Patient safety

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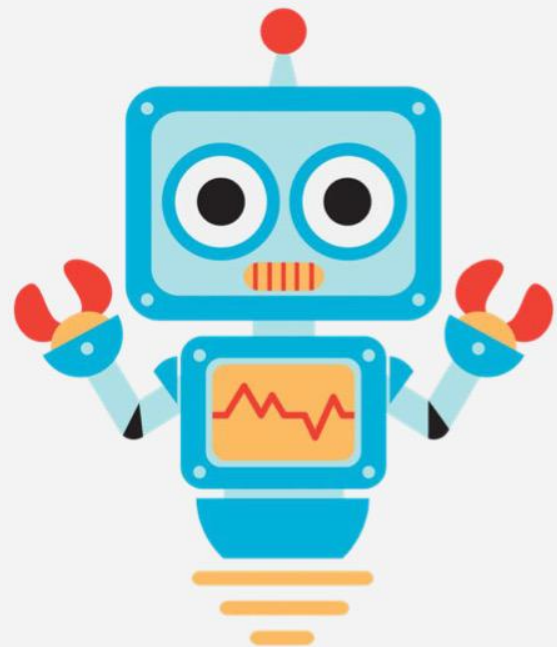
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Content

1. Medical informatics
2. Patient safety definitions, imperatives and current issues
3. Medical errors and adverse events
4. Error types
5. Human errors
6. The impact of health informatics on patient safety
7. CPOE Benefits
8. 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). This is a new definition, it is focusing more in computer application and communication. at the same time it defines the areas as medical services, education and research.

Safety in health care

Freedom from accidental injury due to medical care, or medical errors.
IOM, 2000

The avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of healthcare.
Vincent, 2011

Patient Safety defined as; The prevention of errors and adverse effects to patients associated with health care.
World Health Organization

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

▪ 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).

Error: he is old and almost 70 and can not tolerate NSAIDS

Adverse effect: the result of an error
So not every error result in an adverse effect
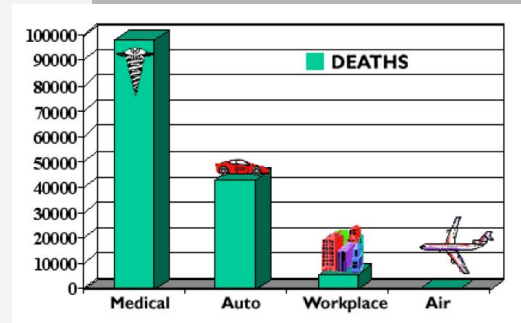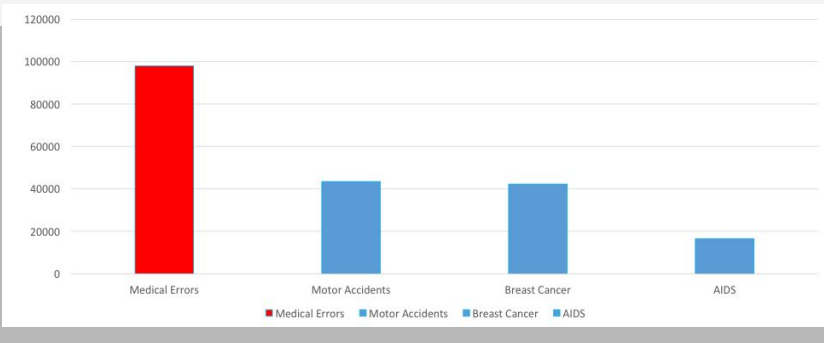BUT sure we try to avoid errors as much as we can

The magnitude

98,000/365 = 268.49

In 1998

Equal to one plane crashes every day!

Death Rate (US) 1 or 2 years later

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
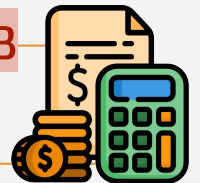
Over 7,000 deaths annually.

Resulted by medication errors alone, occurring either in or out of the hospital.

