Patient Safety and Health Informatics

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Content

- Medical informatics,
- Patient safety definitions, imperatives and current issues
- Medical errors and adverse events
- Error types
- Human errors
- The impact of health informatics on patient safety
- CPOE Benefits
- Take Home Messages

Medical informatics

- *"Medical informatics is a rapidly developing scientific field that deals with the storage, retrieval, and optimal use of biomedical information, data, and knowledge for problem solving and decision making."*
  Blois, M.S., and E.H. Shortliffe. in Medical Informatics: Computer Applications in Health Care, 1990, p. 20.

- *"Medical informatics is the application of computers, communications and information technology and systems to all fields of medicine - medical care, medical education and medical research."* *definition by MF Collen (MEDINFO '80, Tokyo, later extended).*

Define **SAFETY** in healthcare?

In 2-3 minutes, define patient safety, what does it mean to you? And how would you think we can enhance it? Write down your notes

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Freedom from accidental injury due to medical care, or medical errors.

IOM, 2000

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INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

Advising the nation • Improving health

The avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of healthcare.

Vincent, 2011

Professor Ahmed Al Barrak
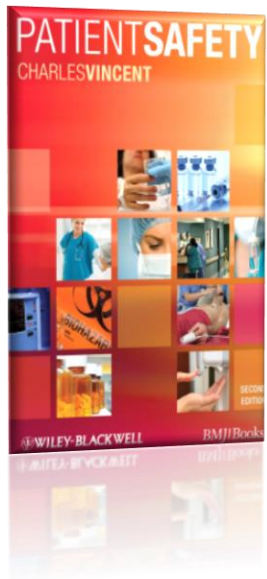
Patient Safety defined as;

The prevention of errors and adverse effects to patients associated with health care.

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Errors vs. Adverse Effects

- A 67 year old patient is prescribed Nonsteroidal anti-inflammatory drugs – NSAID for osteoarthritis pain, and is admitted 4 weeks later with GI hemorrhage.

- This is an adverse event, even though the prescribing decision was not erroneous. Recording it as a patient safety issue is honest, as the patient was harmed by medical care.

- Being less tolerant of threats to patient safety such as this may lead to more recommendations to take precautionary action (such as guidance regarding co-prescription of proton pump inhibitors - **PPIs** for all older people given an NSAID).
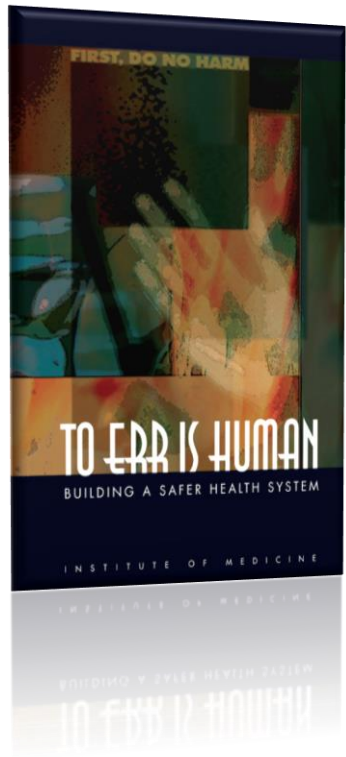
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Errors **vs**. Adverse Effects

- **Errors:** prescribing Nonsteroidal anti-inflammatory drugs – NSAID without considering patient condition (age) which require co-prescription of proton pump inhibitors – PPIs.

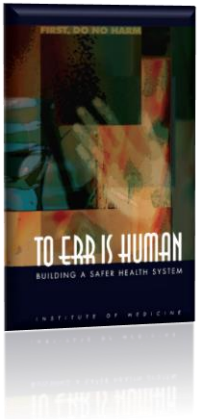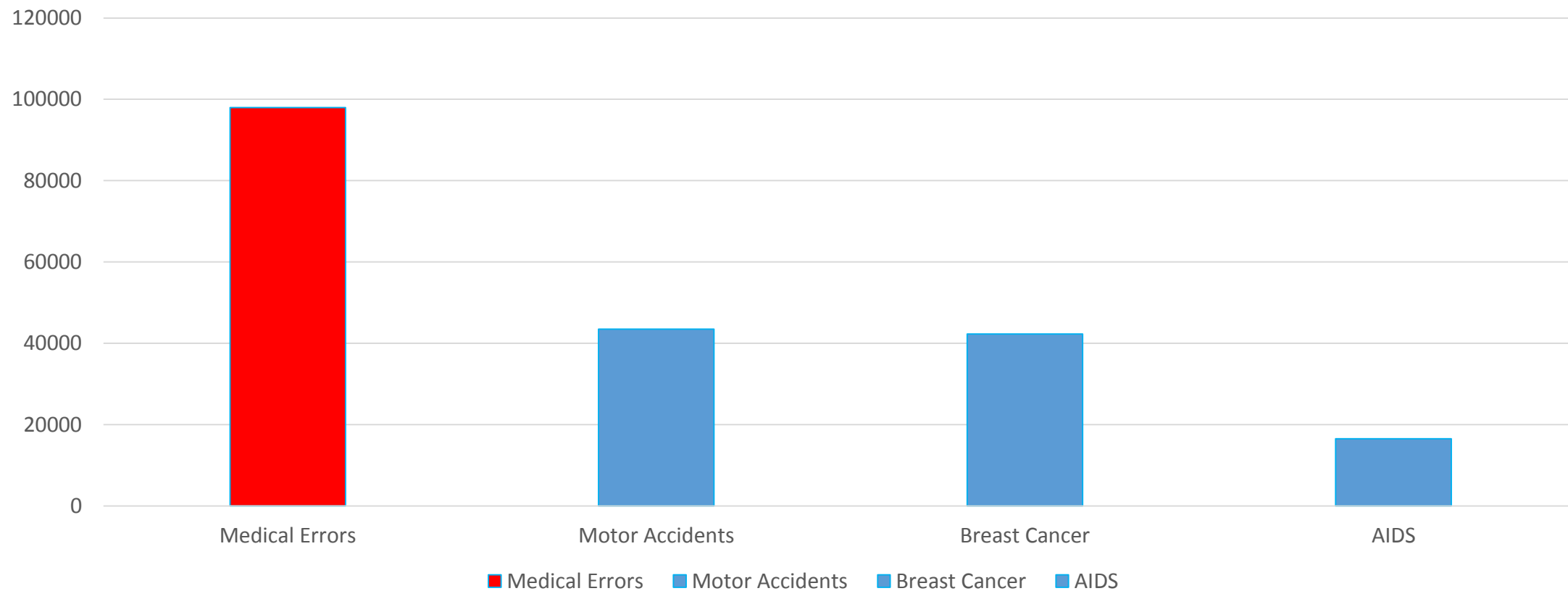- **Adverse Effects:** GI hemorrhage

The magnitude

98,000/365 = 268.49

Equal to one plane crashes every day!
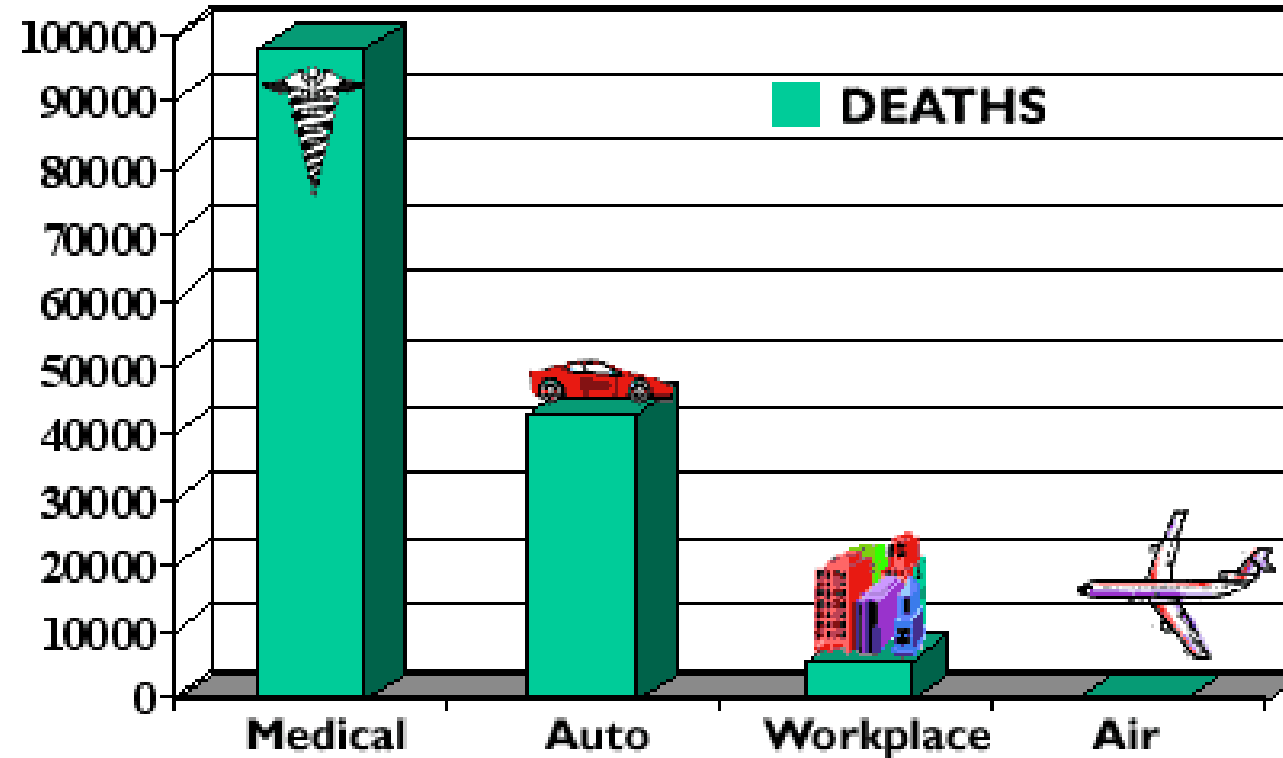
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# Death Rate (US)

