



Queensland Health

**Skills Development Centre**

Queensland Government

# Design and Evaluation

Getting the Human Factors right in Healthcare

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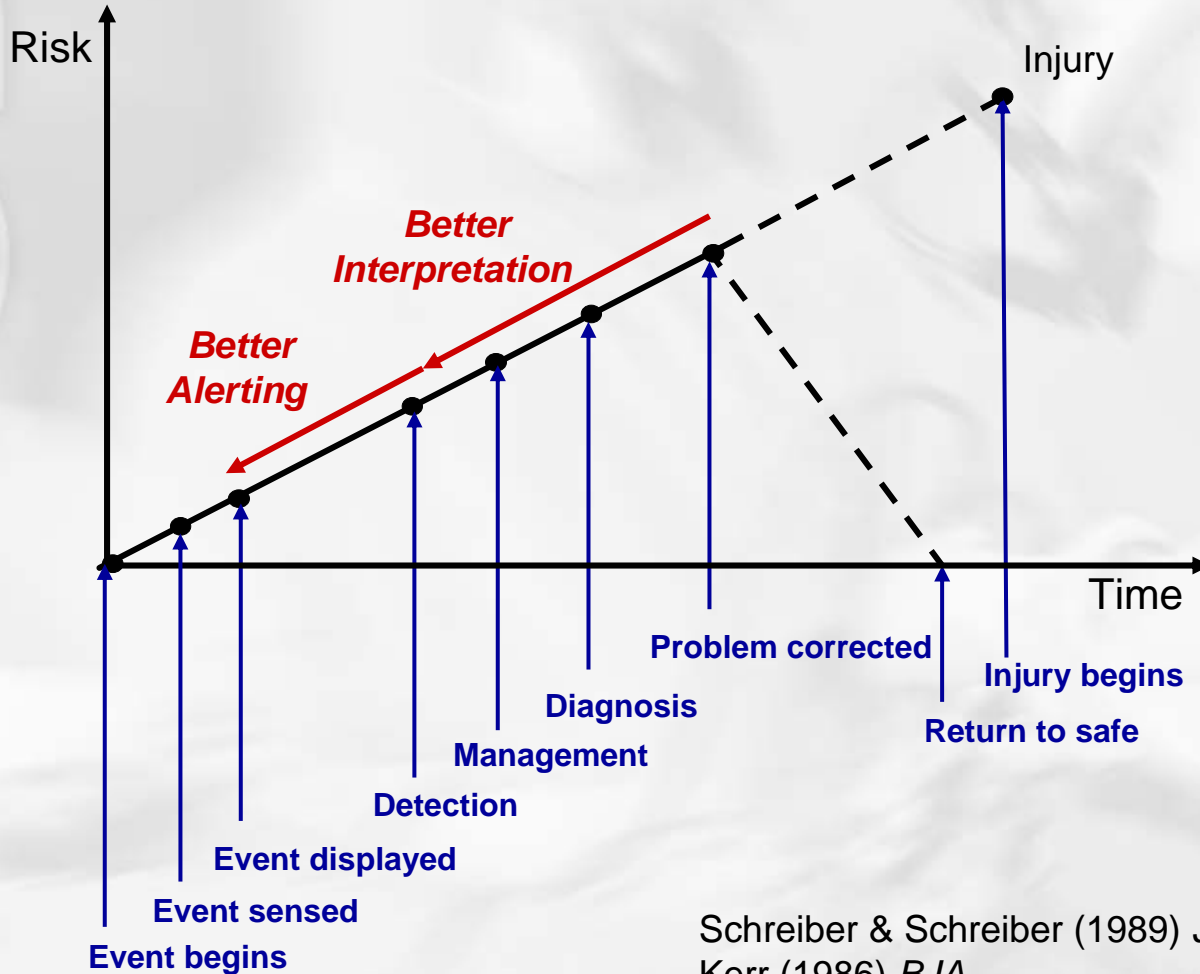
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*capability* ■ *safety* ■ *innovation*

# Patient Charts

- Patient charts have similar problems to computer and medical interfaces
  - They offer a limited visual space
  - They require people to enter data
  - They require people to extract information
  - They have knowledge domains – who can understand the visual representations of information
  - Patient privacy – who sees what information
- At some point in the future patient charts will be computer based
  - The transfer of information between paper and information computer technologies is essential to an effective transition

