Simulation training on the principles of evidence-based medicine: creating programs for the accreditation of residents

Lars Konge, MD PHD
Professor of Medical Education
Copenhagen Academy for Medical Education & Simulation,
Capital Region and University of Copenhagen
Denmark

Simulationscenter Rigshospitalet

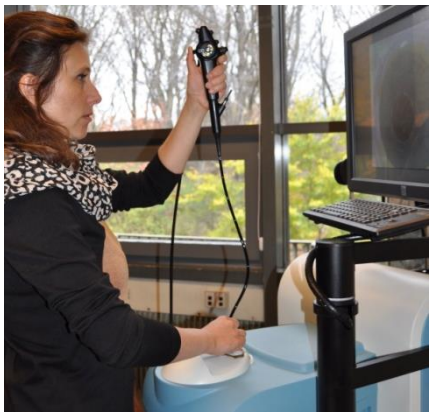
Opened in 2011

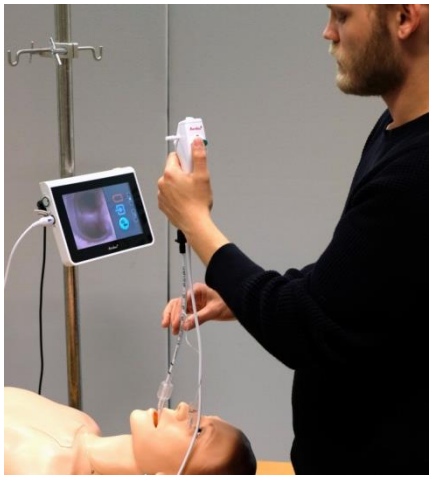
Copenhagen Academy for Medical Education and Simulation

http://vimeo.com/109224706

MINIMALLY INVASIVE PROCEDURES

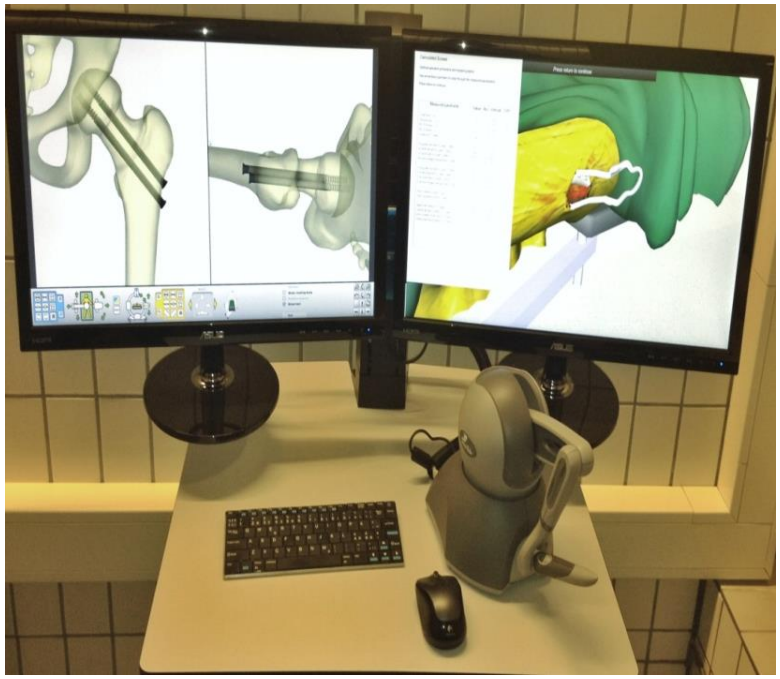
- Laparoscopy
- Arthroscopy
  - Knee
  - Shoulder
- Laparoscopic suturering
- Thoracoscopic surgery





ENDOSCOPIC PROCEDURES

- Broncoscopy
- Flexible optical intubation
- Gastroscopy
- Colonoscopy
- Cystoscopy
- Hysteroscopy
- Vaginal ultrasound scanning
- Endobronchial ultrasound (EBUS)



