

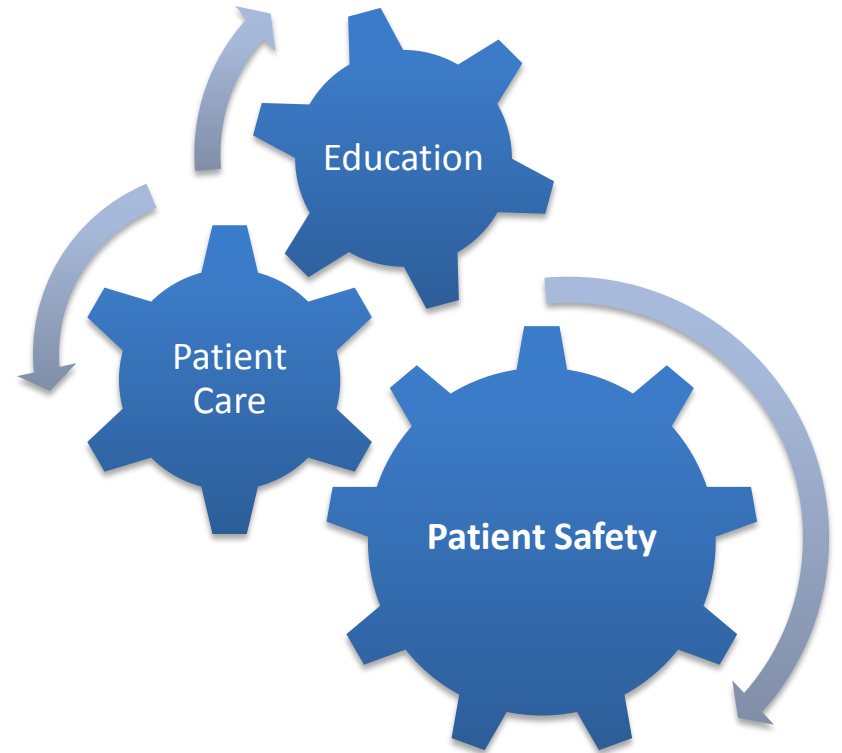
Simulation Teaching and Training

Dr. Ethel Ryan

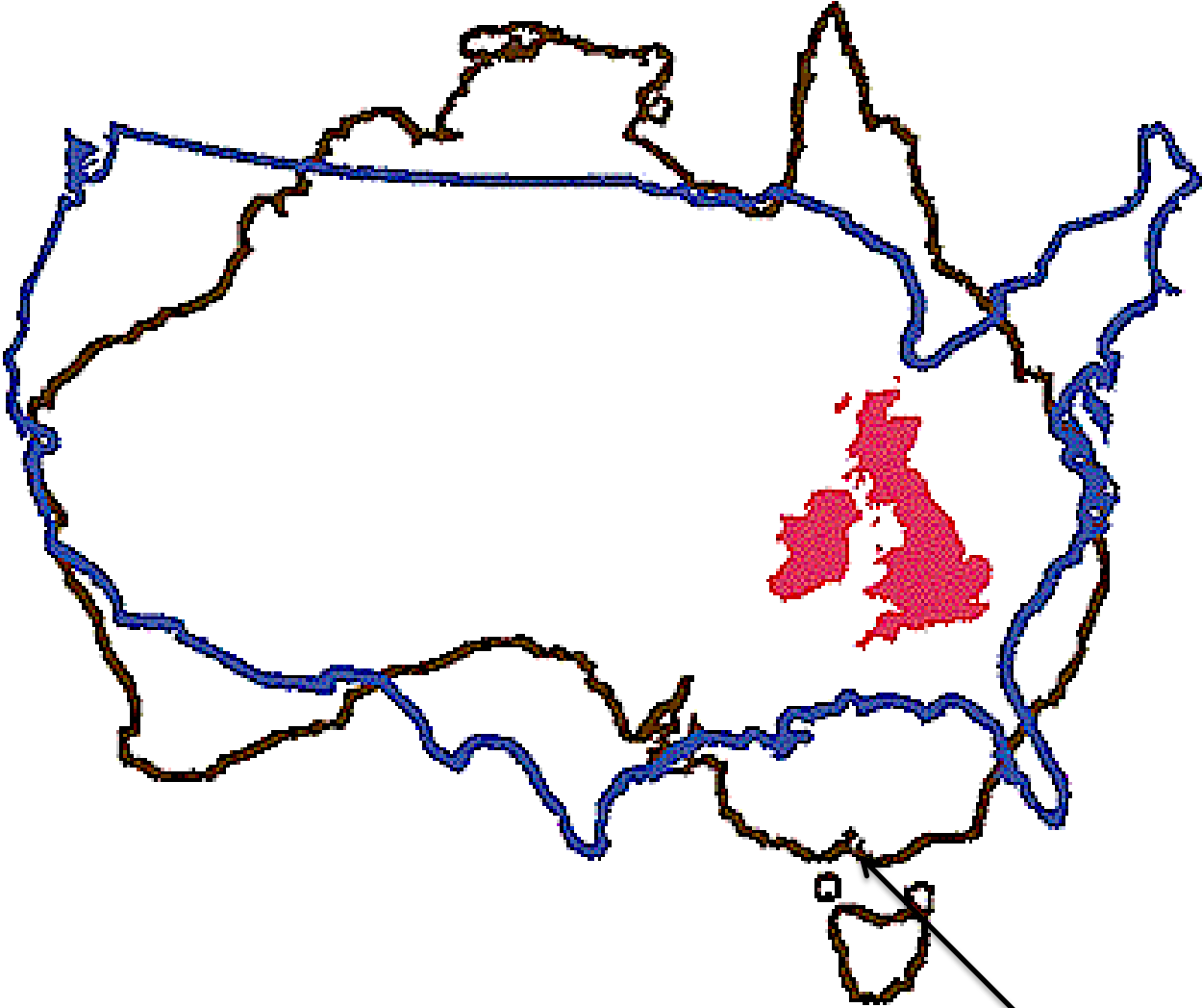


Overview

- Introduction
- Medical Education
- Simulation
- Teamwork
- Human factors
-



Ireland Vs Australia



Melbourne



Ireland Vs Australia



Ireland

- Population 4.2 million
- 31,000 sq miles
- Birth rate 14.44 / 1000 pop
- Infant mortality 5.05 / 1000
- Life expectancy 78.2 years
- East to west 2.5 hours (drive)
- 8% GDP on healthcare

Australia

- Population 22 million
- 2.9 million sq miles
- Birth rate 12.55 / 1000 pop
- Infant mortality 4.75 / 1000
- Life expectancy 81.63 years
- East to west 3.5 hours (flying)
- 10% GDP on healthcare