Annual Accidental Deaths

Status quo

- One in 5 patients discharged from hospitals end up sicker within 30 days and half are medication related

- One of 10 inpatients suffers as a result of a mistake with medications cause significant injury or death

Source: Safe Practices for Better Healthcare Why Implement Practices to Improve Safety at http://www.qualityforum.org/News_And_Resources/Press_Kits/Safe_Practices_for_Better_Healthcare.aspx

Over **7,000** deaths annually.

Resulted by medication errors alone, occurring either in or out of the hospital.
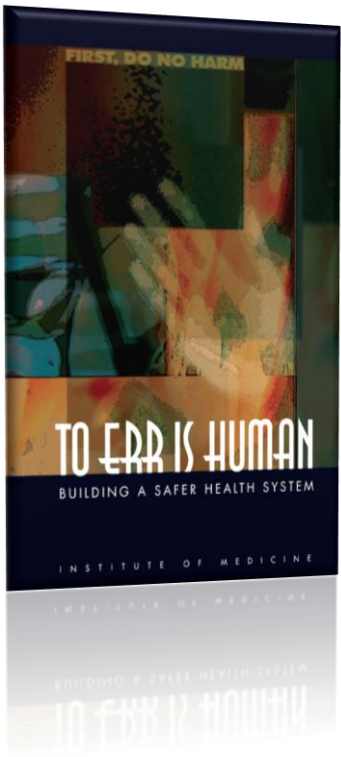
•Between **$17B and $29B**
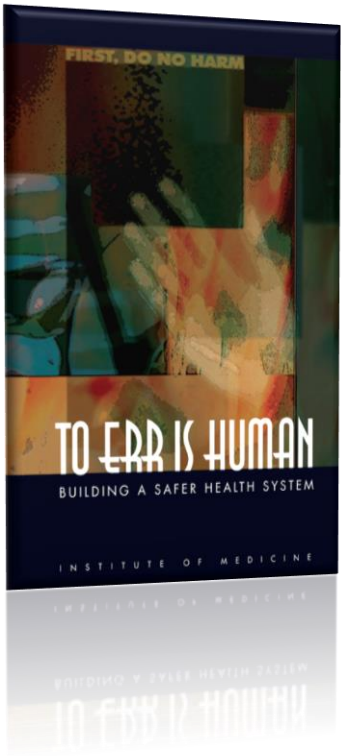
Cost of errors estimated

- A study of two UK hospitals found that 11% of admitted patients experienced adverse events of which <u>48</u>% of these events were most likely preventable if the **right knowledge was applied**.

- The **under-utilization** of healthcare data- information- knowledge contributes to improper clinical decisions, medical errors, under-utilization of resources and raise in healthcare delivery costs
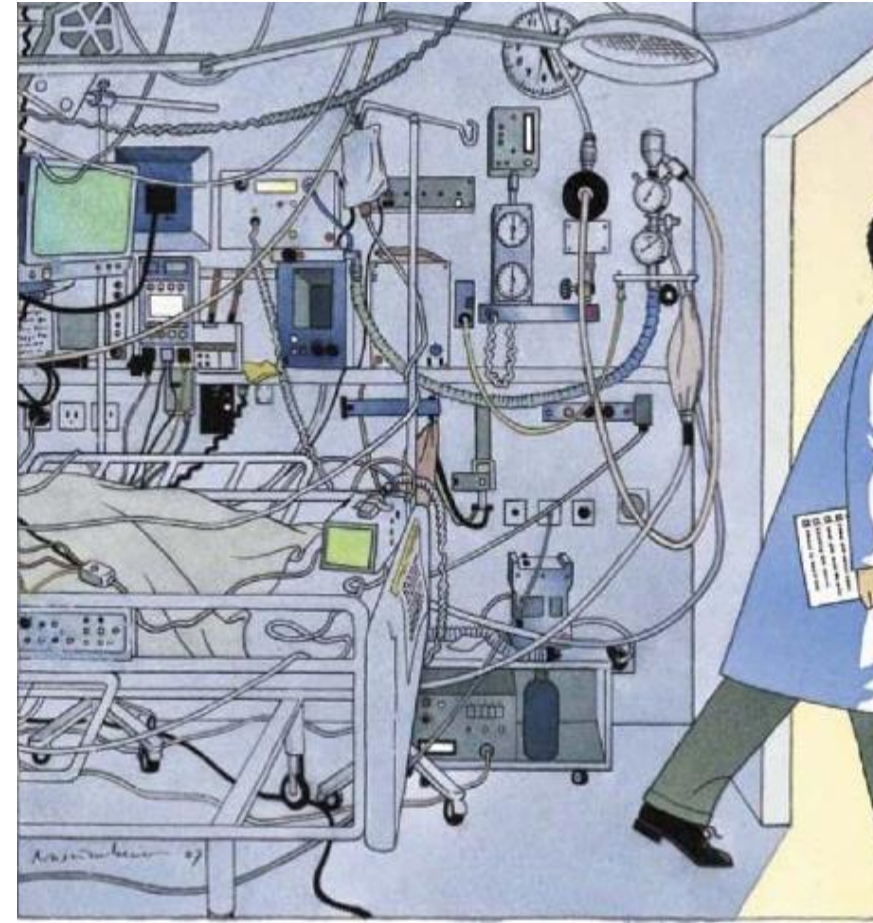
How safe is your hospital?

- Take 3 to 5 minutes to think about safety in your hospital or organization

- List 3-5 risk process or areas

Aircraft Vs. ICU

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*"Modern healthcare is the **most complex human activity** there is, due to interpersonal relationships between many different clinicians with different expertise and interests, and we haven't figured out how to make that work well.*