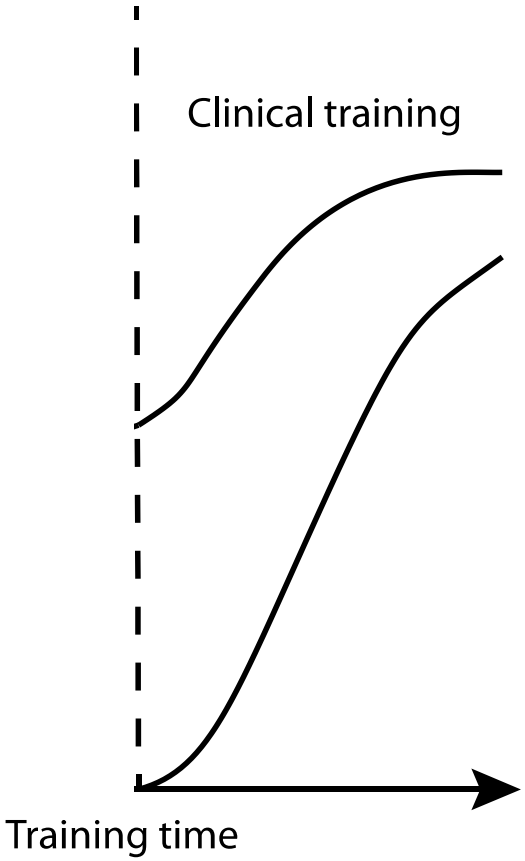
OPEN SURGERY

- Hip surgery
- Ear surgery
  - temporal bone drilling
- Eye surgery
  - Cataract
  - Vitreoretinal surgery
- Basic surgical techniques

VISION

You practice clinical procedures in a simulation based setting before performing procedures in patients

We want to create the "pre-trained novice" that starts his/her learning curve on a higher level



In my talk I will answer the following questions:

- Why should we use simulation training?
- How can we create evidence-based training programs?
- Why should we demand accreditation?
- How can we implement accreditation?

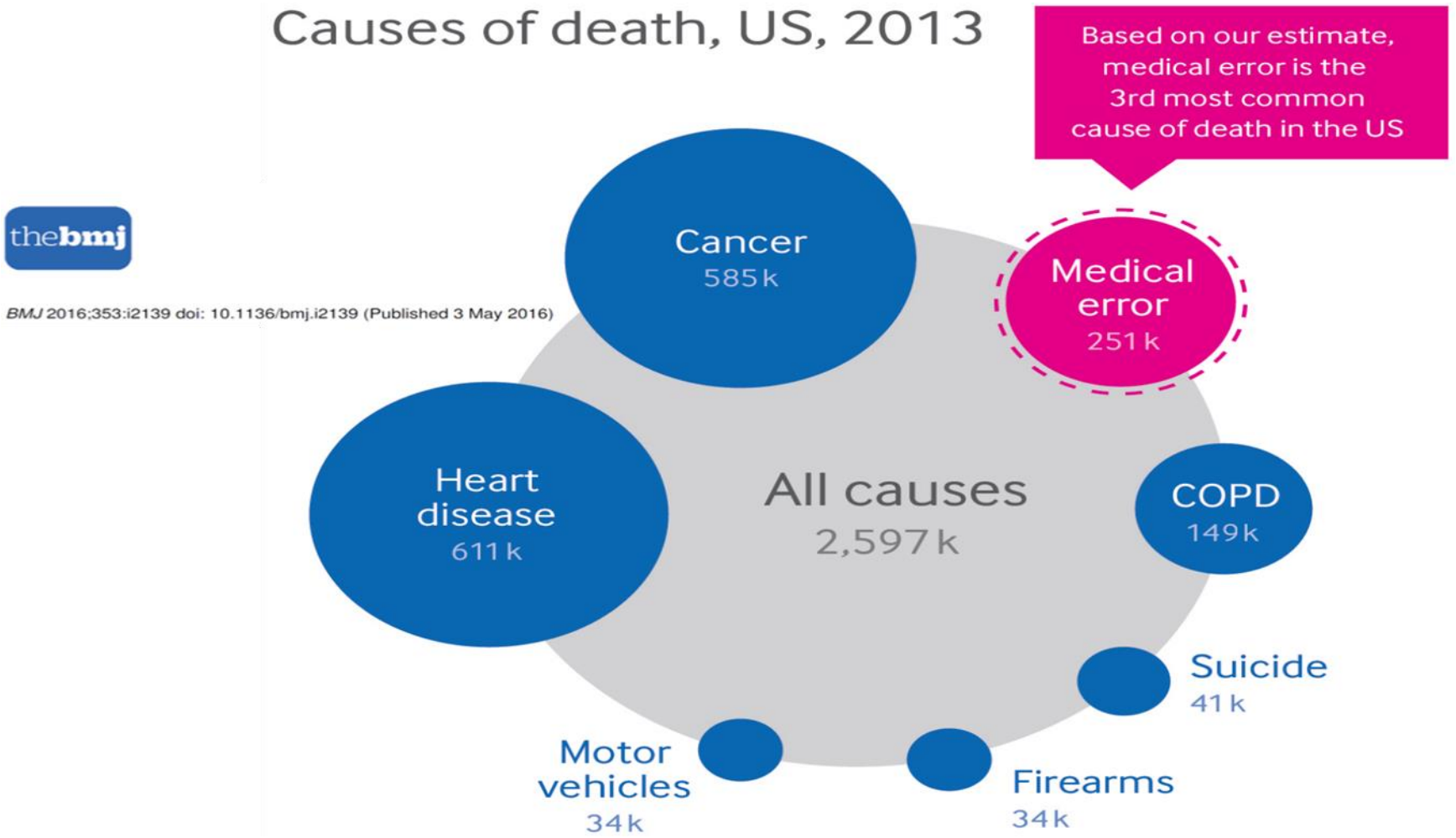
- **Why should we use simulation training?**
- How can we create evidence-based training programs?
- Why should we demand accreditation?
- How can we implement accreditation?

