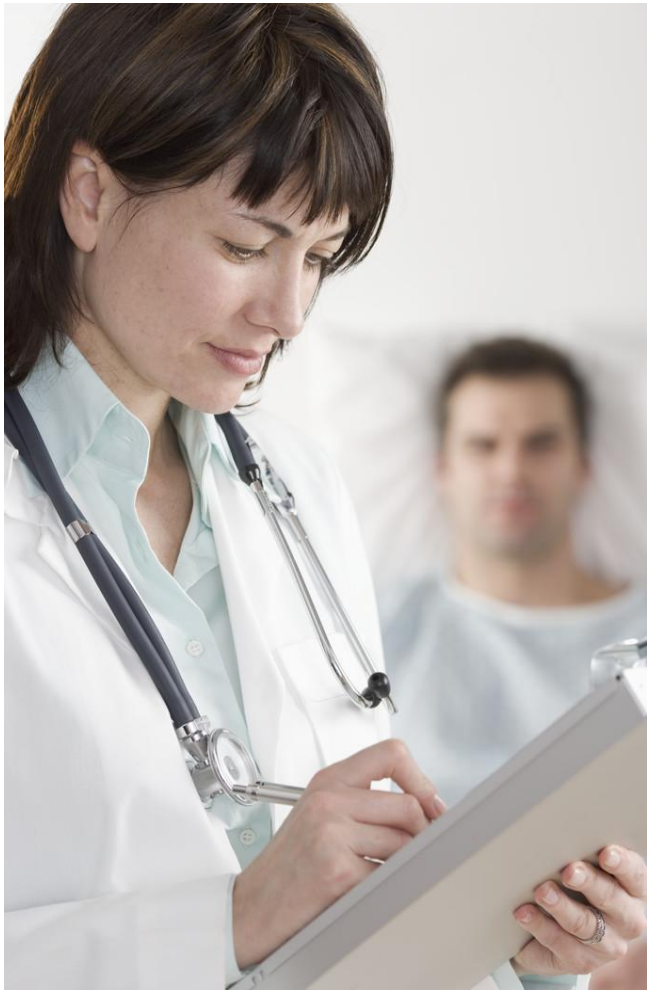
PROS

- Thorough look at full charts
- Repeatable process design
- Helps to identify trends
- Can create objective, quantitative data on safety

CONS

- Retrospective
- “False positives”
- Sample size, not full representation
- Manual process
- Based on pre-defined triggers, not a full retrospective review

Direct Observation



Direct Observation

- Concept developed to study various aspects of medication use process
- Independent, trained observers watch a medication administration take place and document the process with their observations
  - Watches 50 – 100 doses administered
  - Documents findings

Direct Observation

- Observer's notes get reconciled against the original orders to determine if there are any discrepancies
- Data are then reported and tracked
- Observations can be made quite often if an organization has resources available for it

A practical look

PROS

- Actually observing in real time as the administration progresses
- Process-based observations strengthen “ownership” of results
- Helps to identify trends
- Can create objective, quantitative data on safety

CONS

- Resource intensive
- Potential “Hawthorne effect”
- Only a sampling at one given time
- Manual process

Device Data

- Identify generally regarded as safe practices

Device Data

- Bar Code Medication Administration Scan Rates

$$\frac{\text{\# of medications scanned prior to administration}}{\text{Total \# of medications charted as administered}} = \text{\% scan rate}$$

Be careful not to make assumptions

Patient with an INR of 6.7 walks into clinic for their visit without any signs of bleeding.

VS.

Patient with an INR of 4.1 admitted to ED for uncontrolled bleed associated with minor cut.

Causality?

- Can be “data rich and information poor”
- Avoid the pitfall of assuming causality exists simply because you have a data point
- False causality
  - Data: 40,000 automobile accidents in 1 year
  - Data: 30,000 vehicles were red
  - Inference: Red vehicles cause more accidents

Large Data Sets

- Some events happen infrequently in various settings
- Must take advantage of global knowledge in this area
- Population level information on adverse events and reactions can be available through different outlets

Examples of Data Sources for Patient Safety

- External (National and beyond)
  - Agency for Healthcare Research & Trust (AHRQ)
  - CMS Hospital Compare (Patient Safety Indicators, HCAHPS)
  - MEDMARX Adverse Drug Events
  - NDNQI, MDS (Falls and Pressure Ulcers)
  - The Joint Commission
  - Food & Drug Administration
    - Open Adverse Event page
  - Patient Safety Organizations
  - International (NHS, Uppsala Monitoring Center)