Road transfers



Fixed wing transport



Unloading the cot



From the plane to the ambulance



Helicopter transport



Medical education

Teaching

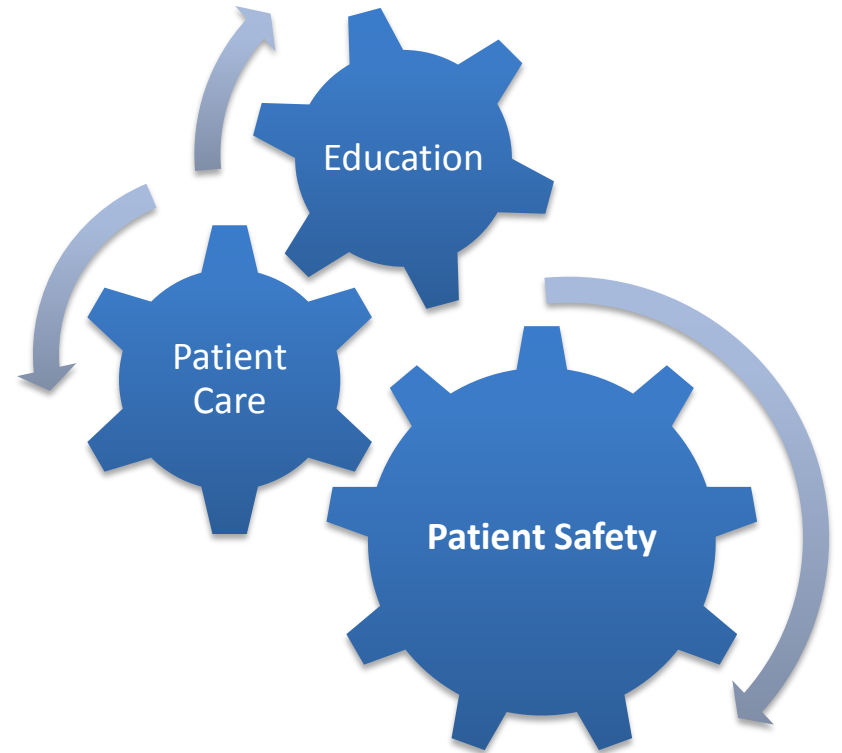
- OSCE examiner
- Resuscitation teaching and training in Melbourne & rural Victoria (level 2 + 3 units)
- Simulation teaching for new registrar induction
- Simulation Instructor course – Harvard
- Simulation conferences

Masters in Clinical Education

- University of Edinburgh
- Online self directed MSc
- First 2 years - modular based
- Research & dissertation year 3

Overview

- Introduction
- **Medical Education**
- Simulation
- Teamwork
- Human factors

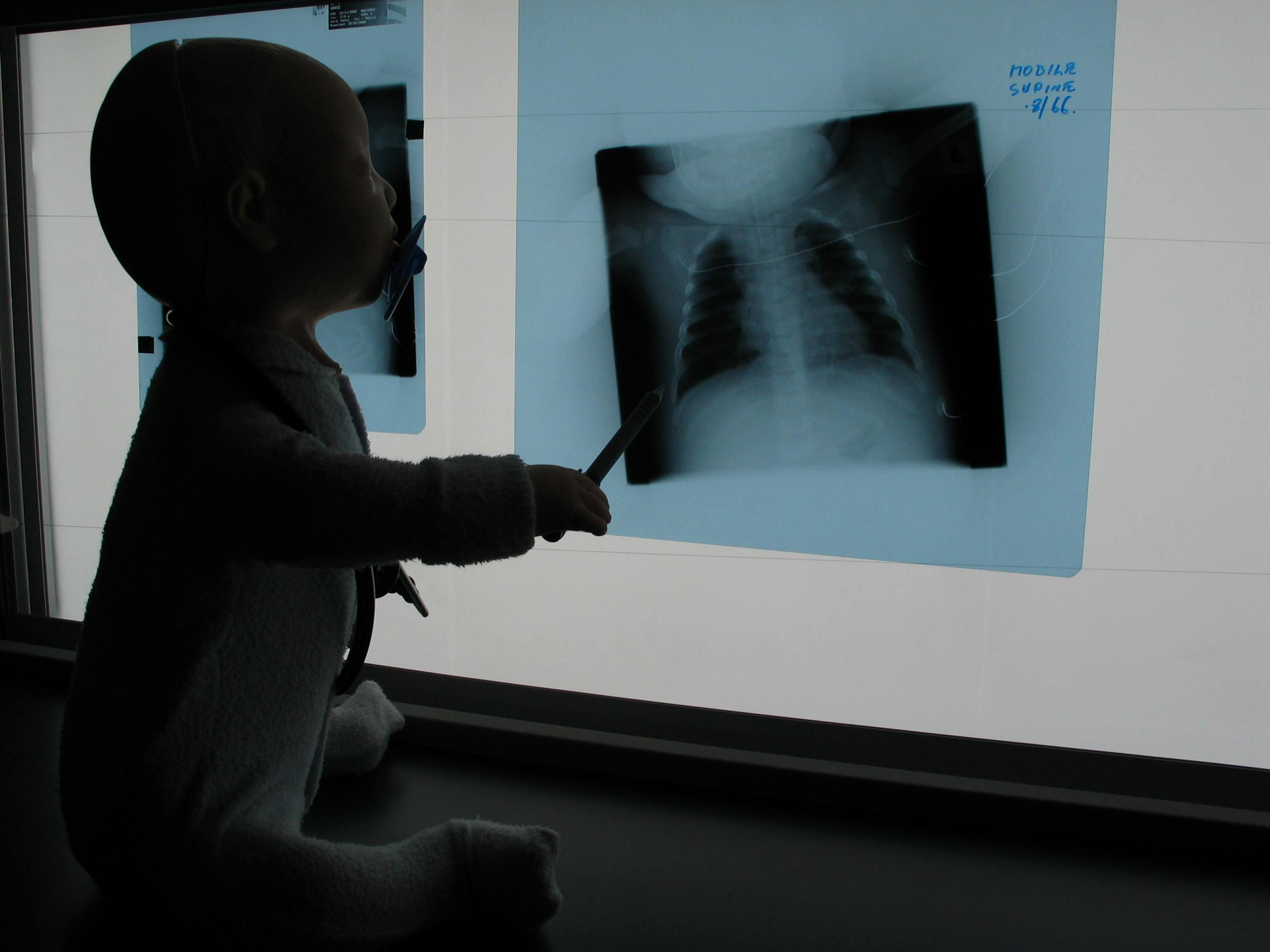


Lecturing style (1)



Lecturing style (2)



