



# Patient safety risks associated with e-health

Never Stand Still

Medicine

Centre for Health Informatics

Dr. Farah Magrabi

Centre for Health Informatics, UNSW

[f.magrabi@unsw.edu.au](mailto:f.magrabi@unsw.edu.au)

*The PCEHR: heralding a new era in patient care seminar*

*28 June 2013*

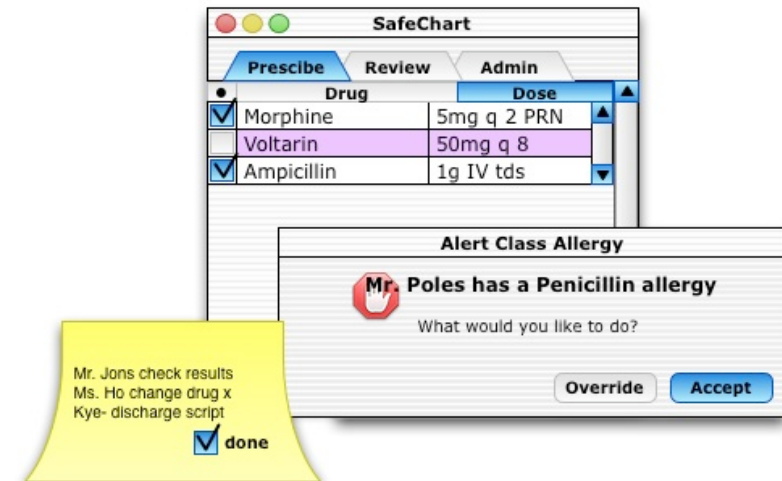
# The Centre for Health Informatics



- UNSW Research Centre, founded in 2000
- Part of the Australian Institute of Health Innovation
- **NHMRC CRE in Informatics and e-health**
- 21 full-time researchers
- Largest academic Health Informatics research group in Australasia
- Four core research streams
  - **Patient Safety Informatics**
  - Consumer Informatics
  - Translational Bioinformatics
  - Modelling and simulation of health systems

# Four parts

1. Review safety of IT
2. Examine how IT can generate errors
3. Discuss safety as a system property
  - *Socio-technical systems*
4. Review ways to improve safety
5. Conclude



*Part 1*

## Alongside benefits IT may harm patients

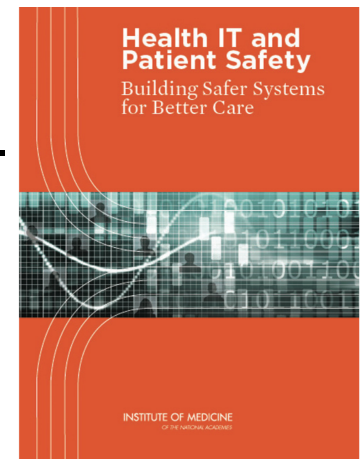
- Safety problems are a “side effect” or “unintended consequence” of information technology (IT).

(Ash, Berg & Coiera, 2004)

## Health information errors cited among top 10 health IT hazards

Potential to improve care comes with potential for harm, ECRI Institute warns

- US IOM Committee: Patient safety & health IT (2011).



# Evidence about patient harm is mounting

	Australia	USA	England	Wales	Pennsylvania	ECRI
Source	AIMS	FDA	NHS safety desk	NRLS	PA-PSRS	Deep Dive
No. of incidents	99	436	850	149	3,099	171
<b>Patient harm incidents</b>	<b>12</b>	<b>46</b>	<b>22</b>	<b>50</b>	<b>16</b>	<b>25</b>
Timeframe	24 months	30 months	6 years	28 months	8 years	3 months
Years	2003-05	2008-10	2005-11	2009-2011	2004-12	2012