We have come to a full stop against a <u>complex</u> environment that <u>resists accepting change</u> on the scale clearly required"
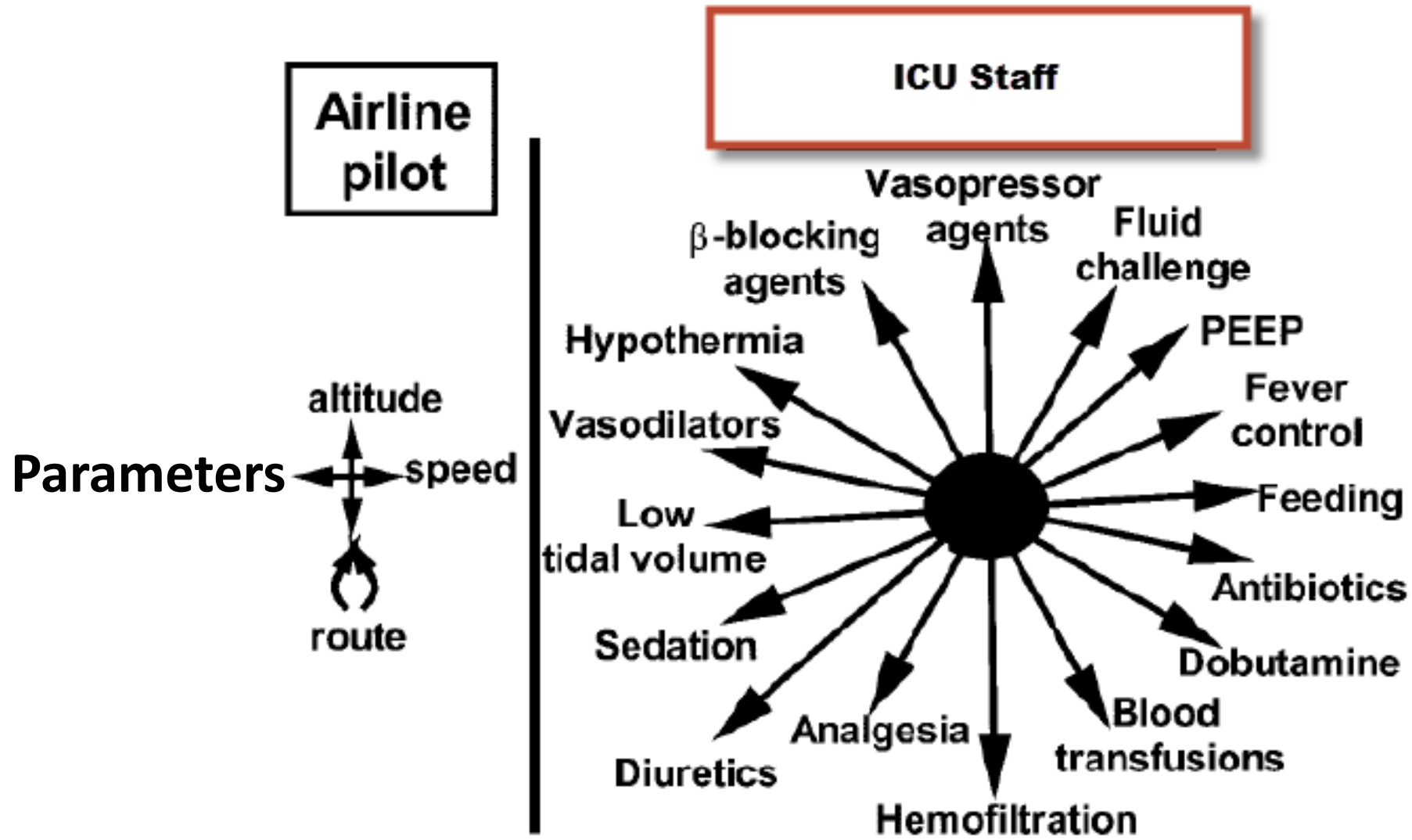
Lucian Leape, MD

Founder of the Modern Patient Safety Movement

Adjunct professor of health policy at Harvard University

"Error in Medicine," published in JAMA, 1994

Airline pilot

Parameters — altitude / speed / route

ICU Staff

Vasopressor agents · β-blocking agents · Fluid challenge · Hypothermia · PEEP · Vasodilators · Fever control · Low tidal volume · Feeding · Sedation · Antibiotics · Analgesia · Dobutamine · Diuretics · Blood transfusions · Hemofiltration
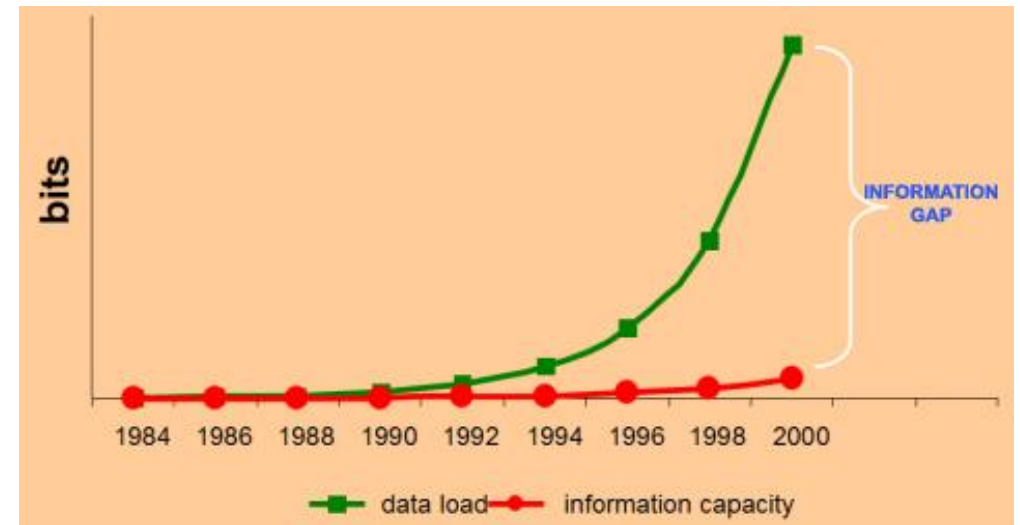
Safety Issues

- Medication errors
- Failure to rescue
- Readmissions
- Falls
- Pressure ulcer
- Sentinel events
- Hospital acquired infections
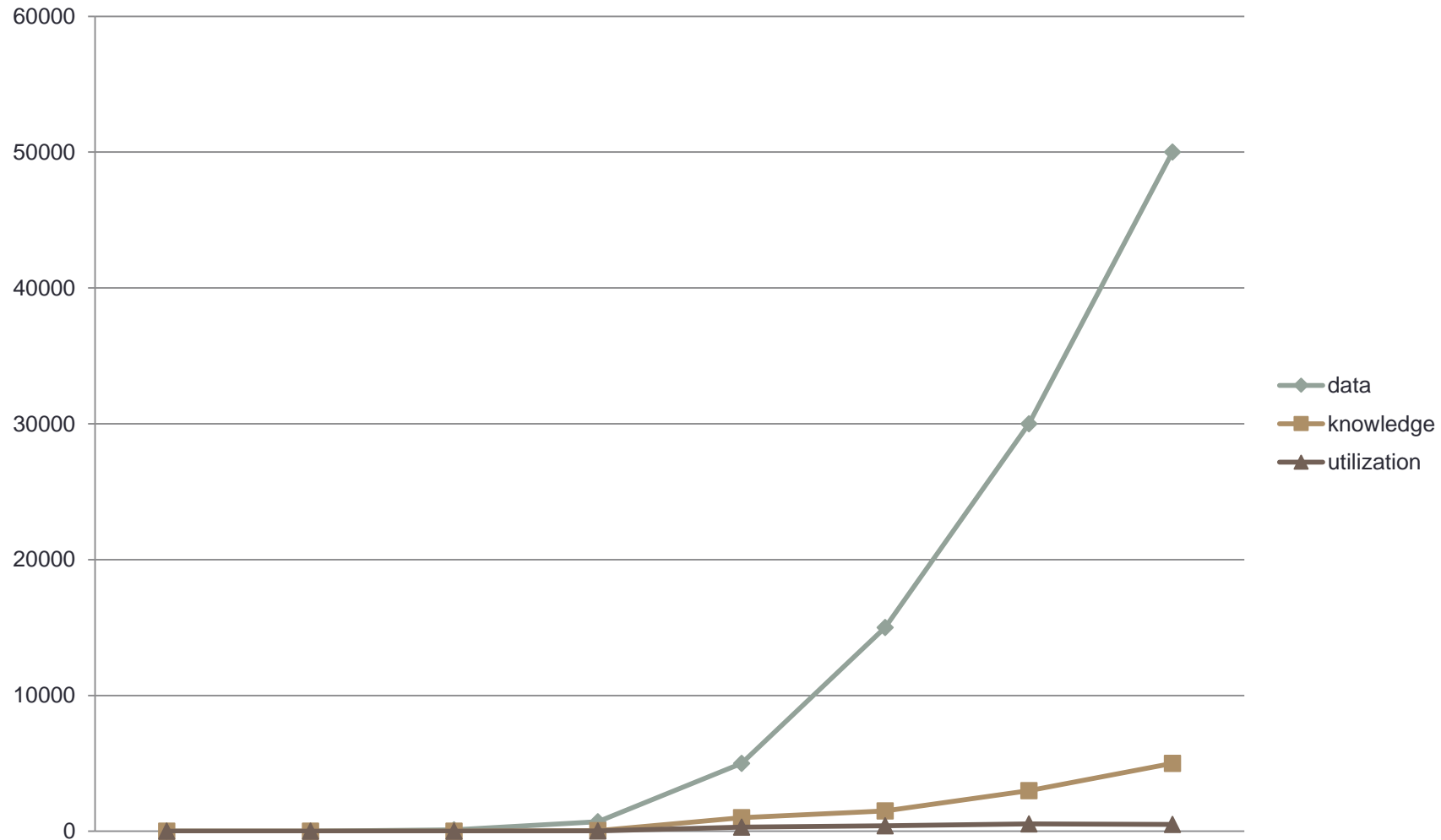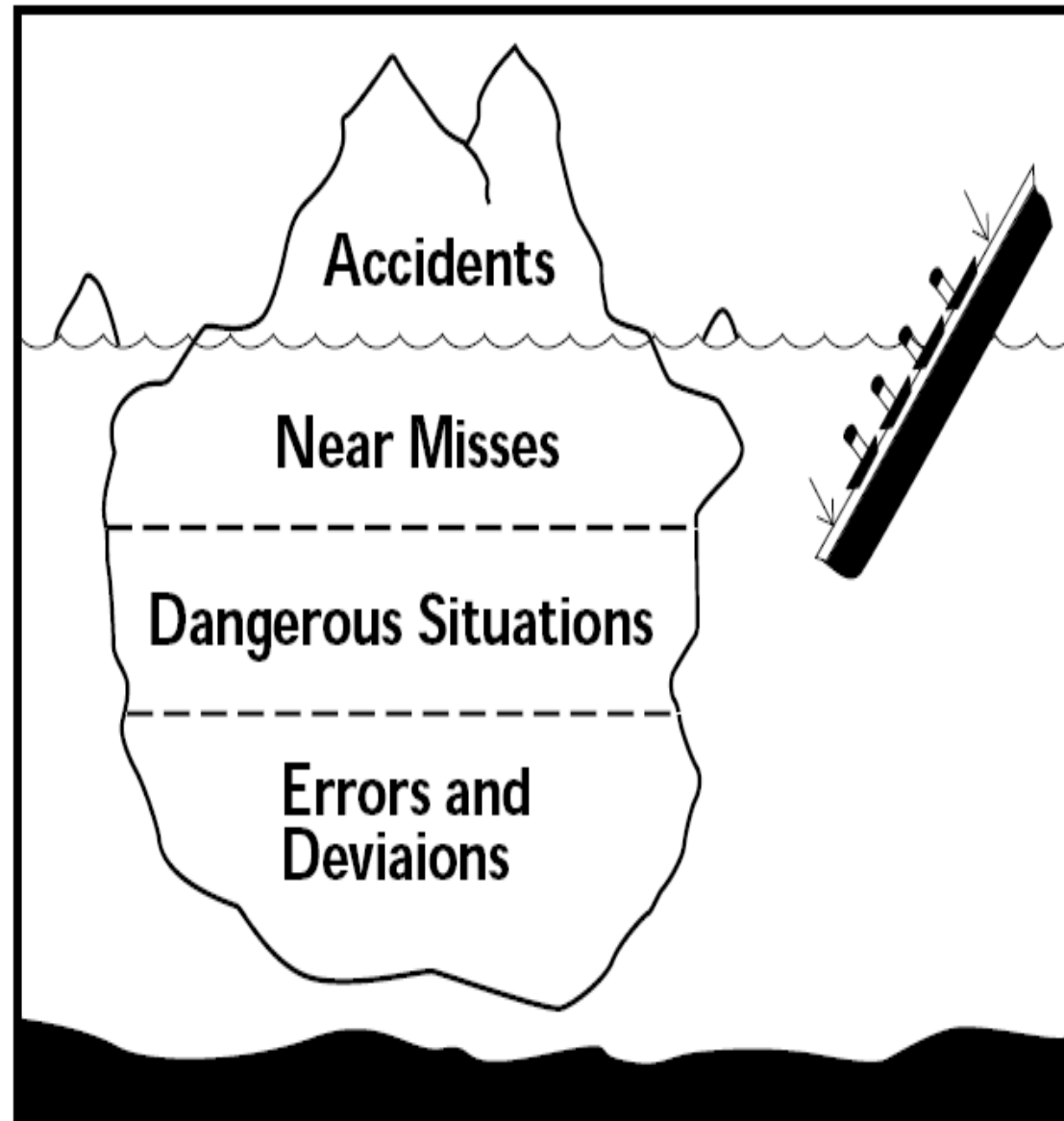- Under reported incidents