Never change a winning team

- We have trained doctors for many centuries
- Why should we change the way we do that?

Because we are not winning!

- The traditional way of training doctors results in many problems


Causes of death, US, 2013
Based on our estimate, medical error is the 3rd most common cause of death in the US
thebmj
BMJ 2016;353:i2139 doi: 10.1136/bmj.i2139 (Published 3 May 2016)
Cancer
585k
Medical error
251k
Heart disease
611k
All causes
2,597k
COPD
149k
Suicide
41k
Motor vehicles
34k
Firearms
34k

Trainee Participation Is Associated With Adverse Outcomes in Emergency General Surgery

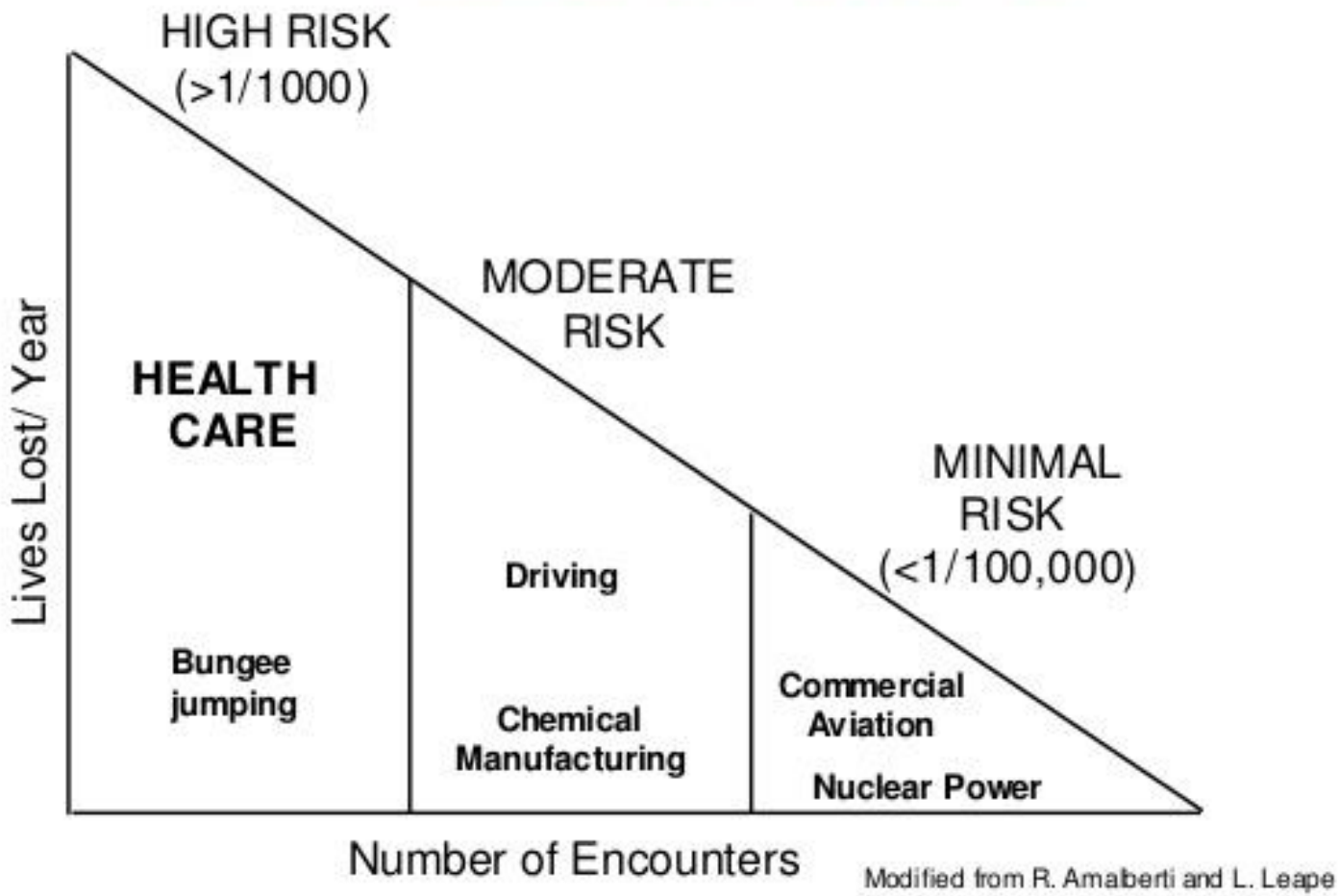
An Analysis of the National Surgical Quality Improvement Program Database