Magrabi et al. JAMIA 2010; JAMIA 2012; under review

Edwards et al. ACI 2012; Penn. Patient safety authority 2012; ECRI 2012



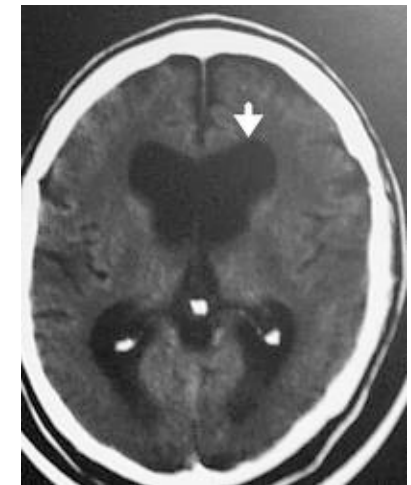
Part 1

## Examples of adverse events

Small font and poor visibility of the medication strength was associated with a ten-fold overdose of epinephrine, resulting in a myocardial infarction.



A surgeon operated on the wrong side of a patient's head when the left and right orientation markers were swapped by the image display.



*reported to the US FDA*

## Part 2

# Information errors can lead to harm

Consider a doctor using an **e-prescribing** system, *information* can be:

1. **Wrong:** *flucloxacillin* (Antibiotic) prescribed but *methotrexate* (Antimetabolite) printed on script → patient takes wrong medication and suffers a reaction
2. **Missing:** Medication is not on list → medication not taken
3. **Partial:** Medication name is listed but dose, frequency missing → patient takes wrong dose
4. **Delayed:** Updated one day late on list → patient misses dose

## Part 2

# Healthcare is a complex socio-technical system

- Socio-technical systems
  - approach to complex organisational work design
  - recognises the ***interaction*** between people and technology in workplaces.
- Provides a framework to examine safety of IT

Part 2

# Safety is a system property

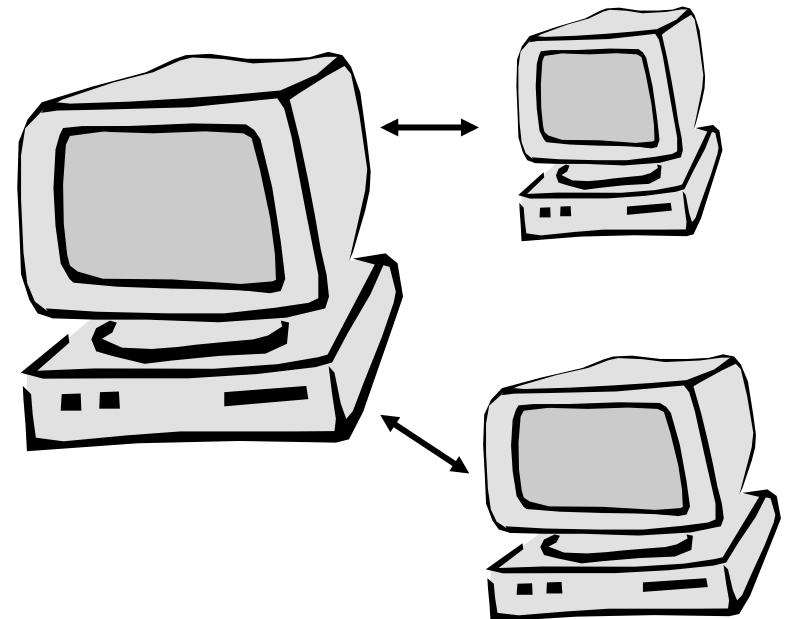
3. In the context of use



2. In the hands of users



1. Software on its own



## Part 3

# Information errors arise from:

### 1. Humans on their own

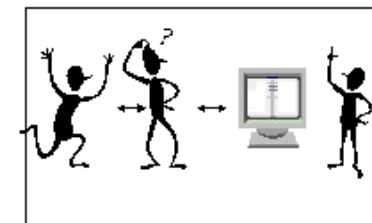
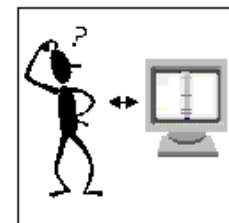
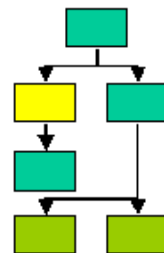
- Knowledge
- Skill
- Rules