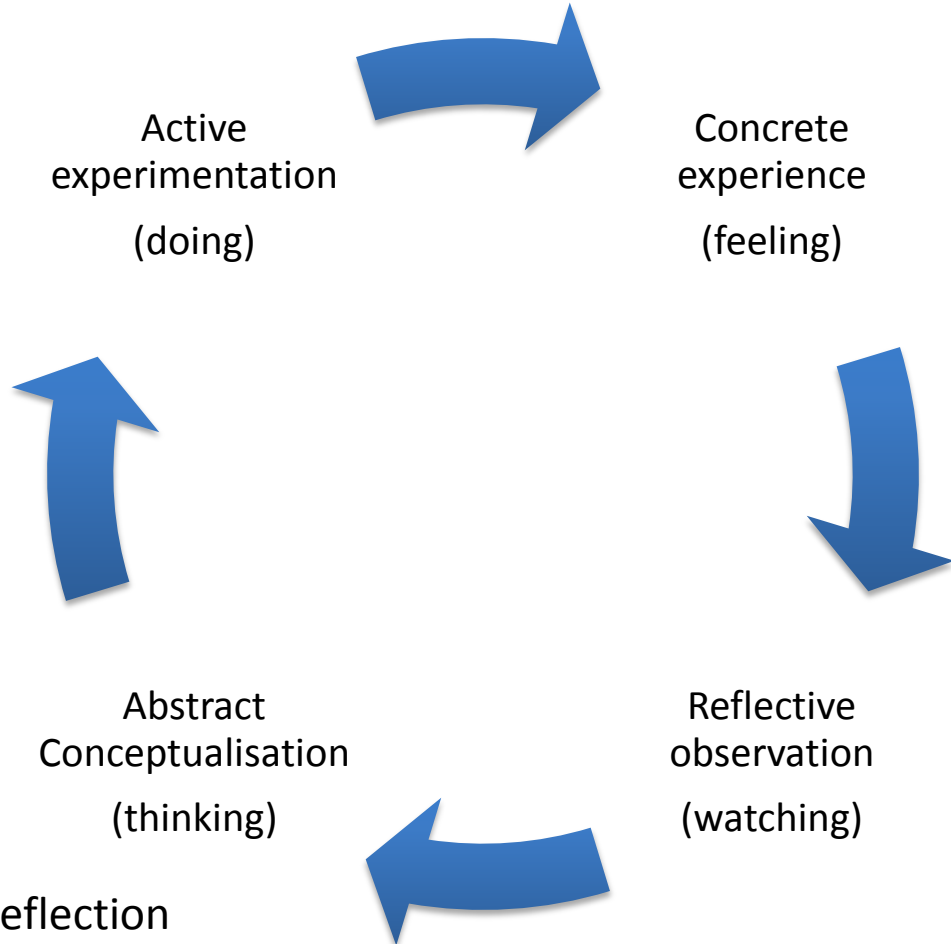


MOBILE
SUPINE
8/66.



Kolb's Learning Style

- Medical staff
- Nursing staff
- Allied health



Learning depends on experience and reflection

Experience is a valuable source of learning

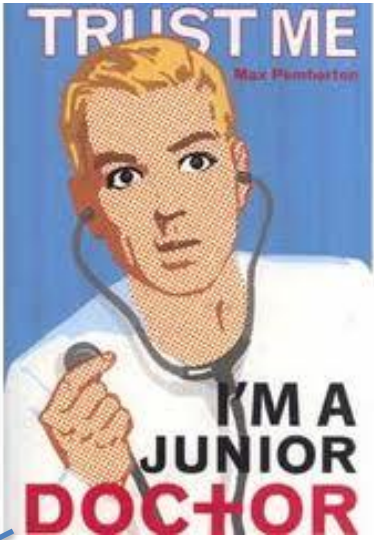
We tend to learn better from practice, than theory

How students learn

- *Deep learners*
 - full understanding of theoretical basis of subject
- *Superficial learners*
 - surface learning, give facts with no conceptualisation of what it all means
- *Introverted*
 - self directed learning
- *Extroverted*
 - learn by interaction

MSc Clinical Education

- To try and demonstrate that regular simulated neonatal oriented teaching and training, using 'SimBaby', would improve the resuscitation skills and procedural skills in paediatric registrars



© Original Artist
Reproduction rights obtainable from
www.CartoonStock.com



"... IN THE FUTURE, PLEASE REFRAIN FROM ANSWERING 'DUH' ON THE EASIER QUESTIONS."

search ID: dcr0507



MSc results

- Overall improvement in resuscitation skills between pre and post simulation training in 8/9 registrars
- Difficult to ascribe perceived improvement to simulation alone
 - Performance influenced by prior experience / no experience of neonatology
 - Current experience in the workplace
 - Paediatric resuscitation courses
 - Innate talent & personality

Simulation

- The effectiveness of simulated based teaching and training in medical education is unknown
- Very little has been written about it in the literature
 - Descriptive papers of personal experiences
- Can be hard to measure qualitative data
 - Little evidence to support validity, reliability and feasibility
- Lack of simulation 'gold standard' in measuring competency and capability of a trainee

Translation of skills...the evidence

Didactic lectures

- 5 part scenario based trauma curriculum
- Written objective at end of training
- First 4 resuscitations captured on video
- (1) trauma resuscitation and (2) crisis management skills evaluated by blinded assessors

Human performance simulators

- 5 part scenario based trauma curriculum
- Written objective at end of training
- First 4 resuscitations captured on video
- (1) trauma resuscitation and (2) crisis management skills evaluated by blinded assessors

The results....

Human performance simulators

Didactic lectures

- Trauma resuscitation scores same
- Individual scores same

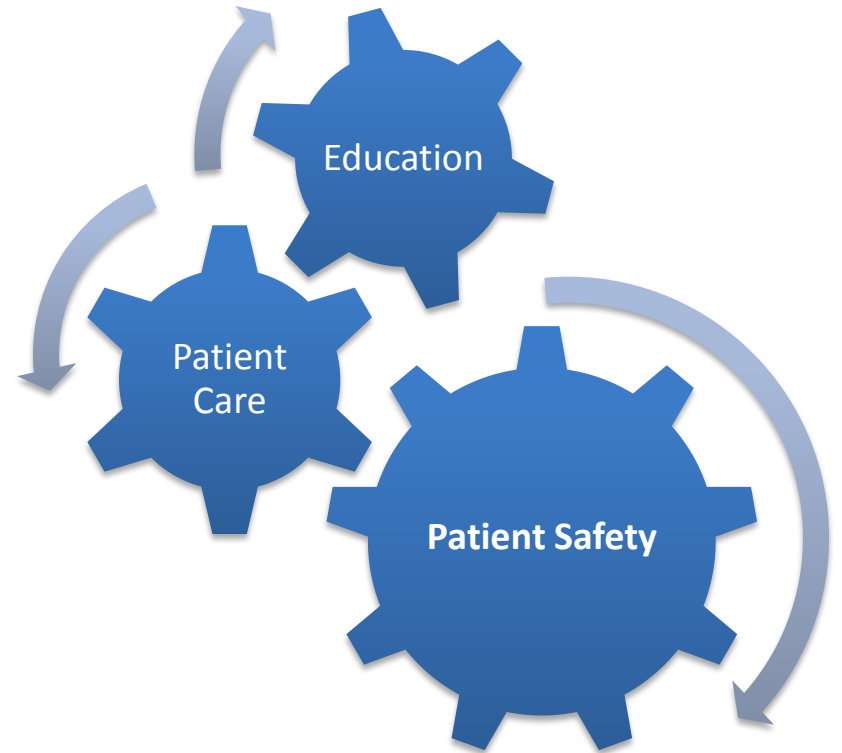
- Trauma resuscitation scores same
- Individual scores same
- **Higher crisis management skills**



Knudson et al, 'Trauma Training in Simulation: Translating Skills from SIM to Real Time' *J Trauma* 2008;64:255-264

Overview

- Introduction
- Medical Education
- **Simulation**
- Teamwork
- Human factors



Simulation

- Not just about using high tech simulators
- Not just teaching students a series of unrelated tasks
- Simulation is a technique that can be used in wider professional development of all healthcare professionals

Simulation...brief historical overview

- 18th century Mdme Du Coudray
- 1960's – Resusci Anni
- 1963 – SIM I
- GAS – Gainesville Anaesthetic Simulator
- CASE – Comprehensive Anaesthesia
Simulation Environment: CRM and teaching
technical and non-technical skills

Simulation history

- Madame Du Coudray – 18th century
- Royal midwife in the court of Louis XV of France
- invented the first lifesize obstetrical mannequin, for practicing mock births



Simulation history

- used an actual fetus as the baby
- In 1759, the king commissioned her to teach midwifery to peasant women in an attempt to reduce infant mortality