George Kasotakis, MD, MPH, Aliya Lakha, BS,† Beda Sarkar, MD, PhD,* Hiroko Kunitake, MD, MPH,* Nicole Kissane-Lee, MD, EdM,* Tracey Dechert, MD,* David McAneny, MD,* Peter Burke, MD,* and Gerard Doherty, MD**

Results: The most common procedures in the matched cohort (n = 83,790) were appendectomy (39.9%), exploratory laparotomy (8.8%), and adhesiolysis (6.6%). Trainee participation is independently associated with intra- and postoperative events, wound, pulmonary, and venous thromboembolic complications, and urinary tract infections.

Conclusions: Trainee participation is associated with adverse outcomes in emergency general surgery procedures.

Comparison of Risk in Health Care With Other Industries



Modified from R. Amalberti and L. Leape

"Given their education curriculum, a surgeon would rather be the first passenger of a pilot than a pilot the first patient of a surgeon"

Wentink, 2003, Surg Endoscopy

BMJ
2009;338:1802-07

Effect of virtual reality training on laparoscopic surgery: randomised controlled trial

Christian R Larsen, Jette L Soerensen, Teodor P Grantcharov, Torur Dalsgaard, Lars Schouenborg, Christian Ottosen, Torben V Schroeder and Bent S Ottesen

20 Gyn specialist registrars with no experience of advanced laparoscopy were randomised to VR training (n=11) until expert level or to standard education (n=9).

Outcome meassure: Technical performance at first live lap. salpingectomy rated by two blinded raters

Outcome measure	Simulator trained group (n=11)	Control group (n=10)	P value*
Surgical performance:			
Total score (points)	33 (25-39; 32-36)	23 (21-28; 22-27)	<0.001
% reaching ≥30 points	82	0	
Operation time:			
Total time (minutes)	12 (6-24; 10-14)	24 (14-38; 20-29)	<0.001

State of the Evidence on Simulation-Based Training for Laparoscopic Surgery

A Systematic Review

Benjamin Zendejas, MD, MSc, Ryan Brydges, PhD,†‡ Stanley J. Hamstra, PhD,§ and David A. Cook, MD, MHPE¶||*

Ann Surg 2013;257: 586–593

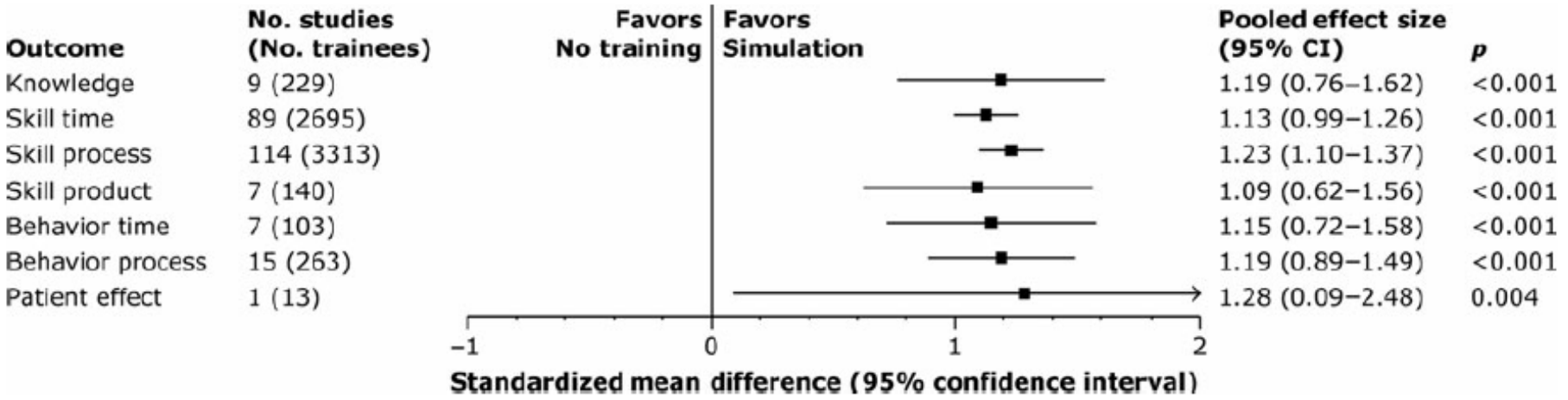


FIGURE 2. Simulation versus no intervention for laparoscopic surgery training.

10,903 articles screened
=> 219 eligible studies enrolling 7138 trainees; 91 (42%) were RCTs.