### 2. Humans influenced by the socio-technical context

- Environment (e.g. interruption)
- Social influence

### 3. Machines

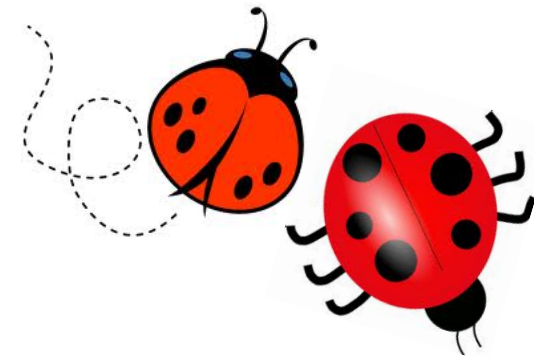
- Hardware
  - code
  - decision support



(after Coiera 2003)

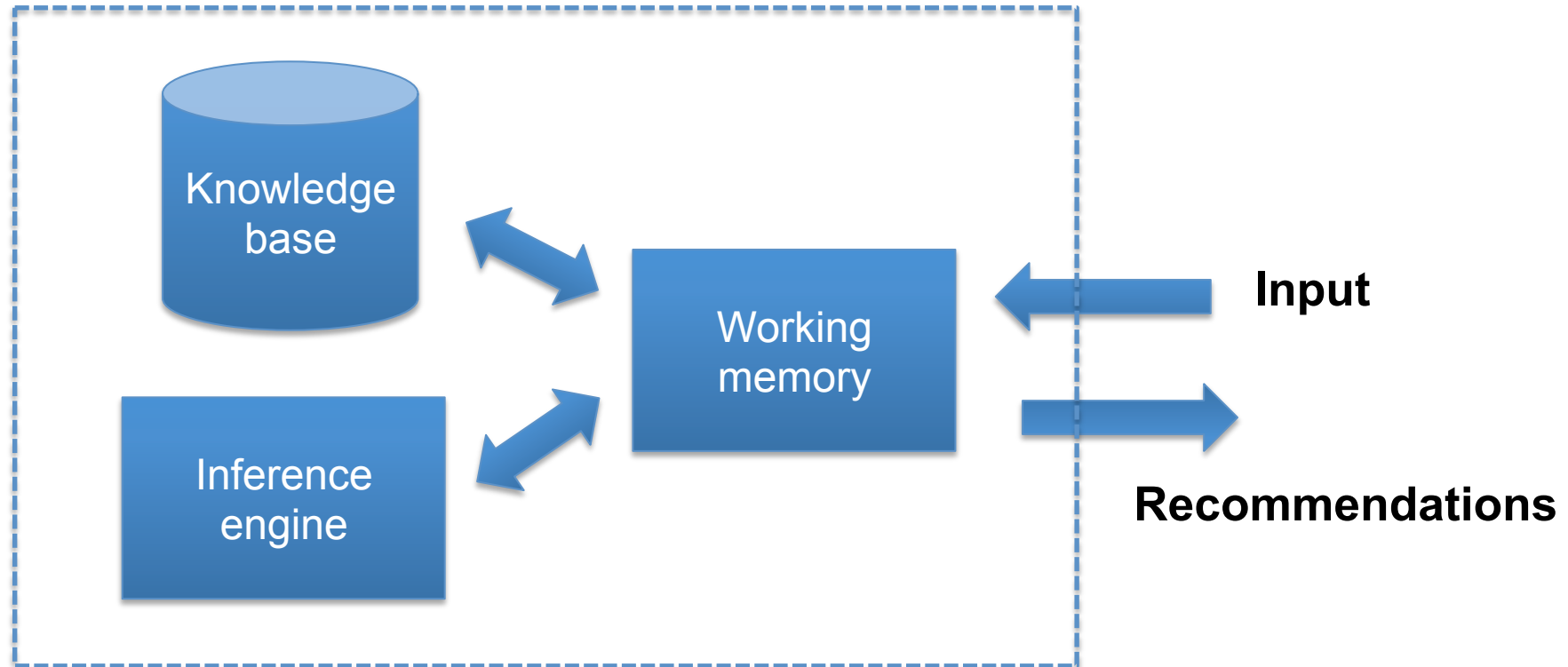
## Development problems generate errors

- *A series of imaging studies were done on **Patient A**. Staff were unable to locate one of the studies afterwards and it was discovered in **Patient B's** file.*
- *Sometimes the orders which are prescribed in the order entry **do not show up** in the worklist.*



*Part 3: Software on it's own*