Professor Ahmed Al Barrak
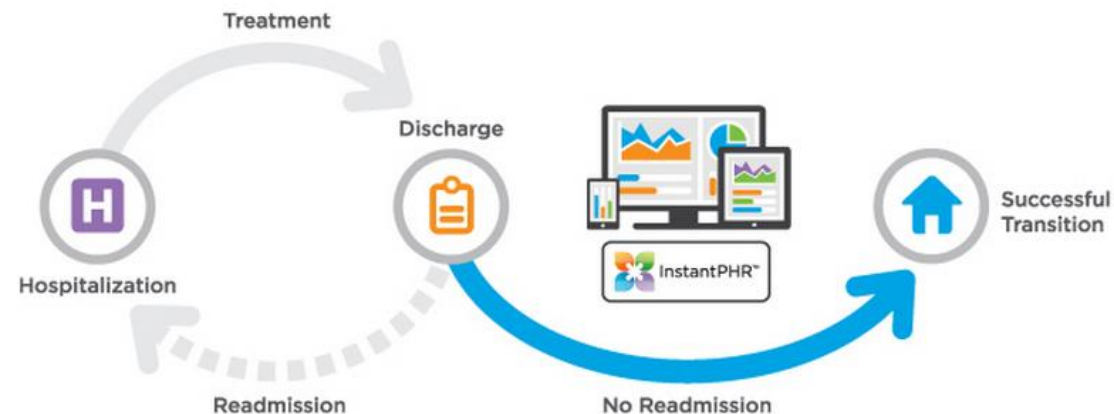
Flood of Information

- Huge gap in data acquisition and information → knowledge capacity

Data – knowledge - utilization

Battles JB, Kaplan HS, van der Schaaf TW, Shea CE. The attributes of medical event-reporting systems. *Arch Pathol Lab Med.* 1998;122:231-238.

i.e. Medication process

Prescribing → Dispensing → Administrating → Monitoring
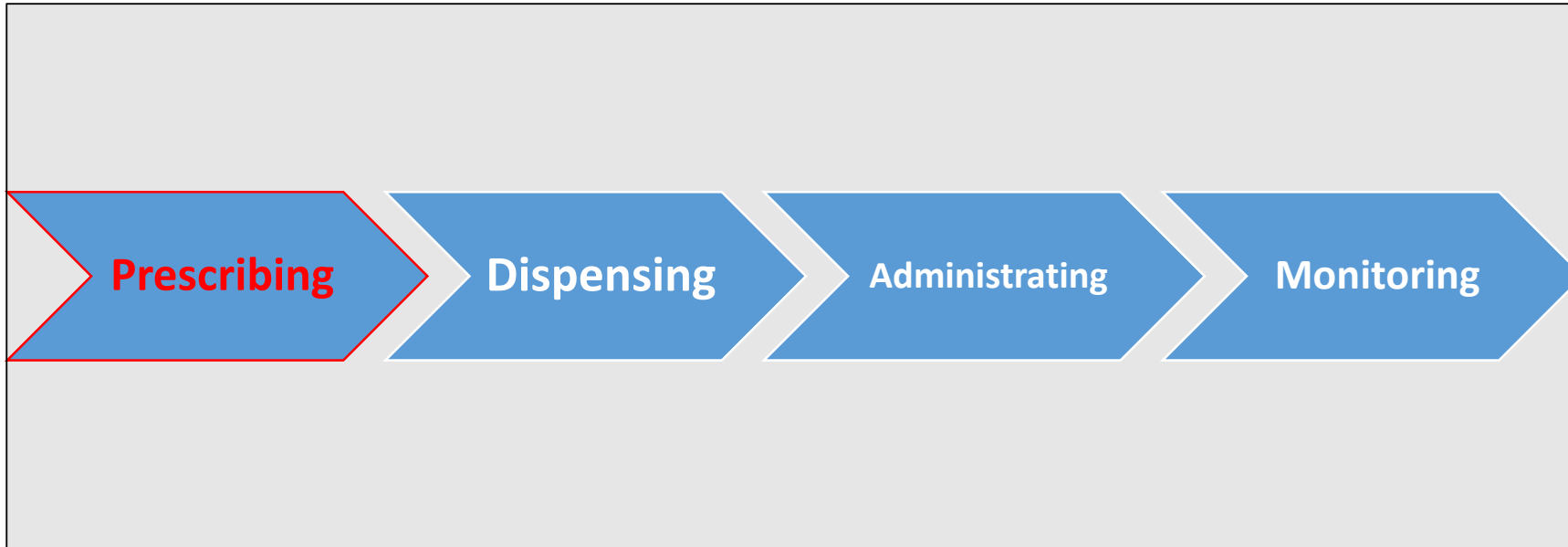
Medication errors (MEs) are common and considered one of the highest risk factors that threaten patients in hospitals. The majority of these errors are considered common during prescribing medication stage
(Shulman et al, 2005).

Where did it happened?