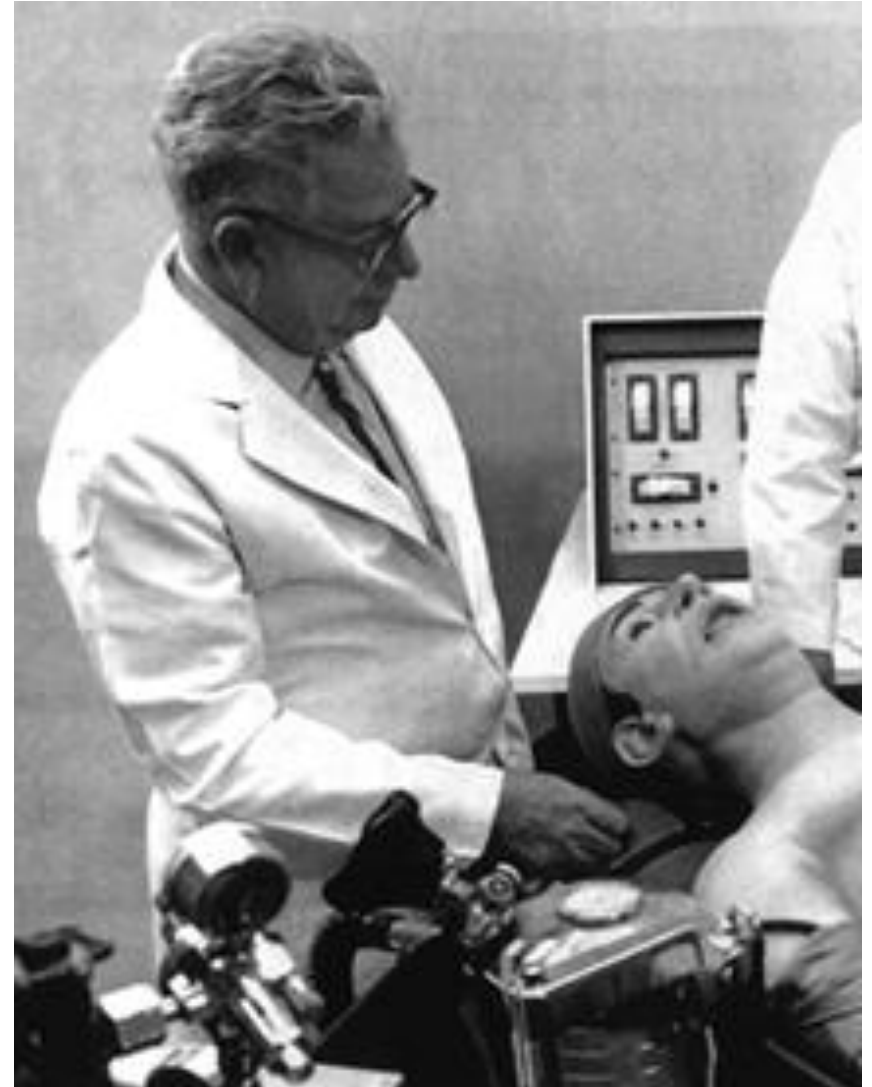
Resusci Anne



- Led the way in standardising resuscitation training
- Developed by Laerdal in the 60's
- Torso
- Intubation + CPR

Sim-One

- Developed by Dr. Stephen Abrahamson in 1963
- Professor Emeritus in University of California
- Assisted by chief anaesthetist, Dr. Samuel Denson
- Sim-One had a heartbeat and pulse as well as lifelike skin and teeth



MEDICINE | *Sim does almost everything—except say 'ouch'*



Among the trickiest tasks an anesthesiologist faces is getting a patient ready for surgery. The job may involve administering oxygen, injecting drugs, perhaps even inserting a stiff tube into the patient's windpipe, all the while keeping an eye on his pulse and respiration.

To speed the process of teaching apprentice anesthesiologists this difficult procedure, Professors Stephen Abrahamson and J. S. Denison of the University of Southern California Medical School, working with Aerojet-General Corp., have devised a marvelous **mechanical man**. Dubbed Sim One, it simulates a real patient in almost every respect except the ability to sit up on the operating table and say "ouch!" Controlled by computer, the plastic-skinned dummy has a heartbeat, breathes, tries to cough the air tube up out of its windpipe and even vomits. Sim is already serving students from Los Angeles County Hospital as a deathproof patient. Although still only a prototype and not in production, when Sims are available in quantity they may serve to reduce the time needed to train an anesthesiologist from eight years to six.

With a blood-pressure cuff on Sim's right arm and an electrocardiogram lead taped over its heart, a student doctor prepares to inject anesthetic into the dummy's left arm. Below, another resident doctor bends to check the dilation of Sim's pupils after inserting a tube in its windpipe.



Deathproof Patient for Student Doctors

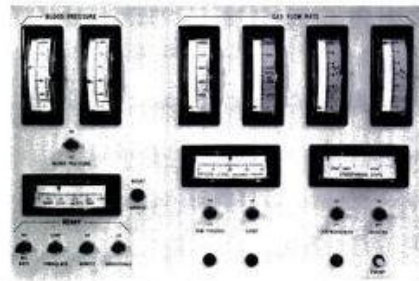
CONTINUED



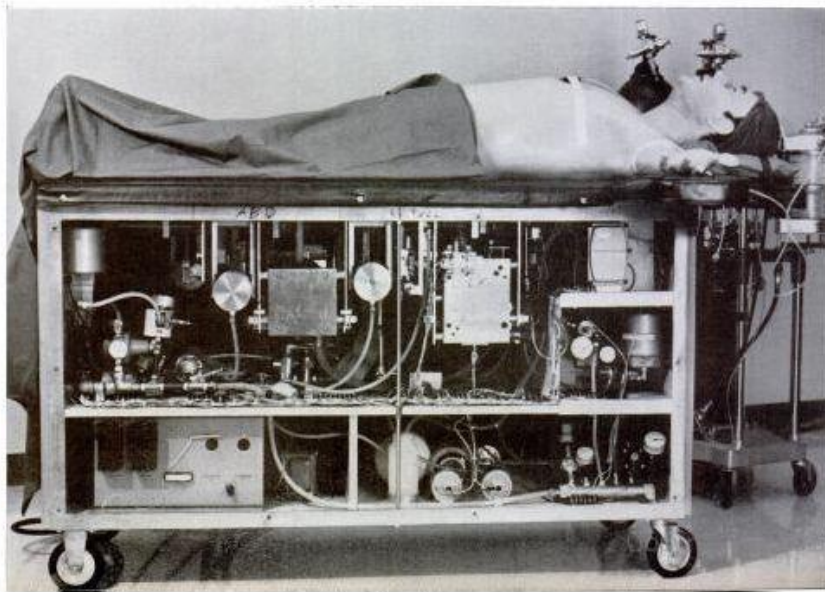
The dummy's amazingly lifelike eyes not only open and close realistically but the pupils also dilate (above left) and contract (above right). To the anesthesiologist, eye dilation is a danger signal, indicating that the patient must be given either more oxygen or less drug. Using the control panel (right), the instructor can monitor both the student's actions and Sim's reactions. The side view below shows what makes the device work—a clutter of electronic gear jammed under the operating table. The boxlike housings immediately below Sim contain the control