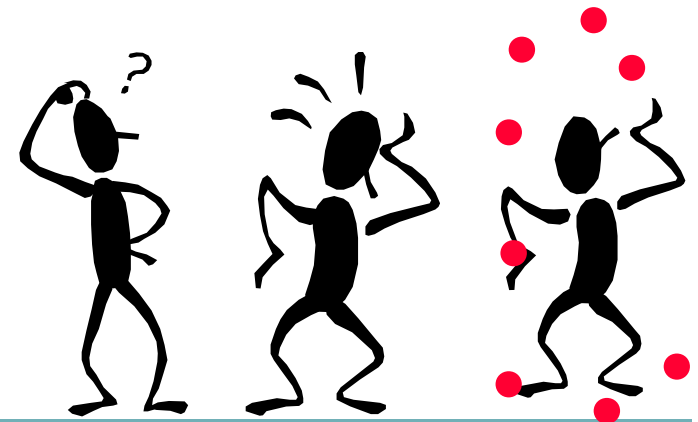
## Inadequate decision support generates errors



- National Prescribing Service: GP decision support study
  - only 3/6 prescribing packages alerted users to 20 major interactions (Sweidan et al. 2009)

## Problems with use of software generate errors

- CPOE system required users to scroll through **225 options** on a drop down menu. Options were arranged in a **counterintuitive** alphabetical order, and resulted in a patient being **overdosed** with four times more digoxin than required.
- Patient's information was **entered under a wrong name** in the computer...