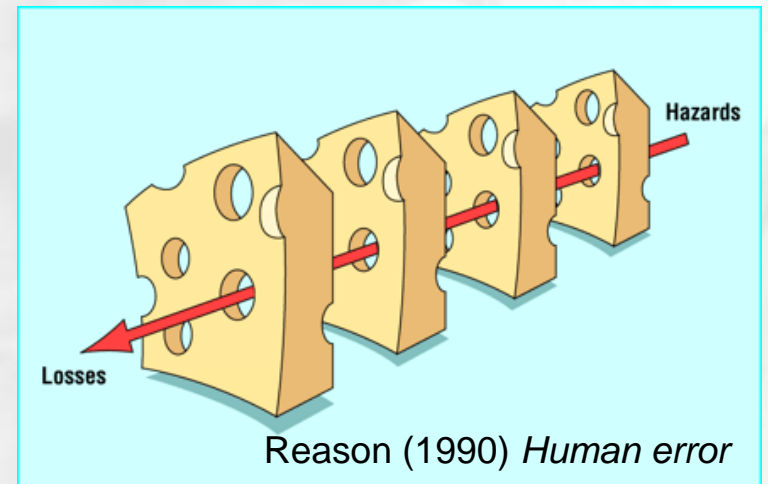
# Injury pathway



Schreiber & Schreiber (1989) *J Clin Monit Comput*  
Kerr (1986) *BJA*

# Human Error

- Slips
  - when our attention is diverted
- Lapses
  - where the goal is forgotten in the middle of a sequence of actions
- Mistakes
  - errors in rule- or knowledge-based performance
- Procedural violations
  - where people intentionally breach rules



# Human-system design examples:

- Are products safe and effective?
  - IEC60601-1-8 alarm standard recommends radical changes to alarms without user evaluation. Sanderson et al. (2006) *Anaesthesia*
  - Abbott Lifecare 4100 PCA interface led to morphine overdoses and deaths. Lin et al. (1998) *J Clin Monit Comput*
- Are procedures reasonable, feasible and followed?
  - Differing professional attitudes to deviation from clinical protocols. Parker & Lawton (2000) *Soc Sci Med*
  - 100% failure to follow protocol in trauma resuscitation walkthroughs. Clarke et al. (2000) *Acad Emerg Med*

# Systems Phases

<u>Concept Definition</u>					
<u>Requirements Analysis</u>	<u>Function Analysis</u>				
	<u>Function Allocation</u>	<u>Task Design</u>			
		<u>Interface and Team Development</u>	<u>Performance, Workload and Training Estimation</u>		
			<u>Requirements Review</u>	<u>Personnel Selection</u>	
				<u>Training Development</u>	<u>Performance Assurance</u>
					<u>Problem Investigation</u>

(Phases from [Dugger et. al., 2000](#))

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# Interface and Team Development

## Objective

- Identify and develop concepts for the interfaces between people, data capture and other people

## Activities

- Apply human factors guidelines
- Research decision support and visualization
- Develop initial prototypes to support evaluation
- Develop working prototypes for incremental evaluation of proposed system
- Determine appropriateness of the interfaces for meeting system and usability requirements
- Specify team organizations

*This is an iterative process*

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# Interface and Team Development

## Method

- Cognitive Task Analysis
- Critical Decision Method
- Goal-Directed Task Analysis
- Interviewing and observing methods
- Simulators/Mock-ups Computational Cognitive Modelling
- Task Simulation
- Rapid prototyping
- Storyboarding
- Heuristic Evaluation
- Walk-throughs/Talk-throughs/Cognitive Walk-Throughs
- Usability Studies

# Using simulation to design and evaluate

- Human-system integration
  - Pre-purchase equipment evaluation
  - Introducing new equipment into practice
  - Evaluating workload and fatigue
  - Design and evaluation of procedures and protocols
  - Design of human-system interface via R&D partnerships
  - Organisational simulation—workflow, communication, etc.

Dalley et al. (2004) *Anesth Analg*

Smith & Gaba (2000) In *Clinical Monitoring: Practical Applications*.

# Quality Assurance for PICU move

- The internal relocation of the Paediatric Intensive Care Unit at The Prince Charles Hospital involved
  - no change in staff
  - no change in communications or procedures
  - minimal new equipment (pendants)
  - significant change in layout of the rooms
- *The move resulted in*
  - *3 serious events in the first week*
  - *problems locating equipment*
  - *plans for staff orientation were not followed*
  - *major stress*

# Quality Assurance for PICU move

- Relocating 13.9 km from The Prince Charles Hospital to The Mater Hospital
- Major staff changes
  - surgical 100%
  - perfusion 100%
  - medical 50%
  - nursing 85%
- Major facility changes
  - space
  - equipment layout



# Quality Assurance for PICU move

- Work place orientation and team development
  - *Safe orientation including emergency responses*
- Identifying and addressing safety concerns
  - *Knowledge, training equipment and protocol deficiencies*
- Equipment evaluation
  - *IMEC system, Pacemaker cables, Bay setup*
- Evaluating workload and workflow
  - *Communication, Equipment setup times*
- Design, and evaluation of procedures and protocols
  - *Handover training, Equipment setup times, Hand hygiene, Drain checking, Volume administration methods, Temporary pacemaker use and connections, Transthoracic pacing via defibrillator*

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