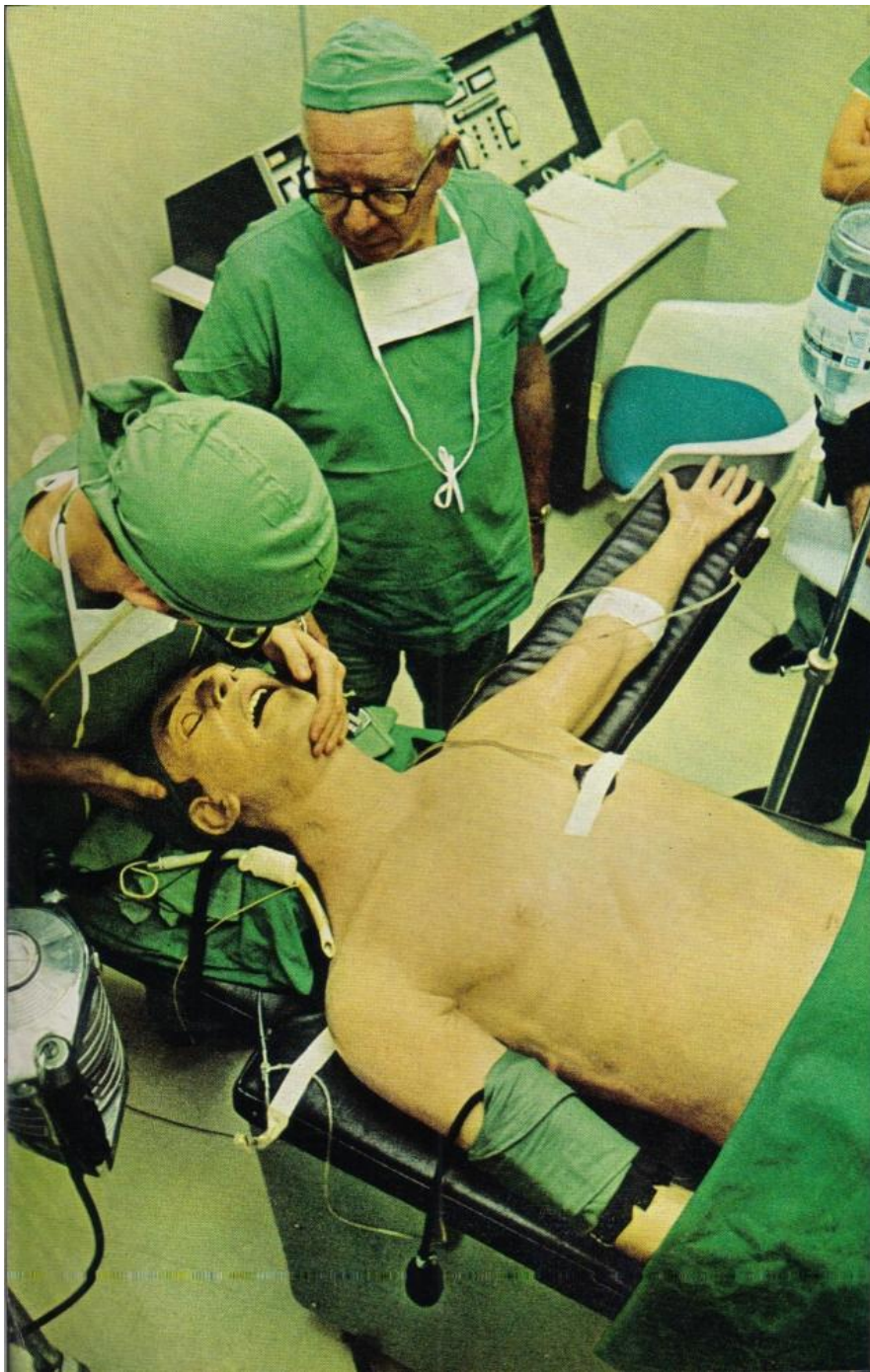
centers for the abdomen and lungs.

To duplicate actual conditions often encountered in an operating room, the instructor can try to confound the student with problems such as coughing or spasms. He can also suspend the proceedings at any moment if he wants to discuss a point. Whereas with a live patient a difficult procedure need—and can—be done only once, Sim makes it possible for the student to practice a process dozens of times. The inventors are already looking ahead: future Sims will bleed, perspire, salivate and turn blue when short of oxygen.



It can get sick on command 30 times a day





- novice anaesthetist learning the skill of endotracheal intubation
- Since then, anaesthetics has been at the forefront of simulator development

Simulation

- Simulation is a person, device or set of conditions that tries to present problems authentically
- The student or trainee is required to respond to the problems as he/she would under normal circumstances
- Simulation is a technique, not a technology.....

Simulation continuum



Classroom

Skills development, transfer and maintenance

Workplace

Novice healthcare
practitioner

Expert healthcare
Practitioner

Patient safety

Why use simulation ?

- Decreases risk to patients
- Ensures learning outcomes are addressed
- Enables deliberate practice
- Facilitates standards setting
- Creation of relevant simulations when required
- Immersion in learning tasks
- Safe environment to learn from errors
- Enables tasks to be structured in staged learning chunks

Why use simulation?

- Creates an almost “real situation”
- Promotes teamwork
- Putting theory into practice
- Improves patient care and safety

- Worldwide there have been major changes in medical education, both undergraduate and postgraduate, which recognise the need to incorporate all aspects of a doctor's practice, including knowledge, skills and expected attitudes with an outcomes based framework

Simulator types

Simulator types

- Part task trainers
- Computer based systems
- Virtual reality & haptic systems
 - Precision placement
 - Simple manipulation
 - Complex manipulation
- Integrated simulators
 - Instructor driven
 - Model driven
- Simulated patients
- Simulated environments

Examples

- Venepuncture arms
- Anaesthesia / haemodynamic simulator
- Venpuncture trainer
- Endoscopy trainer
- Complex surgical procedures
- SimMan
- METI
- Simulated wards / operating rooms etc

Anaesthetic Simulation



- Linked the simulator to a programme on anaesthesia crisis resource management
- Heralded the start of simulation in teaching technical and non-technical skills

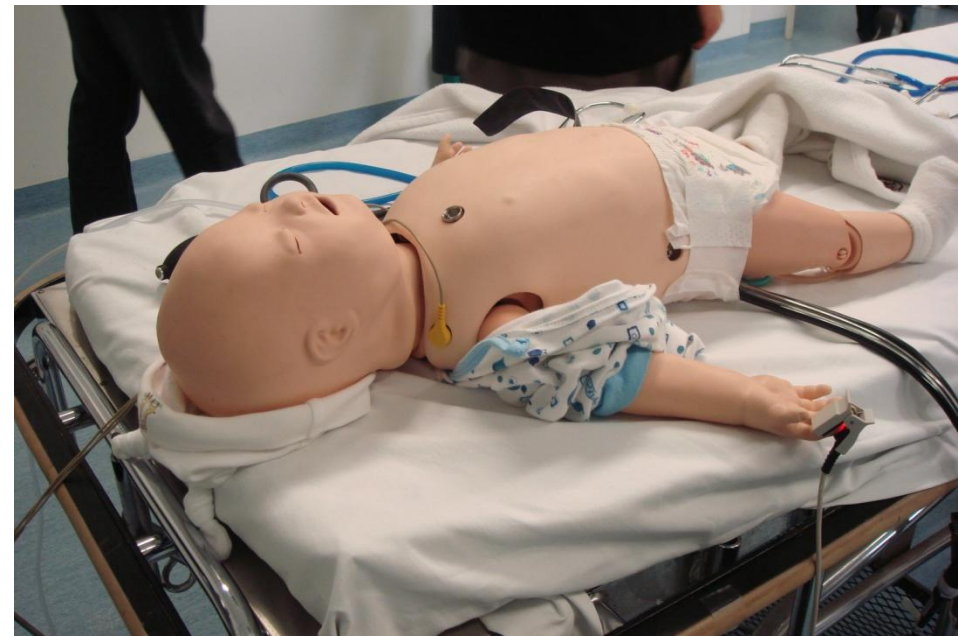
Dr. Howard Barrows



- American neurologist
- Pioneer of
 - Problem Based Learning (PBL)
 - Simulated patients in medical education
 - Standardised patients in medical teaching