Indianapolis Coalition for Patient Safety

SMART Pump Data Hub

Indiana hospitals were the first IPI community members and provided alert data generated by their smart-pump systems (Alaris, CareFusion Corporation, San Diego, CA) for upload and secure storage in the IPI database. Medication safety analysts from each institution were then provided full access to investigate alerts and compare data across both

MEDICATION-USE T

Comparative analytics of infu multiple hospital systems

ANN CHRISTINE CATLIN, WILLIAM X. MALLOY, KAREN J. ARTHUR, CINDY GASTON, JAMES YOUNG, SUDHEERA FERNANDO, AND RUCHITH FERNANDO

Medication errors are commonly associated with i.v. and high-risk medications that may cause severe patient harm.[1-4] Smart infusion pumps improve the safety of i.v. medication adminis-

Purpose. A Web-based analytics system for conducting inhouse evaluations and cross-facility comparisons of alert data generated by smart infusion pumps is described.

Summary. The Infusion Pump Informatics (IPI) project, a collaborative effort led by bers of alerts per device or care area, and override-to-alert ratios, (2) investigative reports that can be used to characterize and analyze pump-programming errors in a variety of ways (e.g., by drug, by infusion type, by time of day), and (3) "drill down"

Infusion Pump Informatics (IPI)

17 hospital systems
30 hospitals

> 20,000 charts and reports generated in 2012-2013 for the analysis, investigation and comparison of hospital alert data

How Does IPI Support Patient Safety?

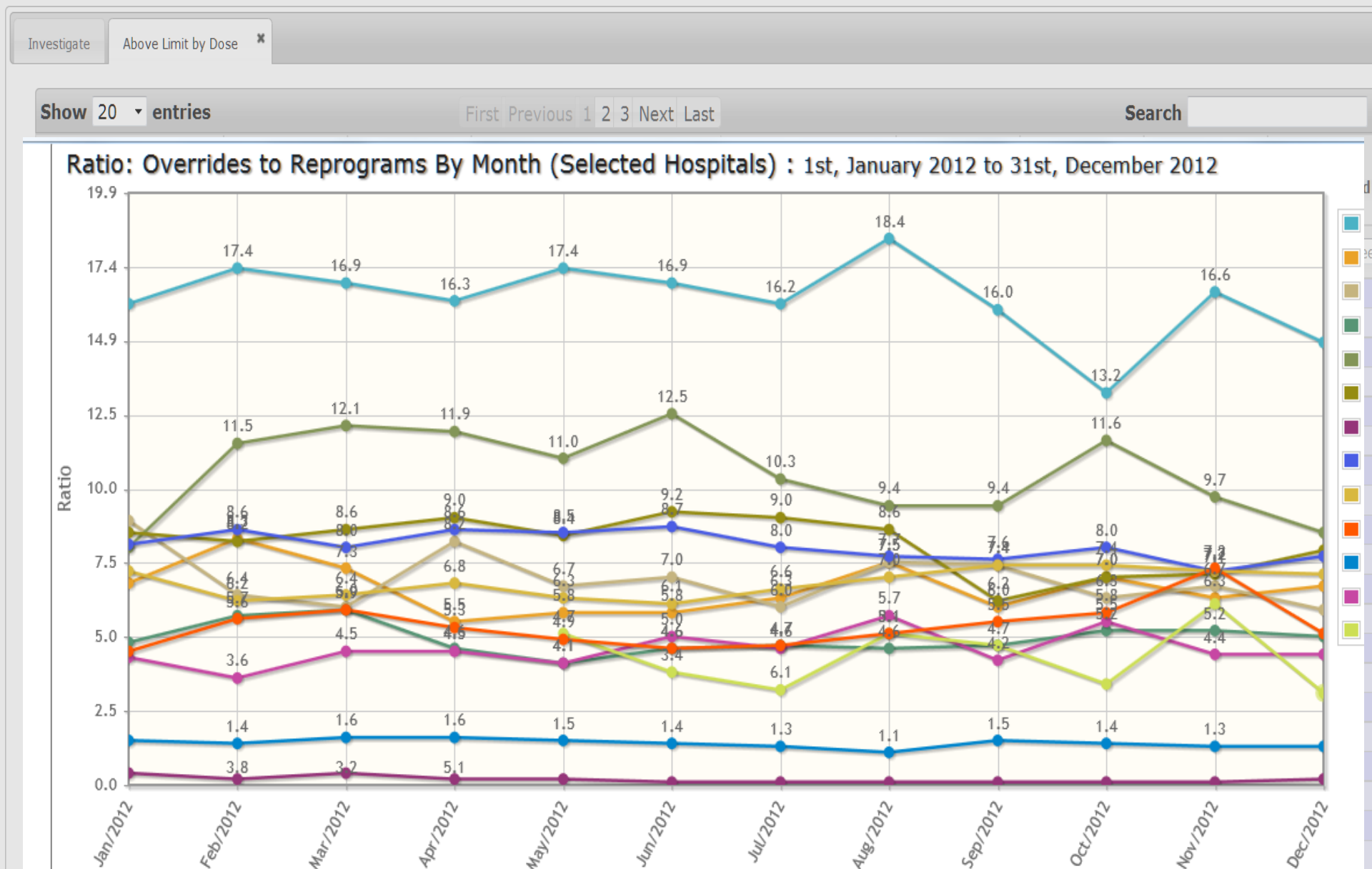
First Previous 1 2 3 4 5 Next Last Search

