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The Anatomy of Failure in Healthcare

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Overview

- Recent evidence of adverse events
Focus on adverse drug events
- Role of learning healthcare systems
- Measuring safety in the future

How Dangerous is Health Care Compared to Other Activities?

Fewer than one death per 100,000 encounters

- Nuclear power
- European railroads
- Scheduled airlines

One death in less than 100,000 but more than 1,000 encounters

- Driving
- Chemical manufacturing

More than one death per 1,000 encounters

- Bungee jumping
- Mountain climbing
- Health care

Comparing Another Way

Commercial airlines
in the U.S. have
gone many years
between deaths

The estimated death
rate related to
healthcare is
~100,000 per year

Adverse Event Definition

In healthcare, an adverse event is “any undesirable or harmful outcome experienced by a patient as a result of medical care, including treatment, medication, or procedures.”

- Example: rash related to penicillin
- Example: knee infection after a total knee replacement

Preventable adverse event—is an adverse event associated with an error.

- Example: patient has a known penicillin allergy but is given penicillin anyway.

Severity of Adverse Event

Significant

- Example: getting an infection after having an IV catheter placed

Serious

- Example: orthopedic surgery resulting in a long-term disability

Life-threatening

- Example: getting too much patient medication after a procedure and needing to go to the ICU to be placed on a ventilator

Death

Safecare: NEJM 2023



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The Safety of Inpatient Health Care

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Incidence of AEs per Admission

- Identified at least one adverse event in 23.6% of the 2,809 admissions within the weighted random sample
- Percentage of admissions that included at least 1 AE was higher:
 - Among older than younger patients
 - Among men than among women



Additional Findings

Adverse drug events were most frequent type of harm

Events related to a surgical or other procedure were most likely to be rated as life-threatening

Health care–associated infections were most likely to be fatal

Patient-care events (57 of 147 events [38.8%]) and ADE (102 of 381 events [26.8%]) were more likely to be preventable than other event types

Only 10 diagnostic errors (e.g., a delayed diagnosis of sepsis or renal failure or an incorrect diagnosis of seizure) that resulted in an AE were identified

What Do the Results Mean?

Backdrop

- There is more focus on patient safety today than when HMPS was done
- Improved processes and documentation → better detection of harm

Observations

- Despite this and advances in some areas of prevention (e.g., HAIs) patient harm appears more frequent, although among all admissions the mortality rate is slightly lower
- Used a broader definition of an AE which resulted in identifying more patient harm
- Results identify clinical areas with more harm events—varies by institution
- Improved ability to identify patient harm will assist in efforts to improve patient safety and quality of care

SafeCare: Outpatient









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Original Research | 7 May 2024

The Safety of Outpatient Health Care: Review of Electronic Health Records

Authors: David M. Levine, MD, MPH, MA  , Ania Syrowatka, PhD , Hojjat Salmasian, MD, MPH, PhD , David M. Shahian, MD , Stuart Lipsitz, ScD, Jonathan P. Zebrowski, MD, MHQS , Laura C. Myers, MD, MPH , ... [SHOW ALL ...](#) , and David W. Bates, MD, MSc  | [AUTHOR, ARTICLE, & DISCLOSURE INFORMATION](#)

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Outpatient Results

Overall, 7.0% (95% CI, 4.6% to 9.3%) of patients had at least 1 AE (8.6 events per 100 patients annually), or 1 in 15 patients.

Adverse drug events were the most common AE (63.8%), followed by health care–associated infections (14.8%) and surgical or procedural events (14.2%).

Severity was serious in 17.4% of AEs, life-threatening in 2.1%, and never fatal.

Overall, 23.2% of AEs were preventable.

Progress in Harm Prevention Has Occurred in Many Areas

Prevention of hospital-acquired infections, especially bloodstream infections, ventilator-associated pneumonia, and catheter-associated urinary tract infections

All medications are now ordered using the computer and checked for problems

Bar-coding of medications is required

Many effective strategies for preventing blood clots are available

Despite this, harm is still frequent



Learning Healthcare Systems

Learning Health System

Learning Health Systems



Learning Healthcare System is a **health system** in which **internal data** and experience are systematically integrated with **external evidence**, and that knowledge is **put into practice**.

Learning Healthcare System Examples

- Vanderbilt has done practical clinical trials
 - Compared normal saline vs. Ringer's lactate for fluid resuscitation
 - Ringer's lactate was used mostly by surgeons, normal saline by internal medicine
 - Randomized trial showed a survival benefit for Ringer's lactate
 - Compared flexible laryngoscope vs. rigid in emergent intubation in the emergency room. Flexible is more expensive
 - Mortality benefit for flexible
- At MGB developed a tool to identify important radiologic abnormalities, convey them to appropriate physician
 - Now being done system-wide

Challenges & Gaps in Using EHRs to find AEs



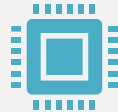
- Under-reporting: only ~3.6% of AEs appear in reporting systems (BMC Health Serv Res 2011)