Medication by stage Example

Prescribing | Preparation_Dispensing | Administering | Purchasing & Storage | Transcribing/Order Transmission | Monitoring

Who did it?

Physician-Consultant
Physician-Fellow
Physician-Resident
Physician-Assistant
Physician-Assoc Consultant
SN I
Fellow
Pharmacist I
Physician-Locum
Head Nurse

5/12/2016
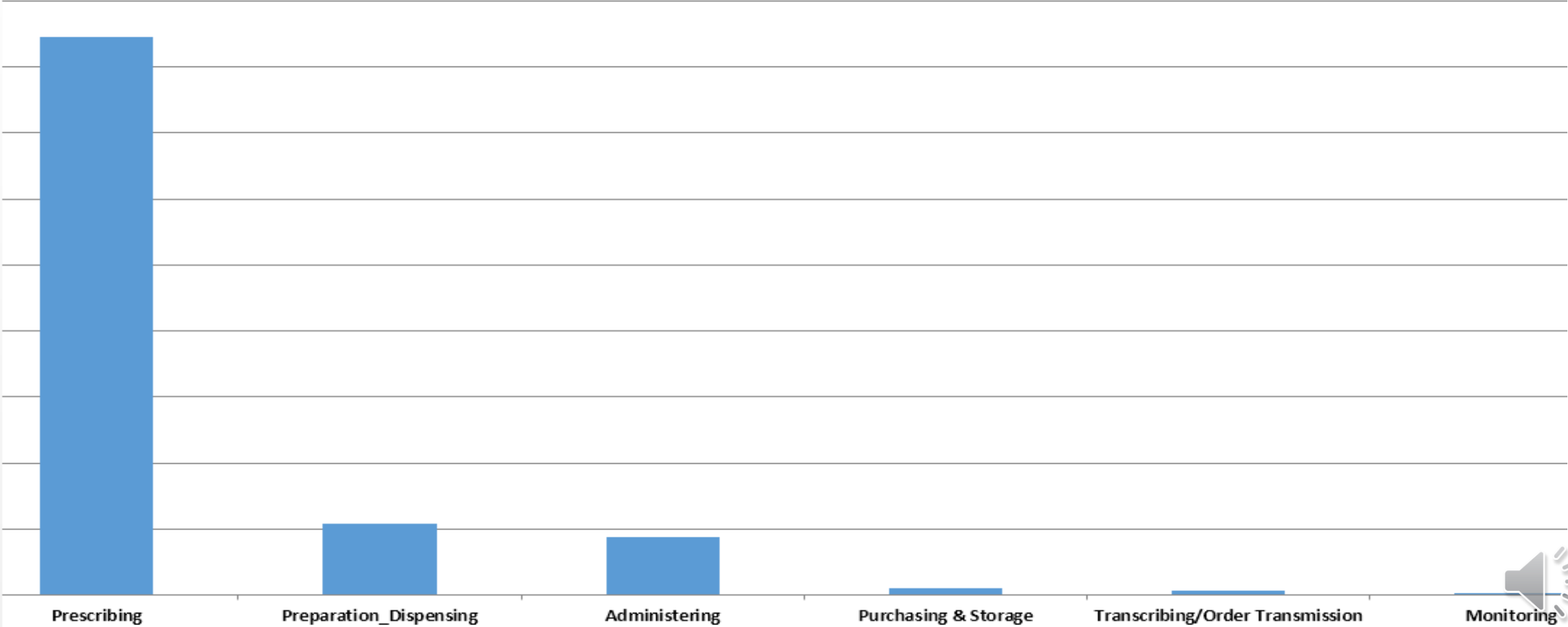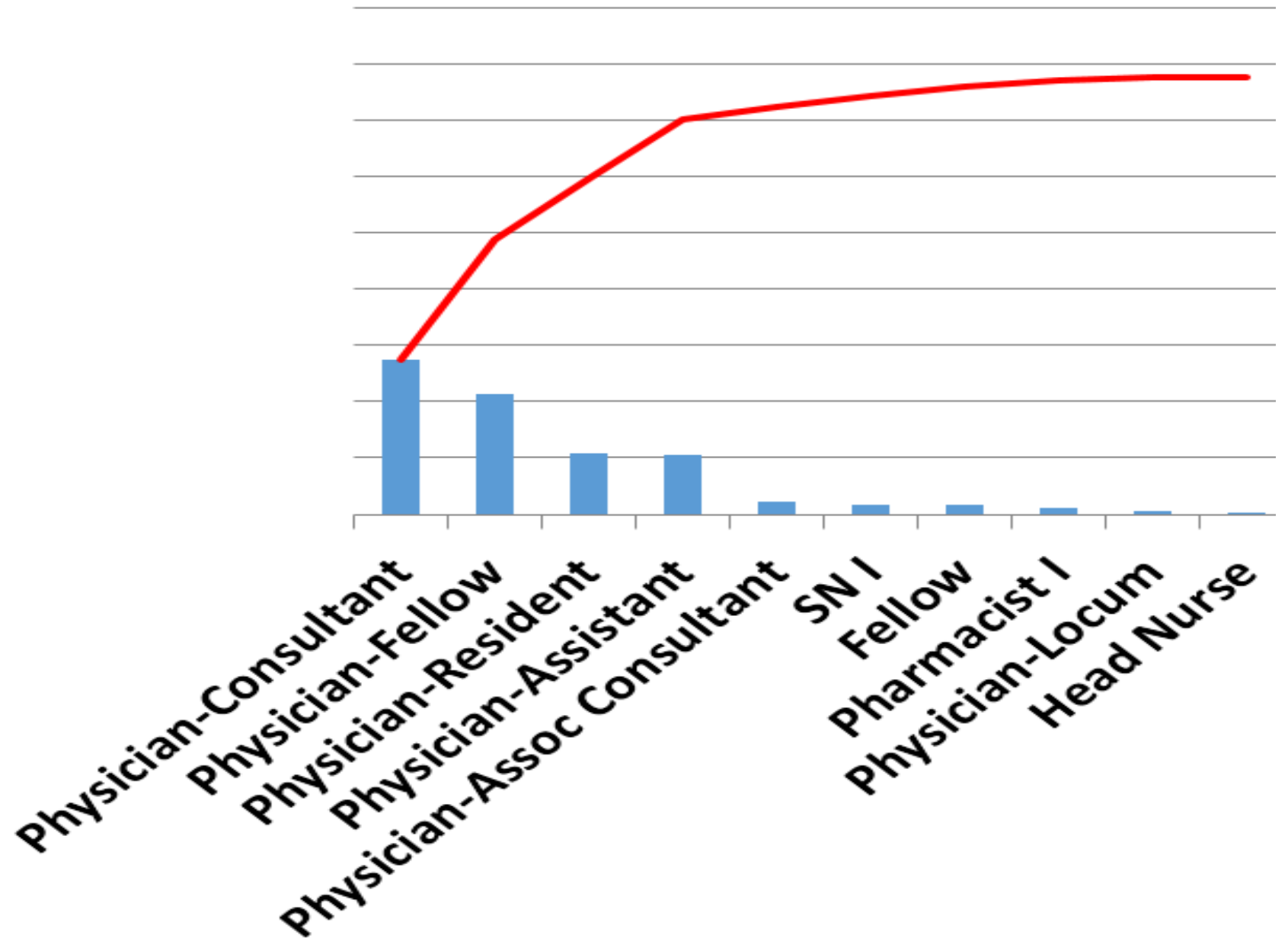
Prof. **Lucian Leape MD**

- Incompetent people are, at most, **1%** of the problem.
- The other **99%** are good people trying to do a good job who make very simple mistakes
- It's the processes that set them up to make these mistakes.