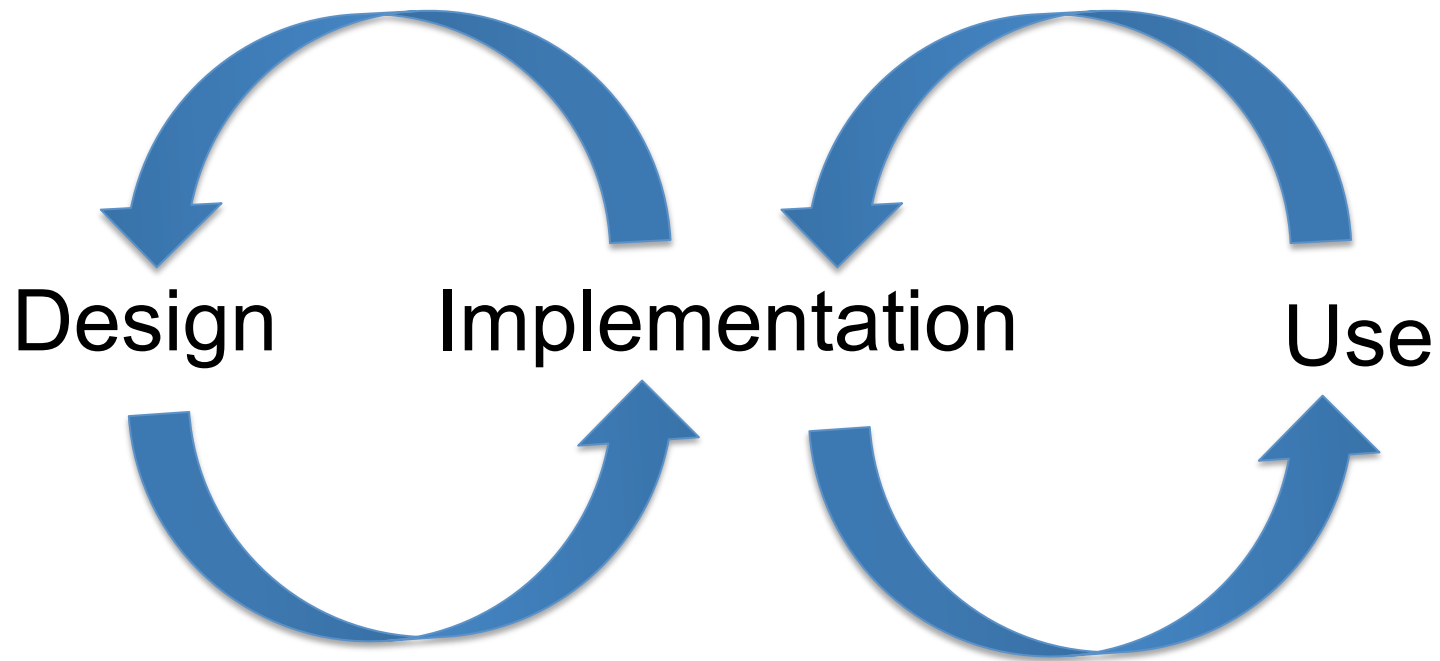


## Poor implementation generates errors

- *IT systems failed.* We rely heavily on IT systems to retrieve radiology, pathology results, ordering of tests and radiology. Hard copies of ultrasound scans not provided. Without functioning IT we could not access results.
- The pharmacy medication alert system was updated and the alerts were *inadvertently turned off*. Alerts were down for approx. 7 days.



## Part 4: Improving the safety of IT



## Part 4

# Safety through design

## Focus

Functionality & usability

- software
- decision support



## Strategies

- User-centered design
  - Common User Interface
- Standards
  - software development
  - decision support
  - health information
- Certification
- Regulation

## Part 4

# Safety through implementation

## Focus

- User acceptance
- Integration
  - workflow
  - local configuration (e.g. DSS rules)
  - other systems, network

## Strategies

- Clinical process re-design
- Clinical champions
- Planned implementation



## Part 4

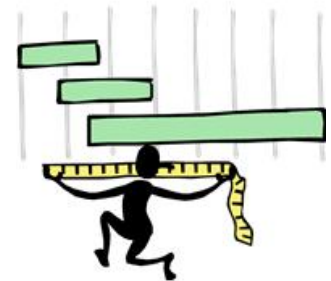
# Safety in use

## Focus

- Safe use
  - access
- Safe operation
  - 24/7, fail-safe
- Maintenance
- Ongoing surveillance

## Strategies

- User training, accreditation
- System to manage availability
- System to manage updates
- Incident monitoring & management at all levels