Sim Baby





Scenario set up

Sim Baby Demonstration



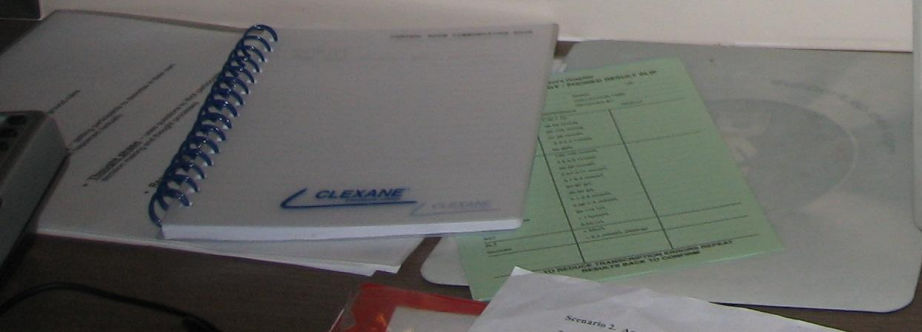
Sim Baby allows....

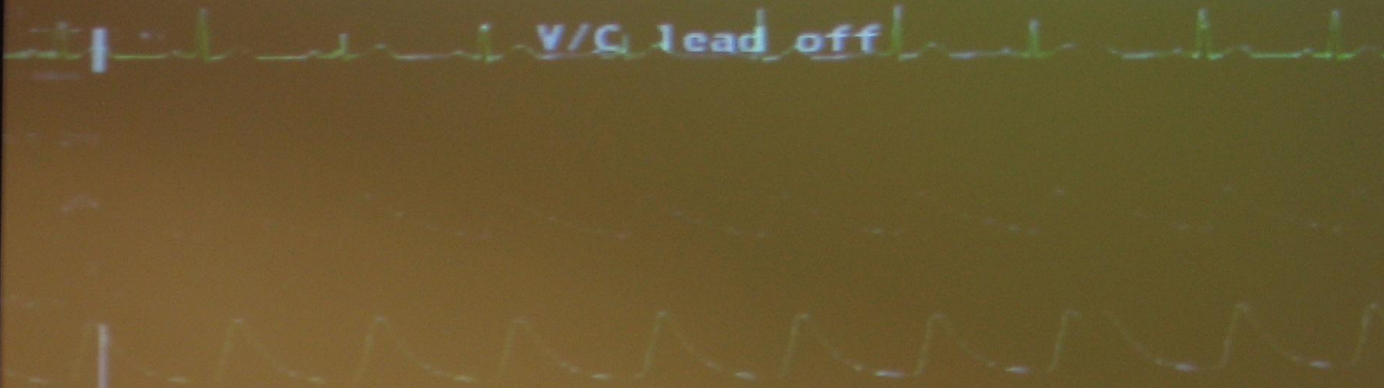
- Orientation of Registrars (SHOs)
- Neonatal resuscitation training
- Regular practice of codes
- Procedural skills
- Intubation + ventilation skills
- Teamwork
- Communication skills

Sim Man on “the ward”



Control room





HR 69

SpO2 106/44

MAP 99

Apnea: deactivated
ET 0 FT
RR 0 APN

Screen view

Apnea

11-12	Balance	HR	SpO2	MAP	RR	APN

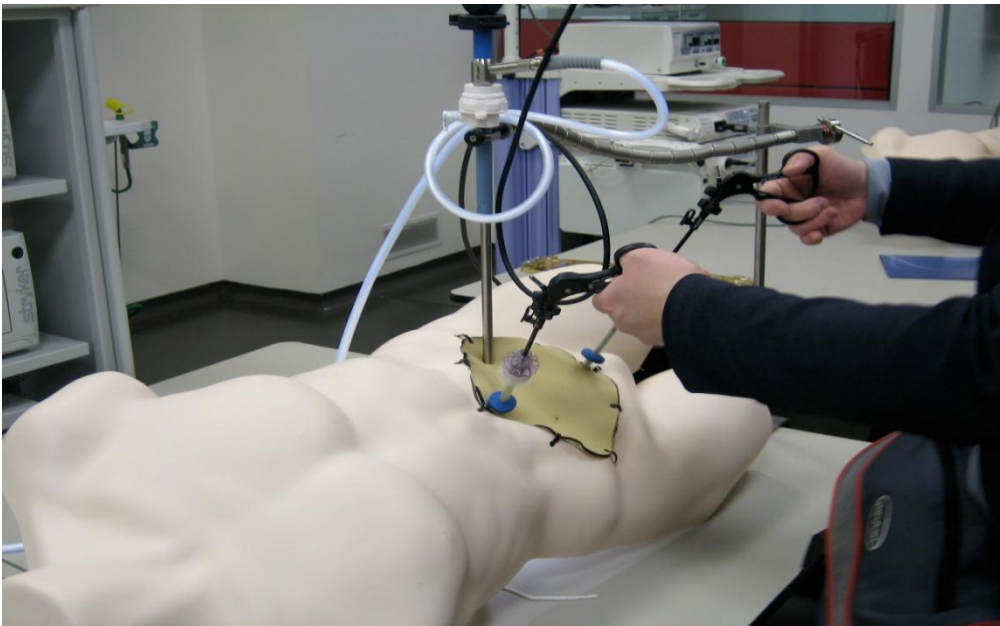
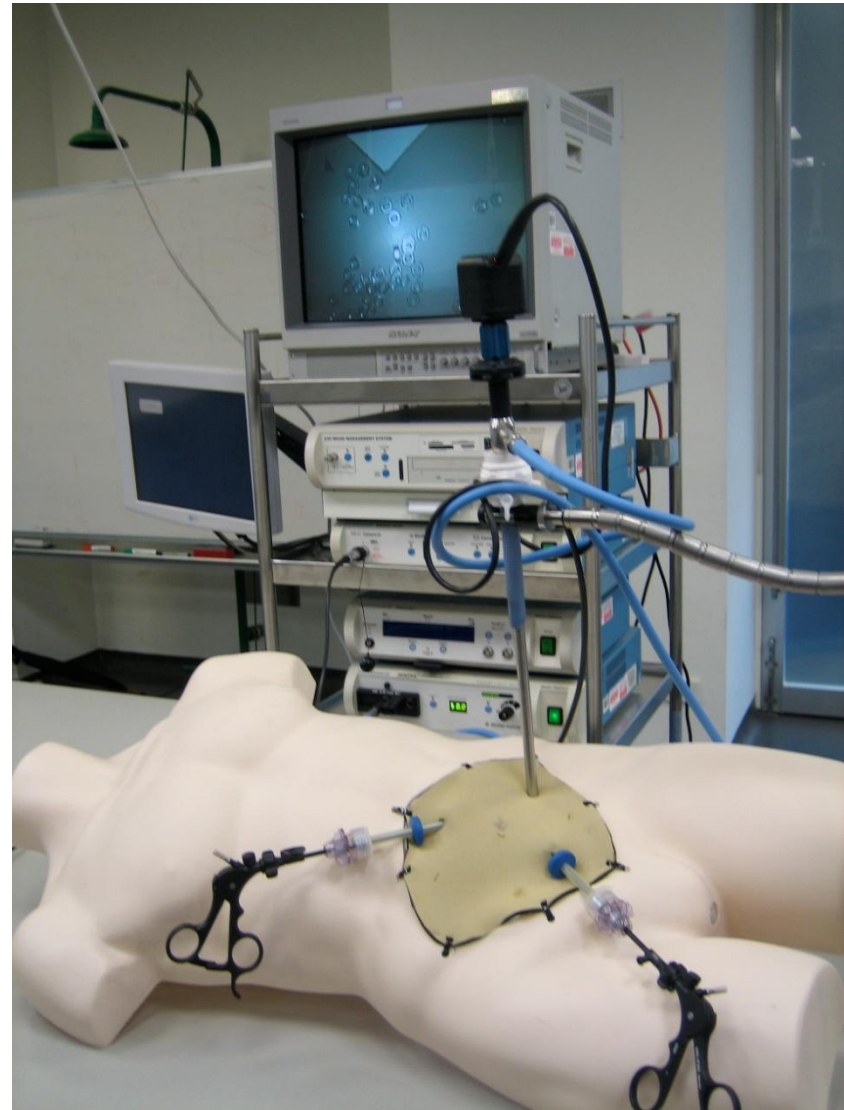
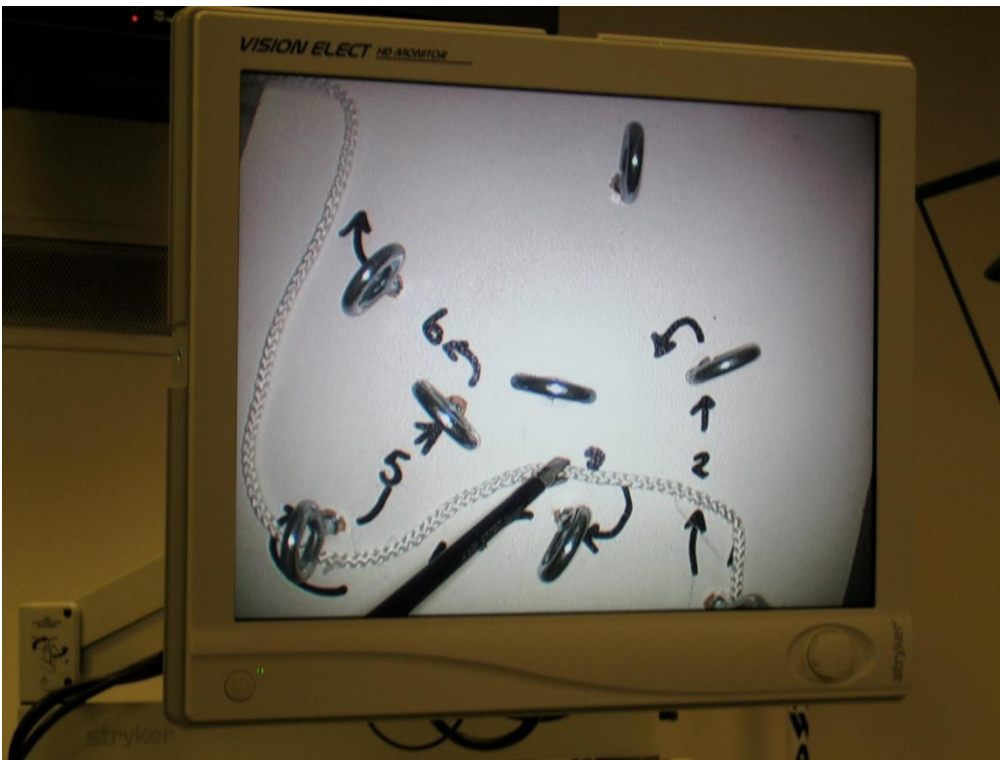