Systematic review

Systematic review of skills transfer after surgical simulation-based training

Dawe et al. BrJSurg 2014; 101: 1063–1076

Results: Twenty-seven randomized clinical trials and seven non-randomized comparative studies were included. Fourteen studies investigated laparoscopic procedures, 13 endoscopic procedures and seven other procedures. These studies provided strong evidence that participants who reached proficiency in simulation-based training performed better in the patient-based setting than their counterparts who did not have simulation-based training. Simulation-based training was equally as effective as patient-based training for colonoscopy, laparoscopic camera navigation and endoscopic sinus surgery in the patient-based setting.

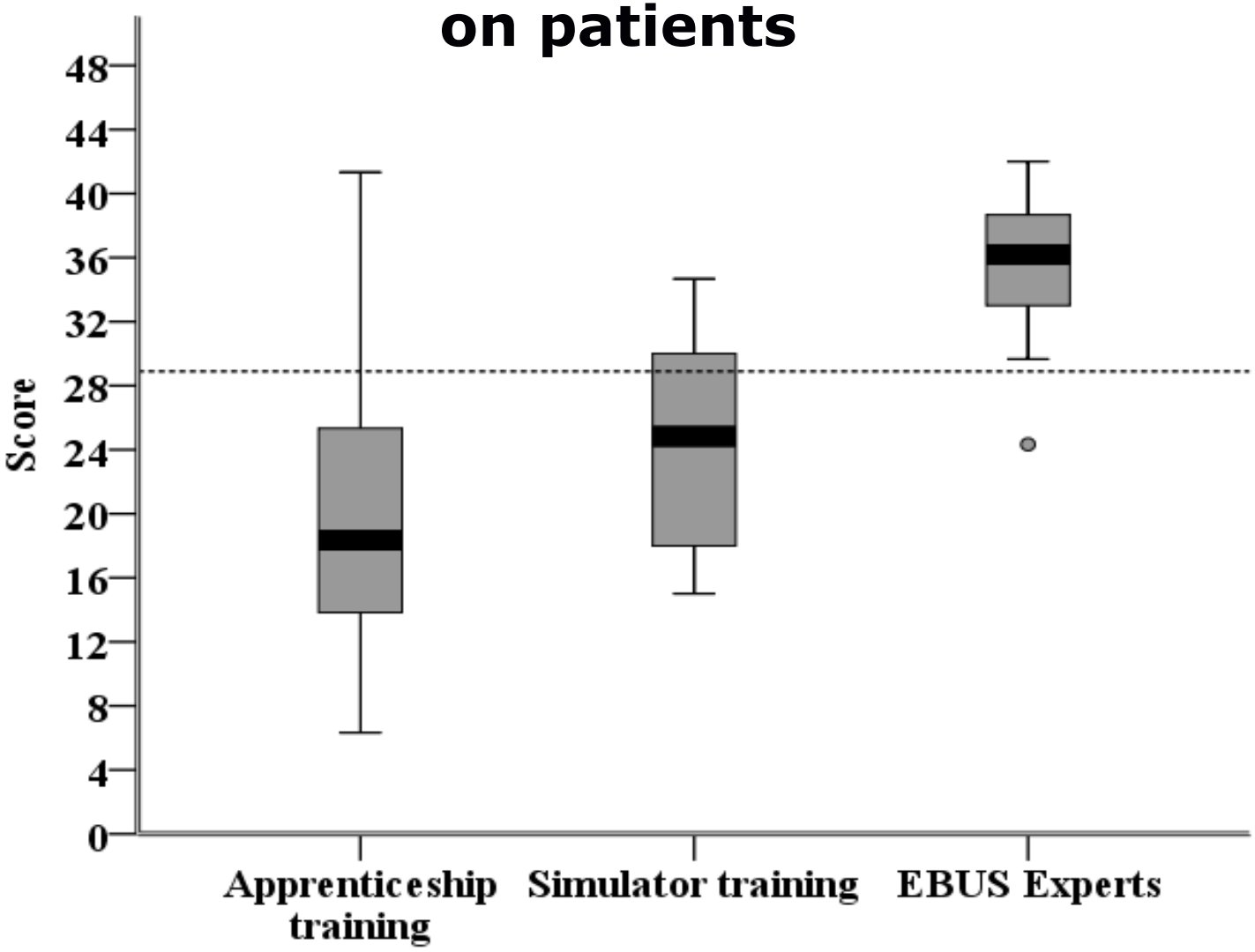
The 15 laparoscopic procedures/tasks studied were

- laparoscopic cholecystectomy,
- laparoscopic tubal ligation,
- salpingectomy,
- Extraperit. inguinal hernia repair,
- intracorporeal knot suturing during Nissen fundoplication,
- right hemicolectomy and
- camera navigation.

Thirteen endoscopic studies included

- colonoscopy,
- oesophogastroduodenoscopy,
- cystourethroscopy,
- flexible transnasal laryngoscopy,
- endoscopic sinus surgery and
- TURP

Simulation can even be more effective than training on patients



Konge L et al. Simulator training for endobronchial ultra-sound: a randomised controlled trial. Eur Respir J. 2015

And simulation is cheaper!