Error types

Others — Failure of communication

Treatment — Wrong medication administration

Diagnostic — Delay in diagnosis

Prevention — Failure to provide prophylactic

Air safety reports
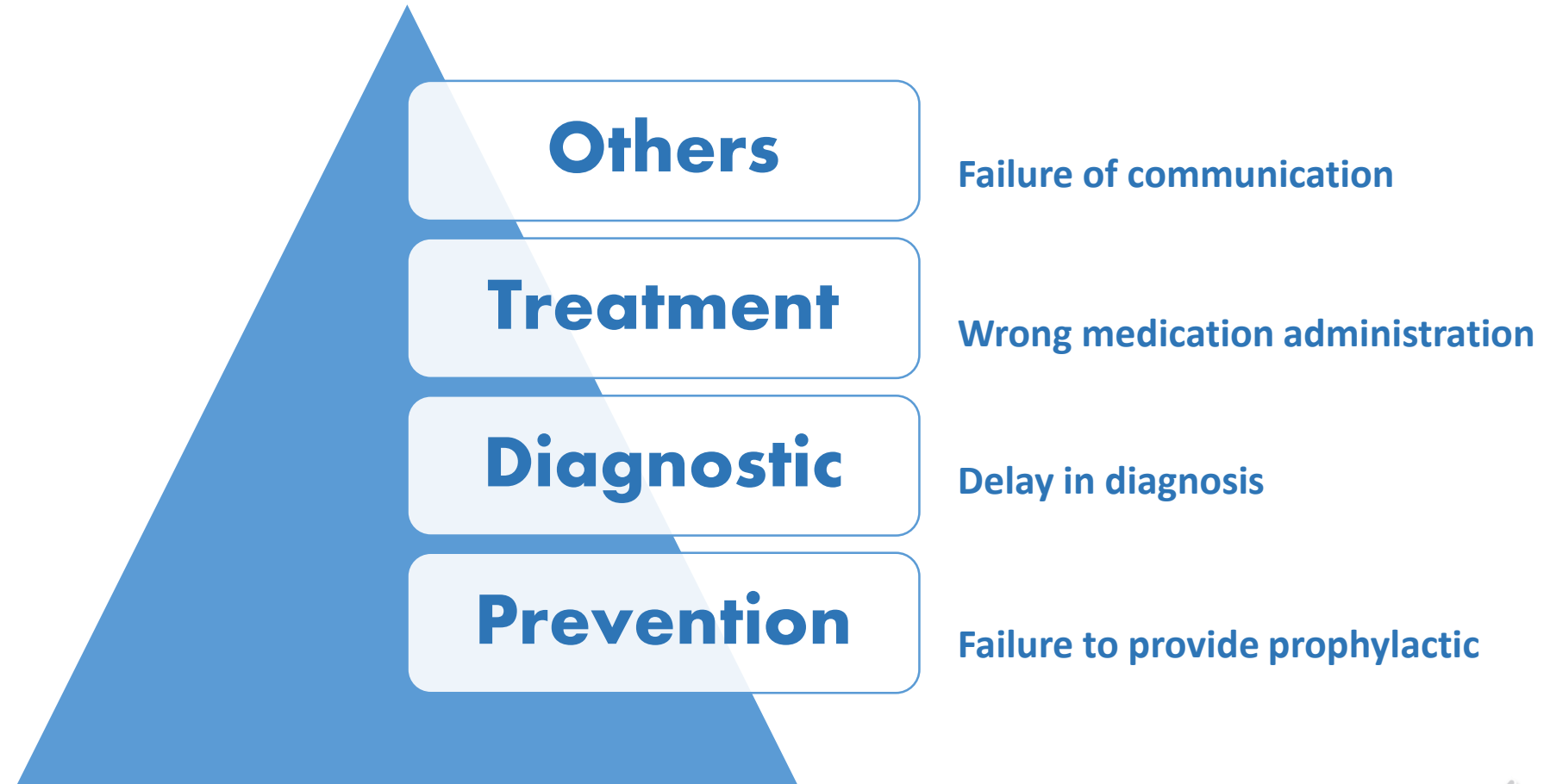
Volume of reports and risk
British Airways data 1994 -1999

Volume of reports / % risk
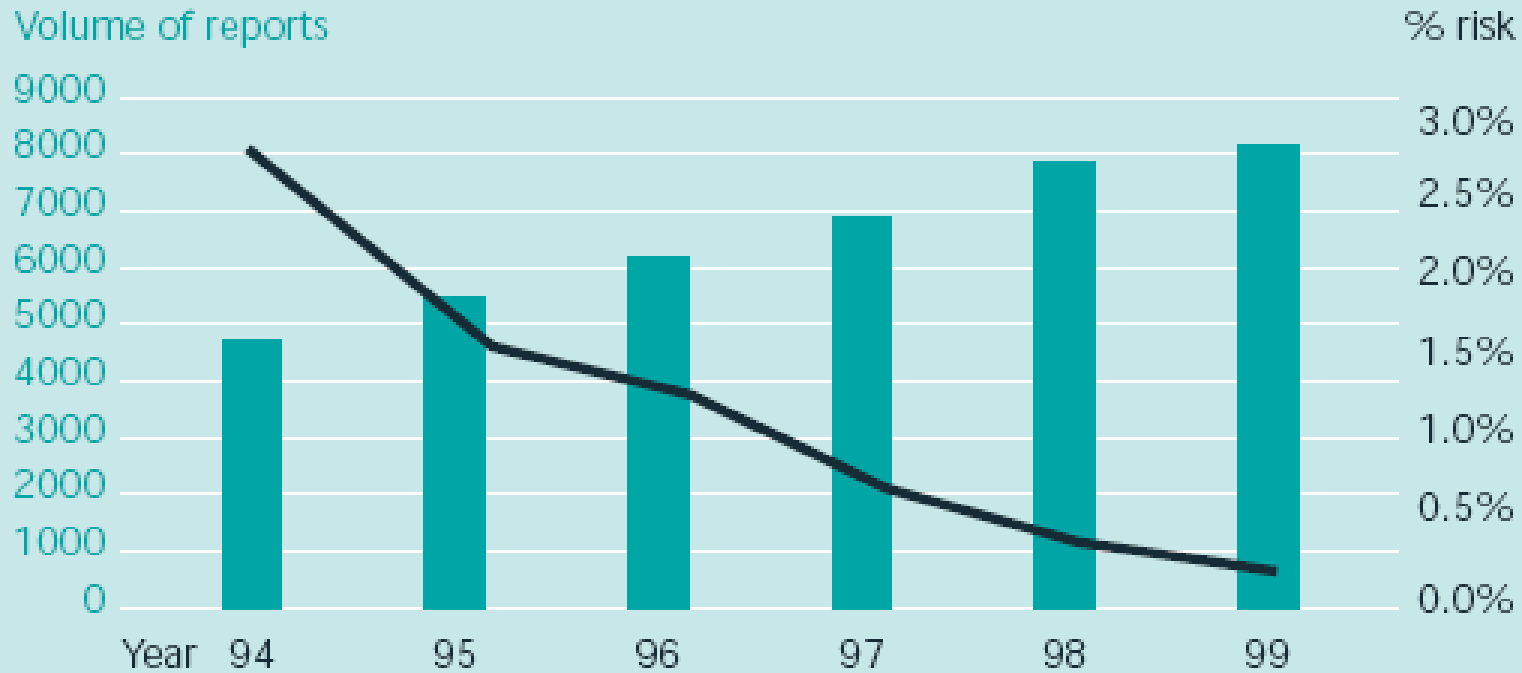
Key — Total number of reports — High and medium risk events (as a percentage of the total number of events)

5/12/2016

Contributing factors

➢Lack of communication

➢Lack of coordination

➢Inadequate staffing

➢IPP / standards not followed

➢Insecure access of patient information

➢ Lack of knowledge

➢Failure to follow up

➢Lack of proper check

➢Improper assessment / reassessment

➢No / inadequate resources or supplies

➢Look alike medications

➢Illegible handwriting
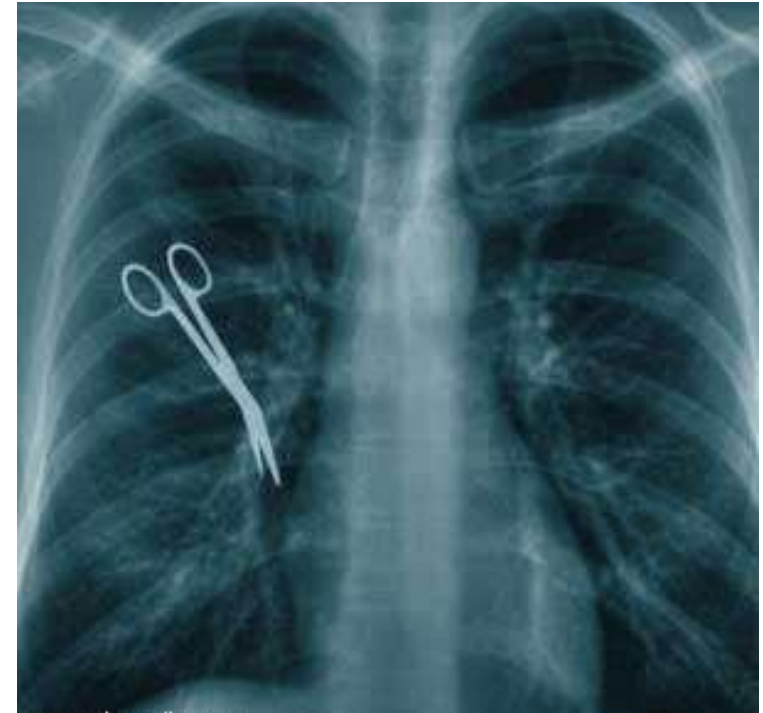
CPOE Benefits

- ≥50% of none-intercepted serious MEs rate decreased significantly (Bates et al, 1998).