Debriefing room

Surgical simulation lab

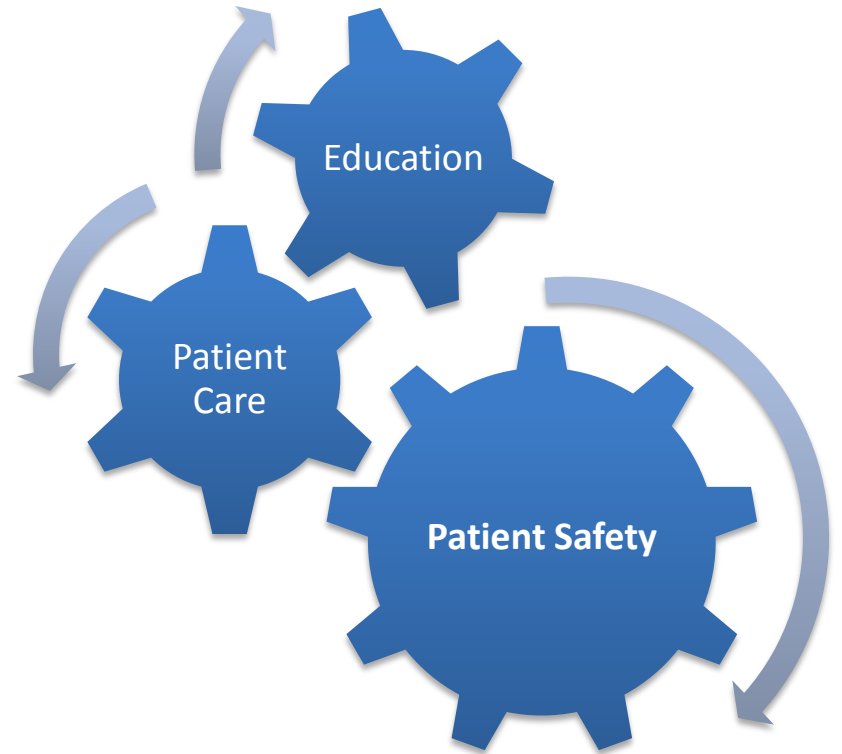


Surgical skills training lab



Overview

- Introduction
- Medical Education
- Simulation
- **Teamwork**
- Human factors



Simulation + Teamwork

- Tim Draycott – Obstetrician, Southmead Hospital, Bristol, UK
- “Training + Working in Teams improves team working”
 - 50% reduction in HIE + low Apgars
 - 70%reduction in shoulder dystocia
 - Lowest stillbirth rate in UK