Cost Savings From Reduced Catheter-Related Bloodstream Infection After Simulation-Based Education for Residents in a Medical Intensive Care Unit

Elaine R. Cohen, BA;
Joe Feinglass, PhD;
Jeffrey H. Barsuk, MD;
Cynthia Barnard, MBA, MSJS;
Anna O'Donnell, RN, BSN;
William C. McGaghie, PhD;
Diane B. Wayne, MD

Introduction: Interventions to reduce preventable complications such as catheter-related bloodstream infections (CRBSI) can also decrease hospital costs. However, little is known about the cost-effectiveness of simulation-based education. The aim of this study was to estimate hospital cost savings related to a reduction in CRBSI after simulation training for residents.
Methods: This was an intervention evaluation study estimating cost savings related to a simulation-based intervention in central venous catheter (CVC) insertion in the Medical Intensive Care Unit (MICU) at an urban teaching hospital. After residents completed a simulation-based mastery learning program in CVC insertion, CRBSI rates declined sharply. Case-control and regression analysis methods were used to estimate savings by comparing CRBSI rates in the year before and after the intervention. Annual savings from reduced CRBSIs were compared with the annual cost of simulation training.
Results: Approximately 9.95 CRBSIs were prevented among MICU patients with CVCs in the year after the intervention. Incremental costs attributed to each CRBSI were approximately $82,000 in 2008 dollars and 14 additional hospital days (including 12 MICU days). The annual cost of the simulation-based education was approximately $112,000. Net annual savings were thus greater than $700,000, a 7 to 1 rate of return on the simulation training intervention.
Conclusions: A simulation-based educational intervention in CVC insertion was highly cost-effective. These results suggest that investment in simulation training can produce significant medical care cost savings.
(*Sim Healthcare* 5:98–102, 2010)

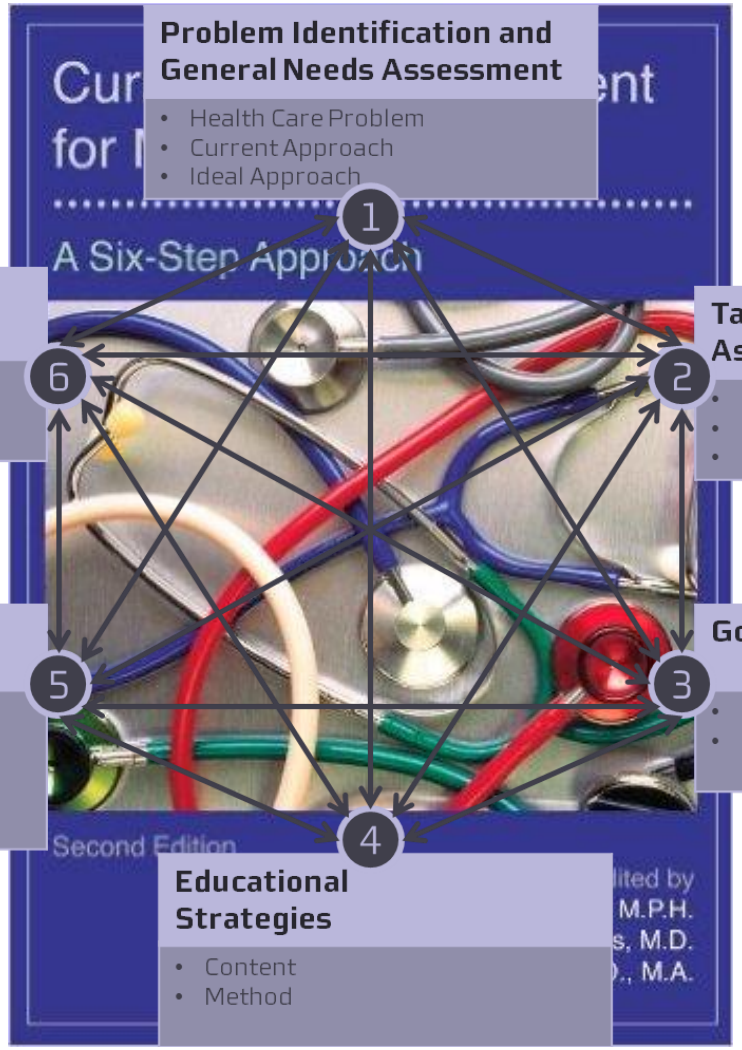
Key Words: Simulation, Education, Cost-effectiveness, Infection, Intensive care unit.

Simulation is safer, more effective, and cheaper than training on patients

WHY DON'T WE USE IT MORE?