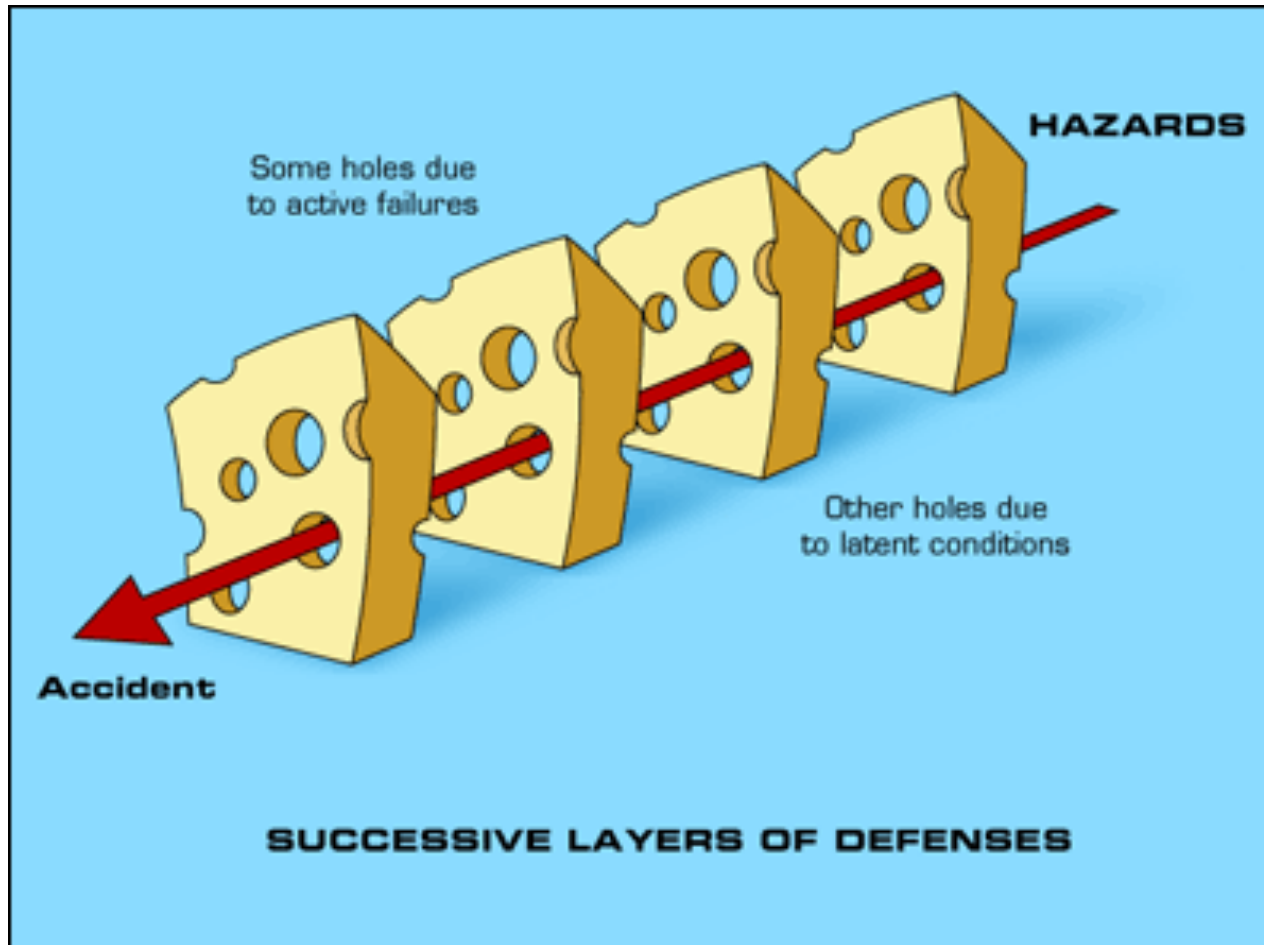


*Part 4*

# Bringing it all together to ensure a safe system

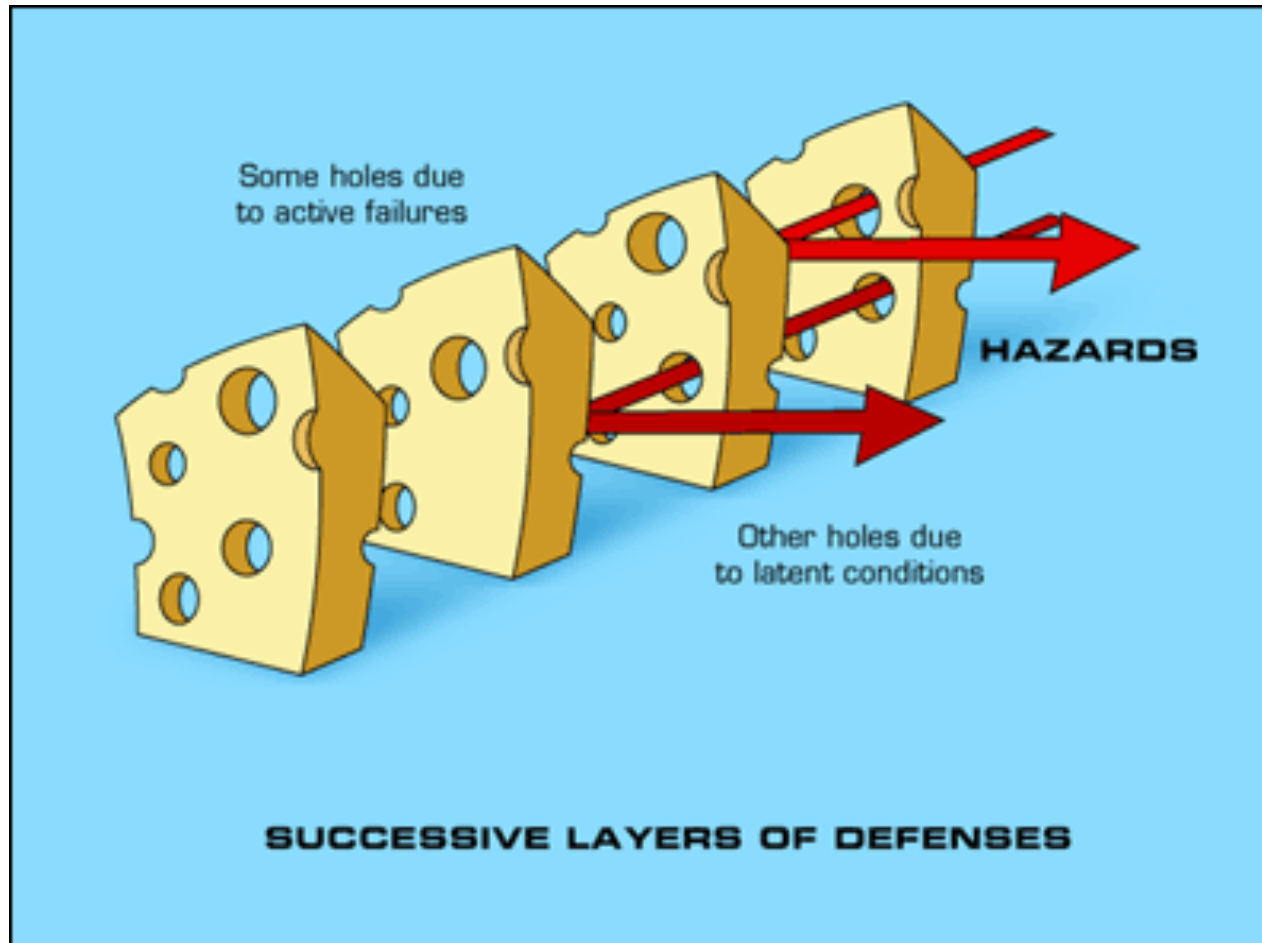
Part 4

# Reason's Swiss cheese model - 1



Part 4

# Reason's Swiss cheese model - 2



# Summary

- Alongside their benefits, **poorly designed, implemented or used systems** can lead to patient harm.
  - New ways of making error cf. ‘side-effect’ of IT.

- Information errors arise from:

**Safety strategies**

- software on its own
- in the hands of users
- in complex socio-technical clinical environments

- **Safety is a system property**
- Address safety in **design, implementation & use**

Thank you!!

Dr. Farah Magrabi

[f.magrabi@unsw.edu.au](mailto:f.magrabi@unsw.edu.au)