Between $17B and $29B

Cost of errors estimated

Per year

- A study of two UK hospitals found that 11% of admitted patients experienced adverse events of which 48% of these events were most likely preventable if **the right knowledge was applied.** highlighting the underutilization of the available information and knowledge during healthcare delivery.
- The **under-utilization** of healthcare data- Information- knowledge contributes to improper clinical decisions, medical errors, underutilization of resources and raise in healthcare delivery costs. We are suppose to improve patient safety through proper clinical decision and proper utilization of information

Aircraft Vs. ICU

We have to move forward to change our way in runing healthcare system and try to workout the resistance we are facing

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 complex environment that resists accepting change on the scale clearly required"
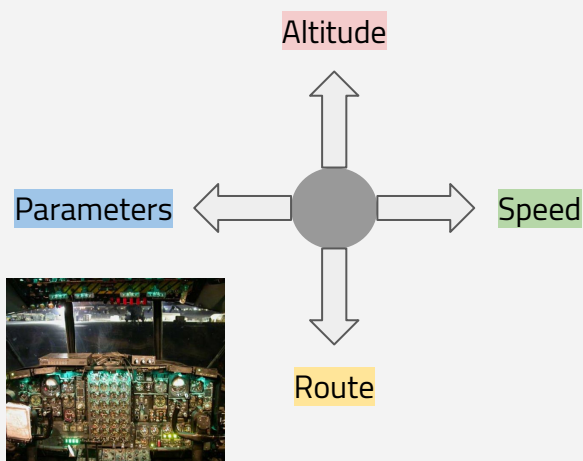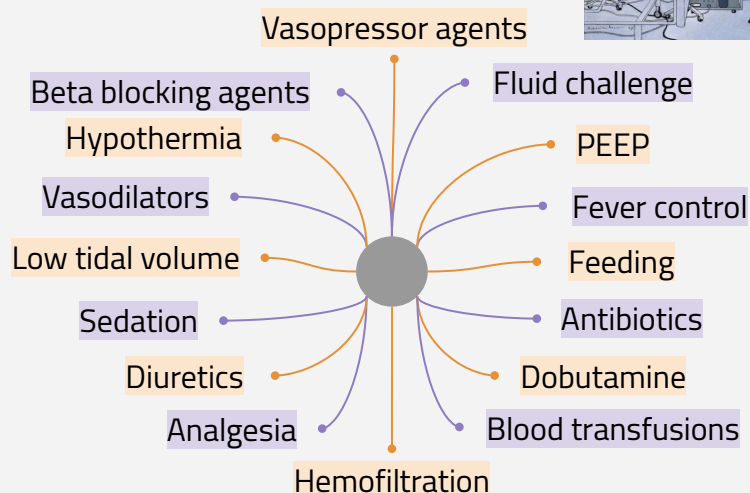
Lucian Leape, MD
Founder of the Modern Patient Safety Movement
Adjunct professor of health policy at Harvard University
"Error in Medicine," published in JAMA, 1994

All parameters and functions are well defined in aircraft while more complicated situations in ICU

Airline pilot

- Altitude
- Parameters
- Speed
- Route

ICU staff

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

Safety Issues

- Medication errors one of the most common
- Failure to rescue
- Readmissions 1 out of 5 patient require readmissions in the next 30 days
- Falls
- Pressure ulcer bad outcome for hospitalized patients
- Sentinel events
- Hospital acquired infections
- Under reported incidents
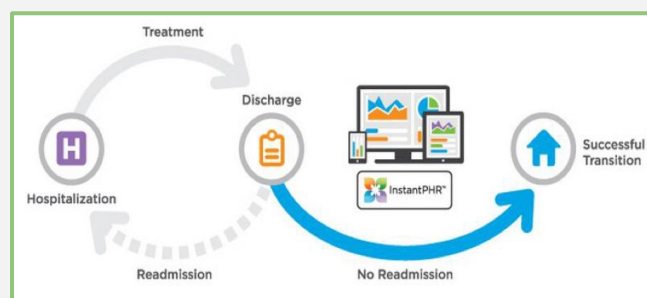
Flood of Information