- 81% reduction of medication errors (Bates et al, 1999).

- Decreased patients LOS (Rothschild, 2004).

- Improves medication reconciliation process (Vira et al, 2006).

- Improves the prescribers' compliance (Cunningham et al , 2008).

- Decreases mortality rate by 20% per month (Longhurst et al, 2010).

- Improves patients satisfaction (Spalding et al, 2011).

CPOE Impact

- Facilitates 22 new types of medication errors (Koppel et al, 2005).

- Lack of information systems compatibility, configuration and usability with end users (Colpaert and Decruyenaere, 2009; Rothschild, 2004).

- A significant increase of mortality rates post CPOE (Han et al, 2005).

Informatics Benefits

1. Tracking system
2. Effective communication and coordination
3. Prompt alerts and notifications
4. Decision support system
5. Manage data and store information
6. Secured access and defined privileges
7. Protocol guided and standardized practices
8. Accessible documentations
9. Legible orders, requests, and reports
10. Integrated care delivery
11. Support Lean processes toward more efficient workflows
12. Facilitate productivity measurements and monitoring
13. Reduce medication errors
14. Shortened length of patients' hospitalisation due to effective enhancement of antimicrobial management .
15. Reinforce clinicians compliance on evidence-based practices.

Contributing factors

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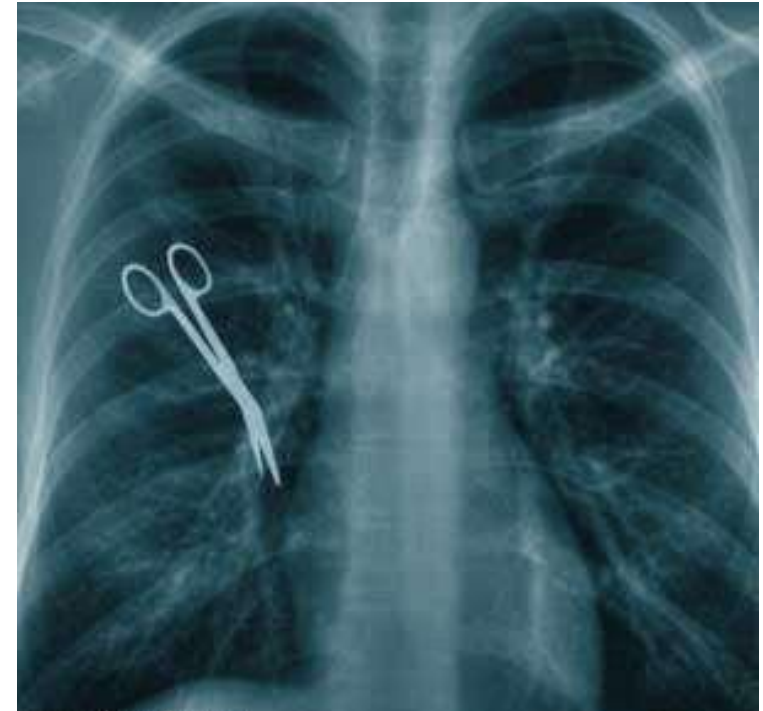
Barriers to technology implementation

- Cost **(36%)**
- Difficulties in proving quantifiable benefits and ROI **(32%)**
- Vendors inability to provide satisfactory products or services **(27%)**
- Lack of standardization with integration and interfaces. (HL7, NAHIT)
- Level of system evolution needed to meet growing demand on technology advancements
- People

Benefits

Peter F. Drucker
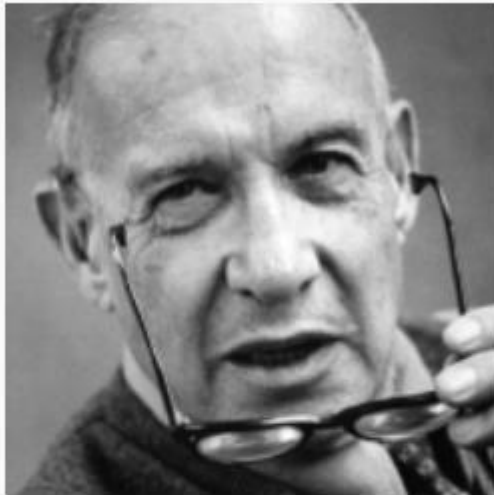
Born   19 November 1909
Kaasgraben, Vienna, Austria-Hungary

Died   11 November 2005 (aged 95)
Claremont, California

You can't manage what you can't measure!

Take Home Messages for Safer Health System

What Medical Informatics tools can?…

- Improve communication
- Make knowledge more readily accessible
- Assist with calculations
- Perform checks in real time
- Assist with monitoring
- Provide decision support
- Require key pieces of information (dose, e.g.)

The Accenture study

- The Accenture survey asked physicians about the extent to which they used **12** different "functions" of EMR and HIS— such as electronic entry of patient notes, electronic referrals, electronic ordering and prescribing and communicating with other physicians or patients via secure email.

- The results showed that physicians who are routine users of a wider range of healthcare IT functions have a **more** positive attitude towards the these technologies. On average across all the countries, as physicians start to use more "functions" —the more positive they are about the benefits

The Accenture study

Majority of doctors surveyed believe that healthcare IT does provide some common top benefits, including:

- better **access**, **quality** data for clinical research (70.9%),
- improved coordination of care (69.1 %)
- reduction in medical errors (66 %).
- average score of 61 %,
- In England, physicians perceived other healthcare IT benefits to include: increased speed of access to health services to patients (55.3 %), reduced number of unnecessary interventions and procedures (52 %).

Table 1: Assessment of Handwritten Prescriptions completeness

Information assessed	No. of prescription with omission (%)
Patient name	0 (0.0%)
Hospital no.	0 (0.0%)
Sex	64 (32.2%)
Age	132 (66.3%)
National ID	171 (85.9%)
Diagnosis	39 (19.6%)
Generic name	85 (42.7%)
Frequency	3 (1.5%)
Dose	20 (10.1%)
Duration	2 (1.0%)
Route of administration	29 (14.6%)
physician's name	12 (6.0%)
Extension and bleep	25 (12.6%)
physician's signature	7 (3.5%)
Date	12 (6.0%)
Clinic name	1 (0.5%)
Total of prescriptions were evaluated: 199 (100%)	

Table 2: Assessment of Handwritten Prescriptions Legibility

Scale*	No. of prescription (%)		% of average scale
	Pharmacist A	Pharmacist B	
1	195 (98.0%)	156 (78.4%)	**88.2**
2	3 (1.5%)	27 (13.6%)	7.5
3	1 (0.5%)	16 (8.0%)	4.3
Total	199 (100%)	199 (100%)	100%
Total of illegible and partially illegible !	4 (2.0%)	43 (21.6%)	11.8%

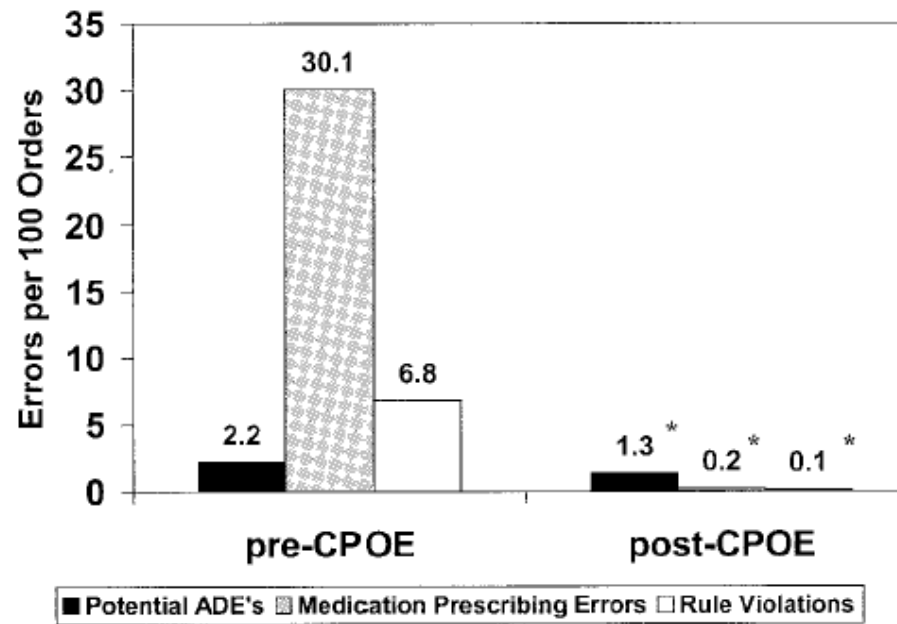*1= Legible, 2= legible with effort, 3= illegible
^ pharmacist 1= expert
~ pharmacist2= new
! scale of 2 and 3