Hard/Soft	Type	Above/Below	Drug Limit	Programmed	Amount Exceeded	Units	% Exceeded	Times Limit	Field Limit	Date	Device ID	Action Taken	Drug Amount	Diluent Vol	Concentrati
Hard/Soft	Type	Above/Below	Limit	Programmed	Amount Exce	Units	% Exceeded	Times Limit	Field Limit	Date	Device ID		Drug Amount	Diluent Vol	Concentratio
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 10:58:23	12549484	Override Reprogram	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 11:50:32	12549484		40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 11:56:16	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 14:24:44	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 18:10:48	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 20:00:57	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 21:18:42	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 21:55:35	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 22:35:25	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 23:13:16	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-17-2013 23:54:14	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 00:33:50	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 01:18:48	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 03:53:36	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 04:31:27	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 06:55:49	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous Dose	08-18-2013 07:33:38	12549484	Override	40.000 mg	100.00	400.000 mcg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous D						ncg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous D						ncg/
tial Soft	Dose	Above Max	20.00	160.00	140.00	mcg/kg/h	700	8.00	Continuous D						ncg/

Showing 1 to 20 of 99 entries

What / where / why / how ?
Every detail from the captured alert data

How Does IPI Support Patient Safety?



Data Repositories

Questions about data management:

- Who oversees?
- Central vs. decentralized?
- Is there an internal data integrity or validation processes?
- Is data ‘locked’ after a period of time once validated?
- How to manage qualitative vs. quantitative information

Developing and Implementing a Safety Dashboard

Design the Dashboard

- Purpose
  - To communicate to end users
  - Consider sharing with non-end users, survey for potential conflicting messages (pharmacy, nursing, quality/risk, physicians, c-suite, etc.)
- Use simple visual cues
- Include at a minimum
  - Dashboard name
  - Dashboard categories
  - Dashboard measures
  - Dashboard display tool

VUH Pharmacy Executive Scorecard

PERFORMANCE INDICATORS		Monthly Goal	JUL	AUG	SEP	OCT
PEOPLE						
Retention (previous 18 months)	Inpatient	65%				
	Clinic	65%				
	Retail	65%				
SERVICE						
ADC Stockouts	Inpatient	<1.5% total refill lines				
	Clinic	<1.5% total refill lines				
Order Processing Time:	Inpatient = CPOE Order Processing Time for STAT	90% in < 10 min				
	Inpatient = CPOE Order Processing Time for NOW	90% in < 15 min				
	Inpatient = CPOE Order Processing Time for ROUTINE	90% in < 30 min				
QUALITY AND SAFETY						
ADC Overrides	Inpatient	<5%				
Bio ID Utilization with AcuDose	Inpatient	90%				
	Clinic	90%				
BIO ID Success Rate With AcuDose	Inpatient	90%				
	Clinic	90%				
GROWTH						
Pharmacy Items	Inpatient	VARIES				
	Clinic	VARIES				
	Retail	VARIES				
Orders Processed	Inpatient (includes VPH)	TBD				
	Clinic	TBD				
	100 Oaks	TBD				
	Retail	TBD				

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Remember to…Make it Visible!

- Make the measures everyone's responsibility
  - Encourage accountability
- Post publicly reported data
- Reward and share successes
  - Communicate feedback often
  - Present at regularly scheduled intervals
- Work together to overcome challenges
- Review dashboards and scorecards at least annually

Questions?

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