- Variability in AE definitions



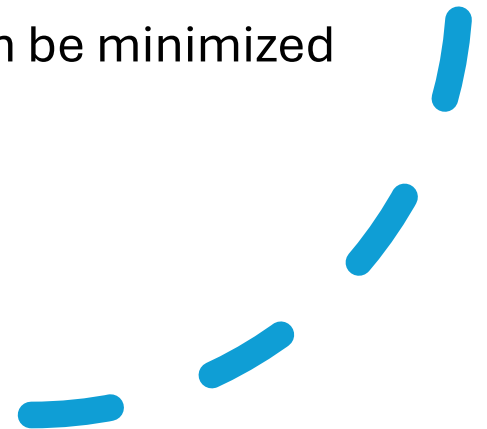
- Alert fatigue; usability issues (PSNet 2020)



- Few real-time validated systems

How Could This Work?

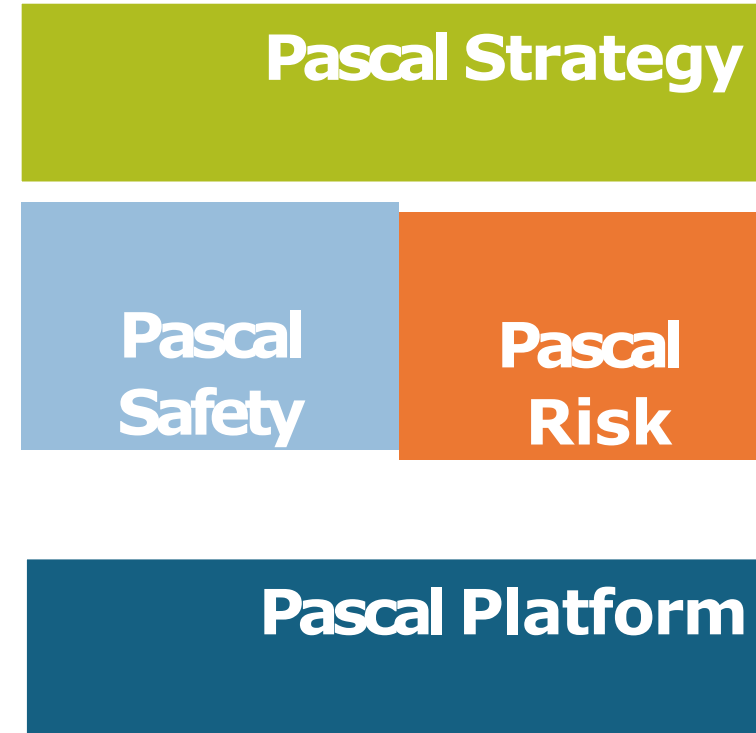
- PascalMetrics approach
 - Use EHR to find things that suggest an adverse event occurred or is about to occur
 - These are reviewed remotely by Pascal team
 - The frontline organization is notified
- Some events can be identified
 - Before harm has occurred
 - Or at a time when level of harm can be minimized



Monitor, Measure & Manage Safety & Risk During Care

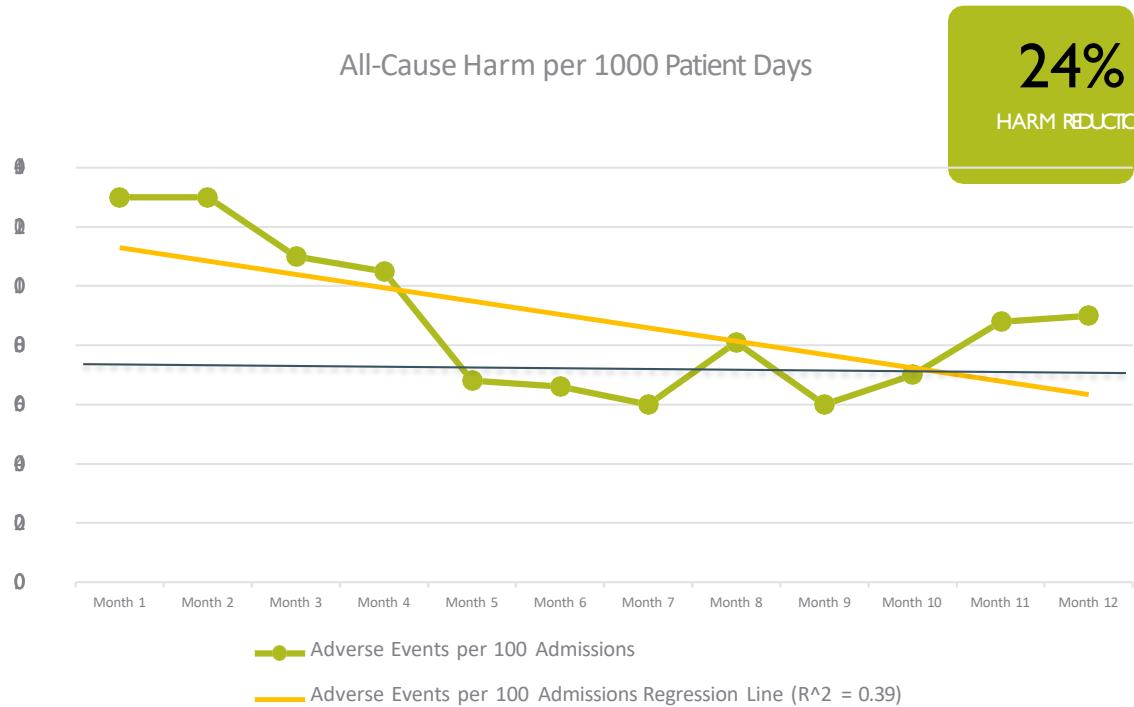
PASCAL SUITE *of SOFTWARE AND SERVICES* *for* **PATIENT SAFETY AND RISK MITIGATION**