Example CPOE reduce errors

- Potts studied ADE rates in 13,828 medication orders before/after CPOE implementation at Vanderbilt Children's PICU:

Potts AL, Barr FE, et al. Pediatrics. 2004 Jan;113(1 Pt 1):59-63.
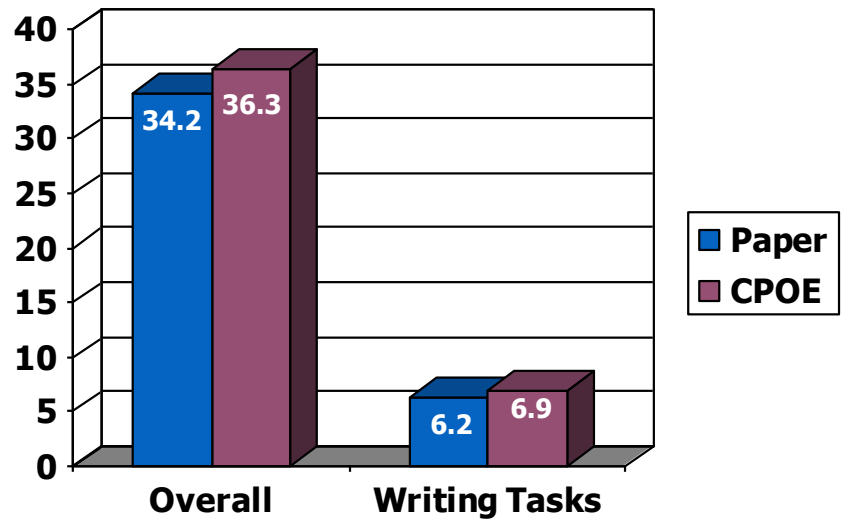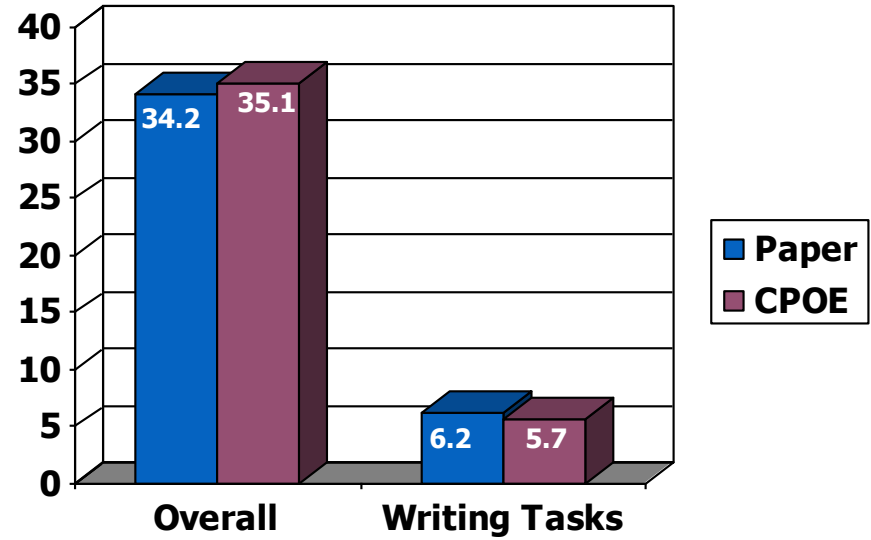
Does CPOE Take More Time?

Time Spent/Patient Encounter (minutes)

Time Spent/Patient Encounter— Duplicate Tasks Removed (minutes)

Evidence shows that CPOE adds less than one minute to the time physicians spent writing orders and overall only added 1-2 minutes per patient encounter. As physicians gained experience with the system, the time for orders actually decreased.

Healthcare

- The healthcare industry is different from, other industries. We are talking about healing and dealing with human,

- NOT a process based, and can't just apply systems and global optimization techniques in the traditional, industrial engineering sense to the healthcare industry,

- Health is something that is very difficult to measure nor to quantify.

- "the science and technologies involved in healthcare -- the knowledge, skills, care interventions, devices and drugs – have advanced more rapidly than our ability to deliver them safely, effectively, and efficiently"
  - IOM. 2001. Crossing the Quality Chasm: A New Health System for the 21st Century.

1

"Modern healthcare is the **most complex human activity** there is, due to interpersonal relationships between many different clinicians with different expertise and interests, and we haven't figured out how to make that work well.

We have come to a full stop against a <u>complex</u> environment that <u>resists accepting change</u> on the scale clearly required"

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Founder of the Modern Patient Safety Movement

Adjunct professor of health policy at Harvard University

"Error in Medicine," published in JAMA, 1994

Informatics Limitations

- Facilitate errors due to inappropriate / poor designing of systems customisations and automations of processes.

- Resistance to change.

- Under developed IT infrastructure

- Inadequate hardware logistics

- Limited funds.

- Lack of visionary leaders.

- Limited studies on the benefits of informatics on patient safety.

Technology adds new concerns

- Poor designed systems due to lack of proper planning and early involvement of clinicians

- Inflexible processes

- Changes in workflows

- Ease of use and interface with the various technologies

- Power outage + no backups

- Risk adjustment

- Overload data and system slowness

5/12/2016

Dr Watson the **IBM's supercomputer**

- The computer can analyze about 200 million pages of data in less than three seconds, which could allow physician to more accurately diagnose and treat complex cases. Physicians could, for example, use Watson to consult medical records and the latest research findings for recommendations on treatment.

- FDA Approved?

Just a Culture Principles

- **Values** and expectations-what is important to the organization
- **System** design and continual redesign of system and address processes and systems so it does not happen to someone else
  - Coaching and open environment
- **Peer to peer** coaching where helping one another to stay safe and make sure things are being done correctly
  - Just culture algorithms can help
- Patient safety needs to be viewed as a **strategic** priority
- The entire hospital needs to be focused on patient safety if a culture of safety is to be established

Dekker S. *Just Culture: Balancing Safety and Accountability*. Burlington, VT: Ashgate Publishing;; 2008.

Marx D. *Patient Safety and the Just Culture: A Primer for Health Care Executives*. New York, NY: Trustees of Columbia University;; 2001.

Examples:

- Having a patient safety **plan**
- Doing an **annual** report card, use **trigger** tools
- Have a patient safety committee
- Many also have separate medication management committee from safety committee (more **attention**)
- **Education** for staff to make sure they know near misses must be included in definition of medical error
- Doing patient safety walkabout **rounds** by senior leaders

Key success of a Culture of Safety

- **Acknowledgment** of the high-risk nature of an hospital's activities and the determination to achieve consistently safe operations
- A **blame-free** environment where individuals are able to report errors or near misses without fear of reprimand or punishment
- **Encouragement** of collaboration across ranks and disciplines to seek solutions to patient safety problems
- Organizational **commitment** and resources to address safety concerns

Event 'Management'

- **Prevent** failure but if you can't,
- Make failure **visible** and
- Prevent **adverse** effects of failure or
- **Mitigate** the adverse effects
- **Learn** from all events

Errors Provide Useful Information

- We can learn more from our failures than from success

- Our processes can be improved when studied

"Give me a fruitful error anytime, full of seeds, bursting with its own corrections. You can keep your sterile truth to yourself."
Vilfred Pareto

Which patients are most at risk of medication error?

- patients on **multiple** medications
- patients with **another** condition, e.g. renal impairment, pregnancy
- patients who **cannot communicate** well
- patients who have **more than one doctor**
- patients who do not take an **active role** in their own medication use
- **children** and babies (dose calculations required)

Systems Process Changes
Structure, Environment, and People

- Simplification
- Standardization
- Process design includes prompts
- Elimination of sound/look-alikes
- Environment/product improvements
- Training
- Teamwork
- Communication

Select Resources for Patient Safety Information

- Agency for Healthcare Research and Quality www.ahrq.gov

- Institute of Medicine of the National Academies www.iom.edu

- The Joint Commission www.jointcommission.org

- Institute for Safe Medication Practices www.ismp.org

- National Patient Safety Foundation http://npsf.org/

- JCAHO "Speak Up" program
  - http://www.jcaho.org/general+public/patient+safety/speak+up/index.htm

Take Home Messages

- Safety is everyone's job!

- Learn from previous errors

- Report incidents to learn not to blame.

- Errors are not only human related but the majority are system failure!

- Technology has been designed by human factors!!

Thank you

Professor Ahmed AlBarrak