Huge gap in data acquisition and information —> knowledge capacity

Explained before in Research Focus lecture
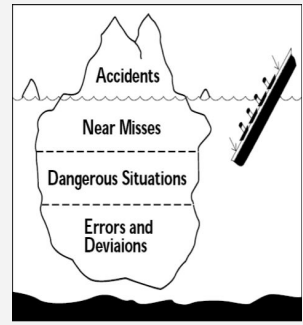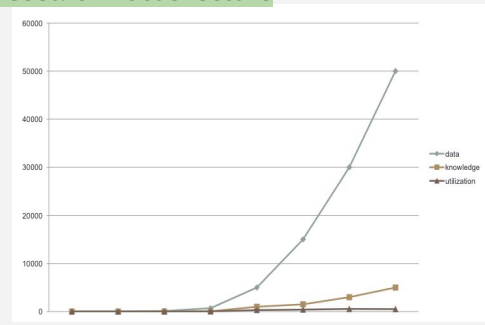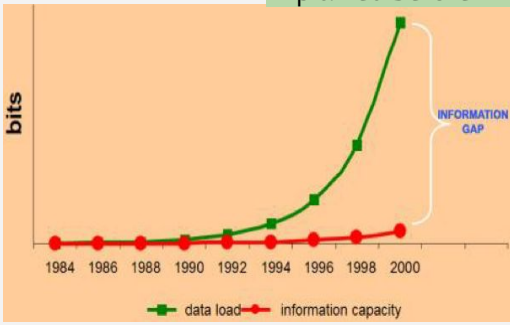
Data – knowledge - utilization

We are not fully utilize and interprets the data we receive, medical informatics help us in that
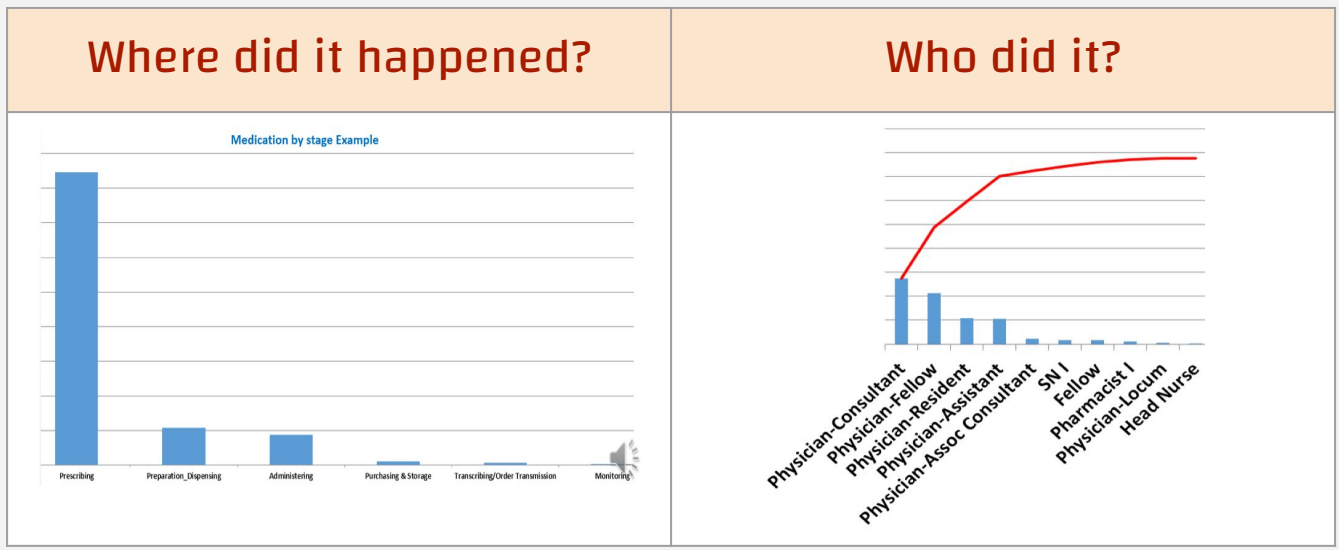

Many issues and complex situations underneath that need to be tackled and under spot.

i.e. Medication process

Prescribing is the most common phase to face medication errors

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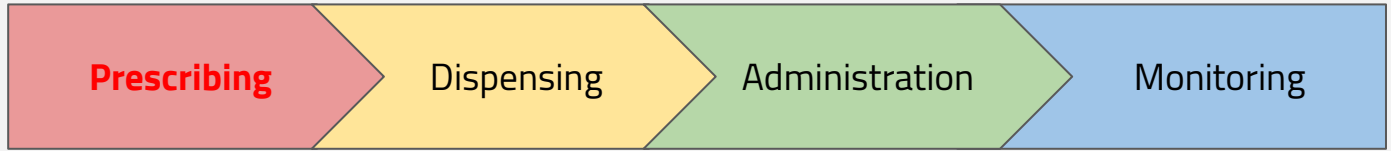
Medication errors (MEs) are common and considered one of the highest risk factors that threaten patients in hospitals. The majority of these errors are considered common during prescribing medication stage (Shulman et al, 2005).

Where did it happened?	Who did it?