Crofts, Draycott et al 2006

Simulation + Teamwork

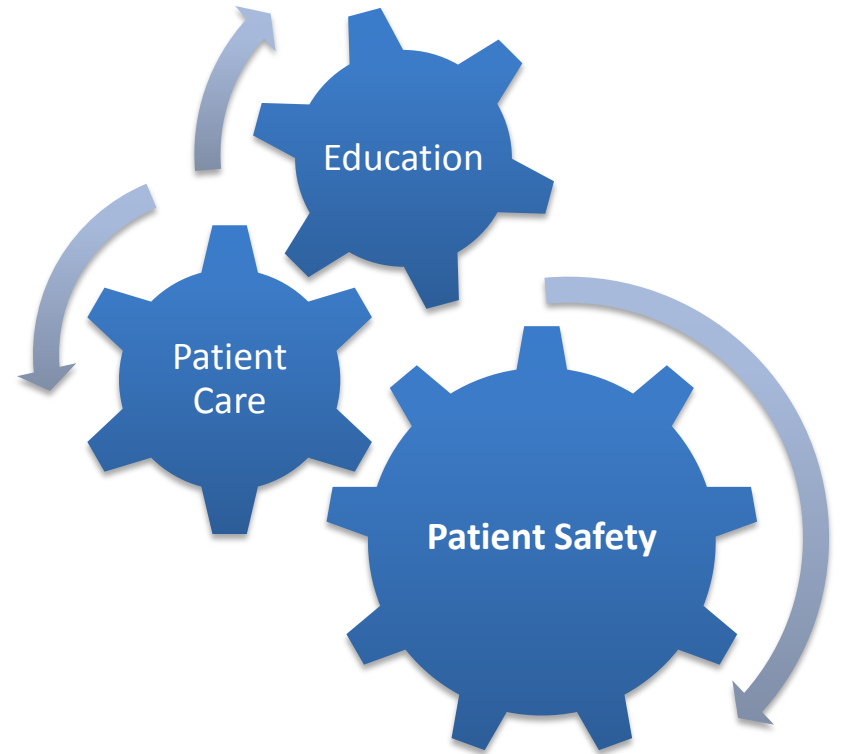
- Copenhagen
 - 45% reduction in sick leave in midwives
- Israel
 - 23% reduction in adverse outcomes
- Melbourne
 - introduction of Medical Emergency Team (MET calls)
 - reduction in cardiac arrests from 90 – 12 per annum



Crit Care Med 2008 Feb36(2):634-6

Overview

- Introduction
- Medical Education
- Simulation
- Teamwork
- **Human factors**

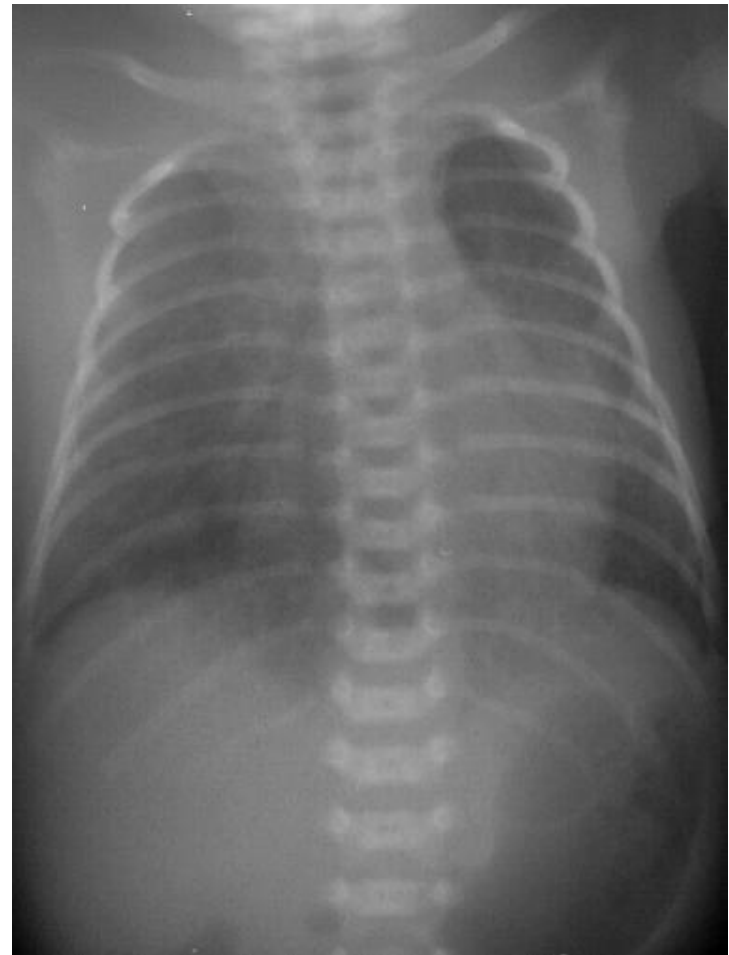


Human factors

- ½ million patients harmed each year as a result of human factors in the workplace (Australia)
- Areas of Errors:
 - 1. Cognitive errors
 - 2. Personal conditions
 - 3. Skill based errors
 - 4. Violations

Example of human error.....

- Baby JY
- Ex 28/40
- Day 5 sudden cardiorespiratory arrest
- PICC “migrated down into right atrium, right ventricle, through pericardium & into pericardial sac, TPN collection ensued....”



Example of human error.....

- Root cause analysis
- Sequence of events
- Radiographs re-examined
- Checklist drawn up for all future central line / PICC insertion

PACIFIC HOSPITAL
1000 10th Street, Tacoma, WA 98402

Central Line Procedural Checklist

Indication: To document procedural practices related to insertion technique for CVP lines, dialysis access ports, and central lines (including PICC).

Type of catheter:

<input type="radio"/> Central Line	Location _____
<input type="radio"/> Dialysis Catheter	Location _____
<input type="radio"/> PICC Line	Location _____
<input type="radio"/> Thoracentesis	Location _____
<input type="radio"/> Paracentesis	Location _____
<input type="radio"/> Tissue/Bone Marrow Biopsy	Location _____
<input type="radio"/> Other:	

Is this a NEW line: YES NO
Is the procedure: Elective Re-position Emergent Other: _____

State reason for placing in femoral area:

Procedural Checklist

	YES	YES (After Reminder)
Safety Practice		
Before procedure, did the provider:		
<input type="checkbox"/> Cleanse hands? (ASK, if unsure)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Prep procedure site using aseptic technique? With large chlorop. Applicator.	<input type="checkbox"/>	<input type="checkbox"/>
<i>*30 seconds for dry site (esp. subclavian, Jugular)</i>		
<i>**2 minutes for moist site (esp. femoral)</i>		
<input type="checkbox"/> Use large drape to cover patient in sterile fashion?	<input type="checkbox"/>	<input type="checkbox"/>
During procedure, did the provider:		
<input type="checkbox"/> Wear sterile gloves during catheter insertion?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Mask, and sterile gown?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Maintain sterile field?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Use ultrasound/Sonosite if appropriate?	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Did assisting physician follow the same precautions? (hand washing, mask, gloves, gown)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Did all staff in the room wear a mask?	<input type="checkbox"/>	<input type="checkbox"/>
After the procedure:		
<input type="checkbox"/> Was sterile technique maintained when applying dressing?		
<input type="checkbox"/> Was dressing dated?		
Name of Physician/Surgeon: _____	Name of Assistant _____	
Name of RN (auditor): _____	Today's Date: ____-____-____	
Placement confirm by X-ray by Physician <input type="checkbox"/>	ADDRESSOGRAPH	
_____, MD/DO		
Signature _____		

PLEASE RETURN COMPLETED FORM TO: Infection Control;

Simulation + Human Factors

- Simulation facilitates:
 - Better communication / teamwork
 - Situational awareness
 - Organisational safety
 - Strategy development
 - Crisis / Crew Resource Management (CRM)
 - Changing the culture
- Patient Care + Patient safety

Theoretical basis of simulation

- Number of theories of learning & instruction underpin the design and delivery of the simulated clinical experience:
 - Behaviourism
 - Cognitivism
 - Social constructivism
 - Situated learning & cognitive apprenticeship
 - Experiential learning

Feedback

- Essential
- Closing the learning loop
- Intrinsic / extrinsic
- Learner
 - Clearer about learning outcomes
 - Areas of performance clarified
 - Raises self – awareness
 - Reinforces good practice
 - Behaviour modification

Effective simulation

- Understand the learner
- Create scenarios based on learning outcomes
- Measurement of performance
- Feedback
- Guide the practice
- Synergy between content experts and process experts
- Evaluate the programme

Simulation - bridging the gap