- Integrated Safety & Risk applications built on proven, proprietary Platform
- Supported by data-driven Strategy from experts in safety, risk and operational transformation
- Developed over 15 years by clinical, technology and industry experts
- Trusted to monitor millions of patients across academic and large health systems



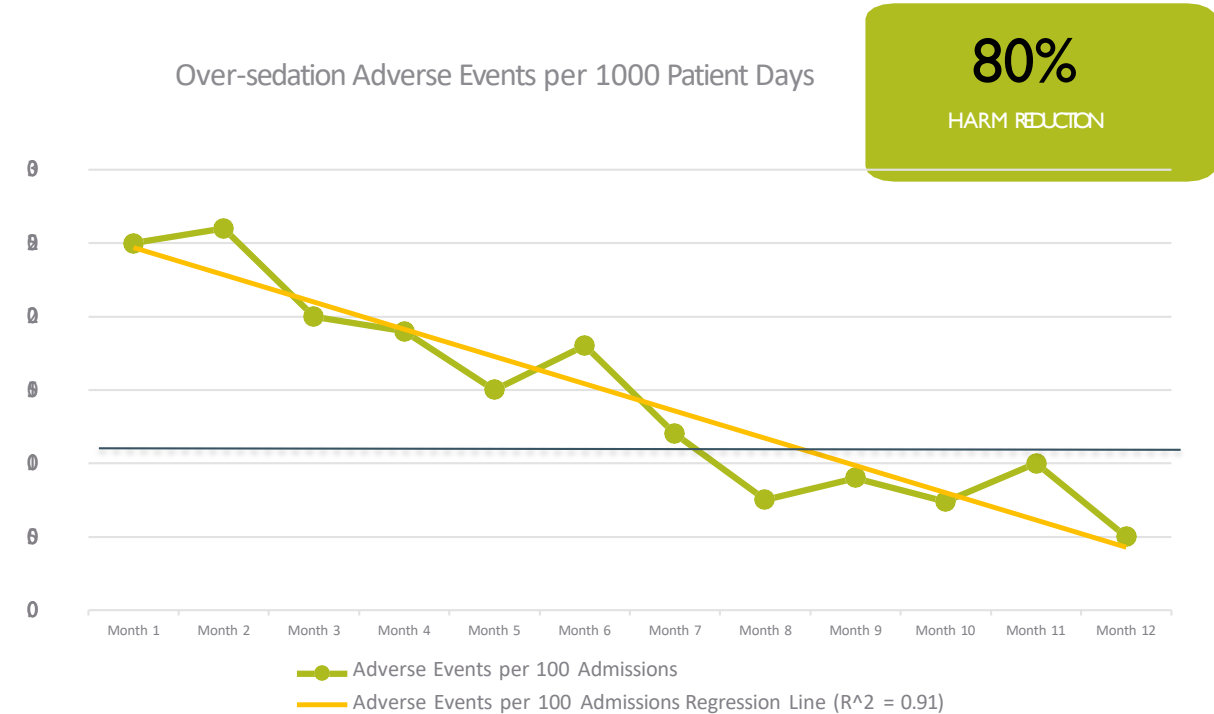
Foundational Client Results: Patient Harm Reduction

All Harm Reduction, System-wide



Source: Client Clinically Validated Data

Specific Harm Reduction, System-wide



Source: Client Clinically Validated Data

Planning to Do a Massachusetts Study

Jointly with the Betsy Lehman Center

Will evaluate 6-8 hospitals in the
Commonwealth

- Seeking state funding
- Our team will do the evaluation

Would assess impact on frequency of harm and
economic impact

- Economic impact might be especially big in Medicaid population

Idea then would be that this would spread

Future of Adverse Event Detection

Should be done largely electronically
using data already in the EHR

Can detect events:

- After they've happened
- Even before they happen

May want to contact

- Safety team
- Care team (most often)
- Patients themselves

Overall Conclusions

Safety in healthcare needs to be improved both inside the hospital and in the outpatient setting

- Medications are the leading cause of harm in both settings

The learning health system approach can help organizations improve and ensure that important improvements are spread

Safety should be measured in the future using data from the electronic health record

Artificial intelligence will help in all these areas. ISQua can help