Medication by stage Example

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

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

Prof. Lucian Leape MD

▪ Incompetent people are, at most, 1% of the problem.
▪ The other 99% are good people (more competent and have more knowledge) trying to do a good job who make very simple mistakes
▪ It's the processes that set them up to make these mistakes. so it maybe the systems making these silly 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

9000
8000
7000
6000
5000
4000
3000
2000
1000
0

% risk

3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%

Year 94   95   96   97   98   99

Key ▪ Total number of reports ▪ High and medium risk events (as a percentage of the total number of events)

- This graph shows you the experience of british by how they able to improve patient safety.

- They have implement and conduct a strategy that they are asking everyone to report mistakes.

- Reporting mistakes is one of the tool to improve patient safety .

Contributing Factors

Lack of communication main aspect leading to many medical errors	**Lack of coordination** between teams and different department of healthcare services
Inadequate staffing	**Lack of proper check**
IPP/ standards not followed	**Improper assessment/ reassessment**
Insecure access of patient information	**no / inadequate resources or supplies**
Lack of knowledge	**Look alike medications** CPOE helps in differentiating look alike drugs
Failure to follow up	**Illegible handwriting** COPE prevent this factor

Informatics benefits

1- Tracking System

2- Effective communication

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

Dr skip this slide

CPOE

CPOE Benefits	CPOE impacts
- >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 to standards and guidelines (Cunningham et al, 2008). - Decrease mortality rate by 20% per month (Longhurst et al, 2010). - Improves patients satisfaction (Splading et al, 2011). Many studies support the implementation of CPOE	- 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) .

Barriers to Technology Implementation

- Cost **(36%)** sustain income to healthcare is not that easy
- 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 resistance

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

Informatics help us much to quantify,measure and evaluate the process and efficacy and whatever we we are doing in healthcare

What medical informatics tools can? .
- Improve communication
- Make knowledge more readily accessible and utilized
- Assist with calculations
- Perform checks in real time and alerts
- 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

- 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 %).

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%)	

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
pharmacist 2= new
scale of 2 and 3

Example CPOE reduce error:
Explained before in CPOE lecture

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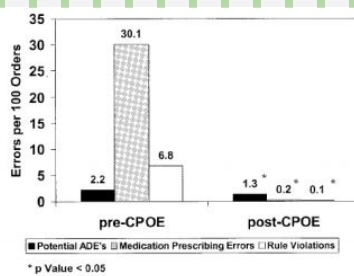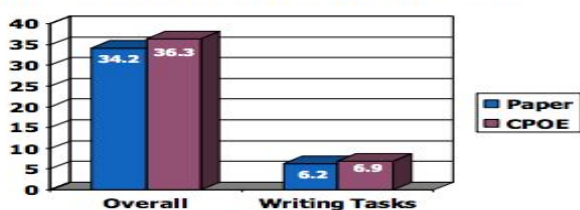

Potts AL, Barr FE, et al. Pediatrics. 2004 Jan;113(1 Pt 1):59-63.
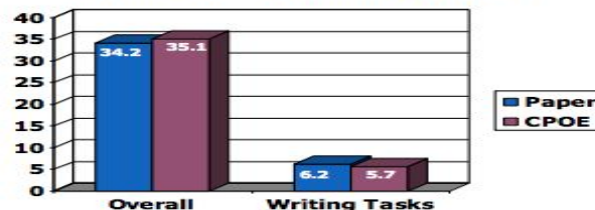
Does CPOE Take More Time?
Explained before in CPOE lecture

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.
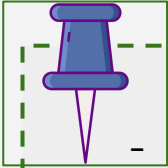
Healthcare

- 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

Very important statement

"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" they are continuous in improvement

IOM. 2001. Crossing the Quality Chasm: A New Health System for the 21st Century

"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 complex environment that resists accepting change on the scale clearly required"

Lucian Leape Founder of the Modern Patient Safety Movement Adjunct professor of health policy at Harvard University "Error in Medicine," published in JAMA, 1994

Informatics Limitations

Limited funds.

Resistance to change.

Under developed IT infrastructure

Inadequate hardware logistics

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

Lack of visionary leaders.
Could lead to a complete miss!

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

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
  better communication coaching with teams or organization trying to help others to overcome struggling
- **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

Examples

- Having a patient safety **plan** very important to have a plan
- Doing an **annual** report card, use **trigger** tools summaries issues
- 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 what policy or purposes should follow
- Doing patient safety walkabout **rounds** by senior leaders
  look at readiness and preparedness for department in respect to safety in hospitals

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
  should be number one priority

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 most important

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

Be able to understand trends and hidden causes and analyze valuable information available and then reduce errors in future

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 should be everywhere is the same ex: same color code ue everywhere
- Process design includes prompts
- Elimination of sound/look-alikes eliminate confusion
- Environment/product improvements
- Training is the key success
- 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!!