Buying the simulators is NOT enough

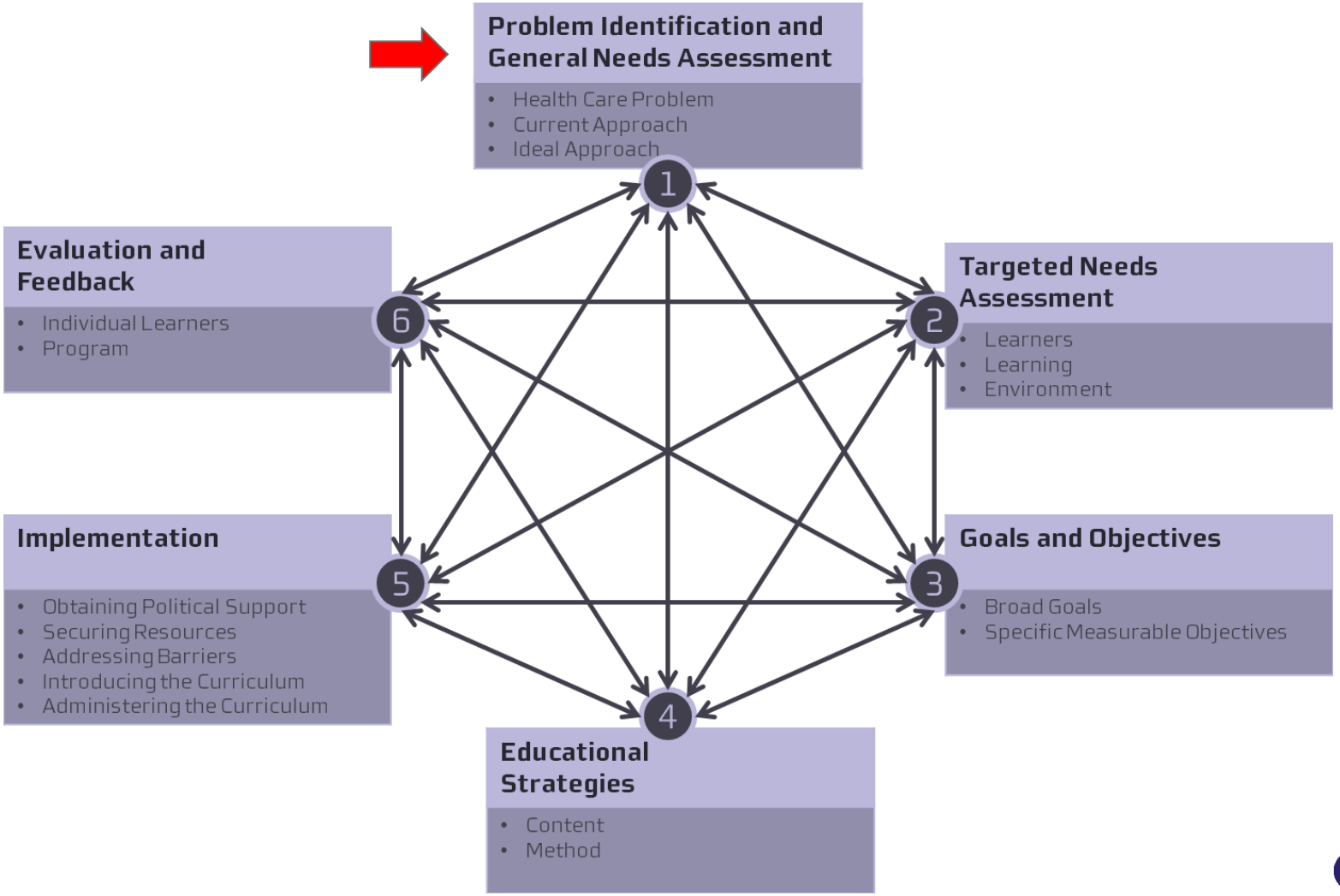
We need a complete curriculum



- Why should we use simulation training?
- **How can we create evidence-based training programs?**
- Why should we demand accreditation?
- How can we implement accreditation?