HUMAN ➕ HI ≠ HUMAN

Questions

1- Which of the following is an example of preventable adverse event?
A-blurry CT scan
B-Cancellation of an appointment
C-Food allergy
D-Prescribing wrong dosage.

2- If a pregnant lady is prescribed a pregnancy-contraindicated medication but she did not have complications, which type of error did the physician make?
A-intercepted adverse event
B-Near miss event
C-Potentially adverse event
D-preventable adverse event

**3- Which of the following patients at risk of medication error?**
A. patients who have more than one doctor
B-patients who can communicate well
C-patients on multiple medications
D-patients who take an active role in their own medications use.

4-which of the following considered as Contributing factors.?
A-Failure to follow up
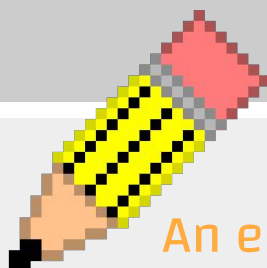B-Standardization
C-Change in workflows
D-Tracking system

1-D.
2-B.
3-C.
4-A

Thank You
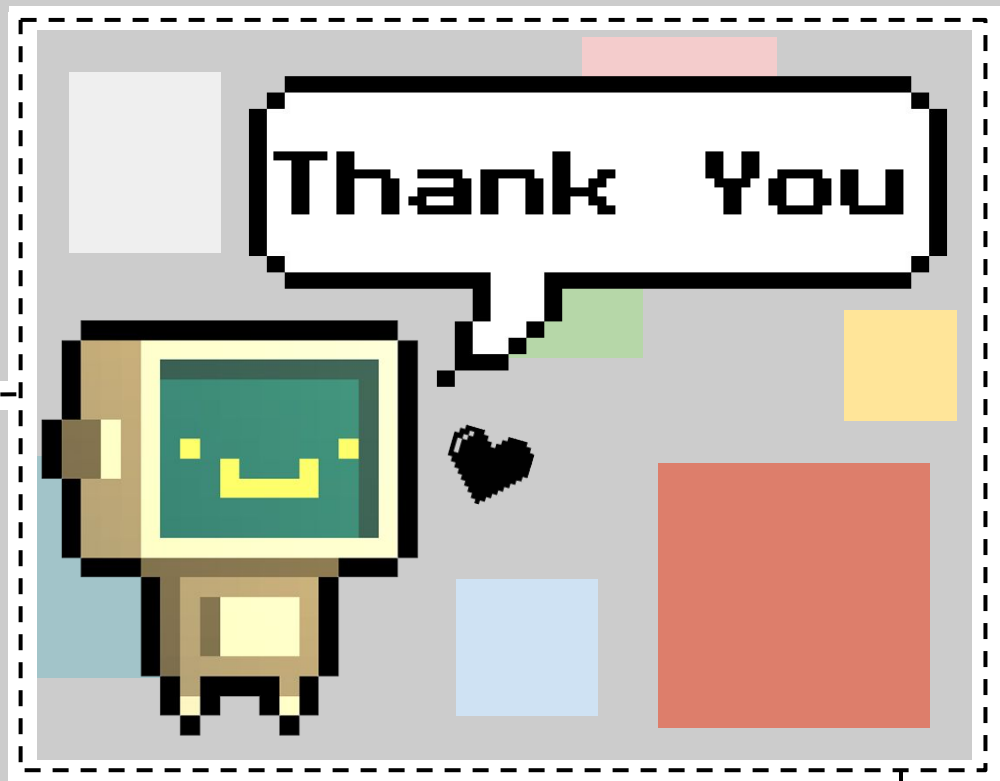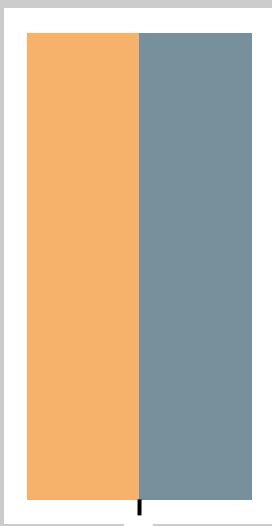
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