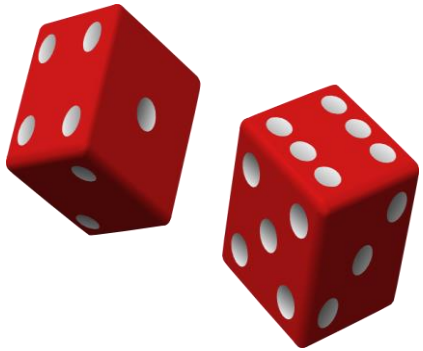
Let us start from the top

General Needs Assessment



Planning training programs should NOT be based on

- available simulators
- a bright idea
- coincidence



Start by asking what your clinicians want

That will put smiles on their faces

The Danish National Needs Assessment Program

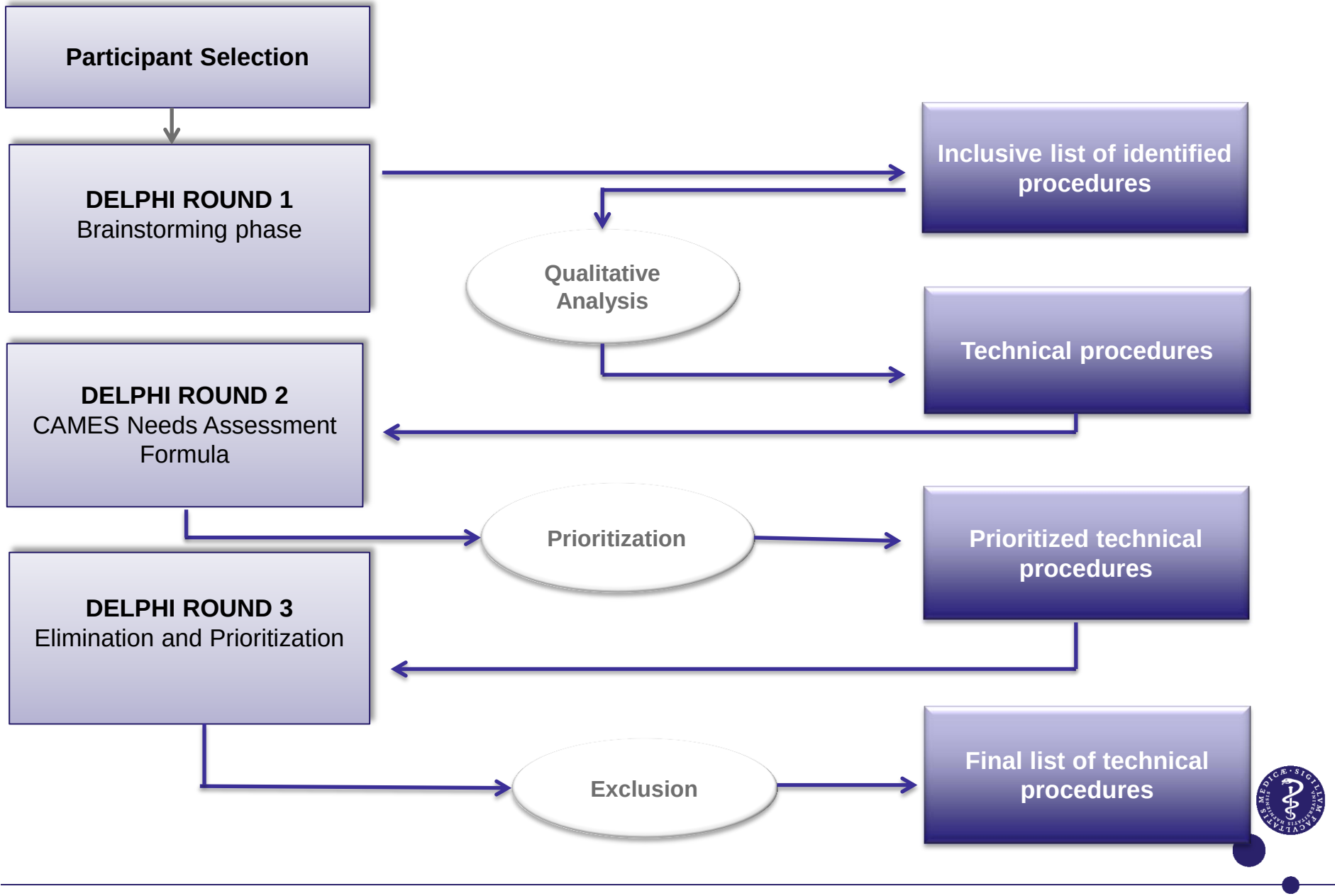
Four larger Simulation centres

38 specialities

Identify Key Opinion Leaders

Delphi process

Prioritized lists of all clinical procedures that clinicians believe should be practiced in a simulation-based environment


Participant Selection
DELPHI ROUND 1
Brainstorming phase
Inclusive list of identified procedures
Qualitative Analysis
Technical procedures
DELPHI ROUND 2
CAMES Needs Assessment Formula
Prioritization
Prioritized technical procedures
DELPHI ROUND 3
Elimination and Prioritization
Exclusion
Final list of technical procedures

DELPHI ROUND 2
CAMES Needs Assessment Formula

NEED = Frequency x N x Impact x Feasibility	
Frequency	number of procedures performed annually
N	number of physicians that should be able to perform the procedure
Impact	discomfort/risk if the procedure is performed by an inexperienced doctor
Feasibility	feasibility of learning the procedure in a simulation-based environment.

Specialty	Status
Pulmonary Medicine	Published (Respiration)
Vascular Surgery	Published (EJVES)
Urology	Published (Scand J of U)
Opthalmology	Under revision (Acta Opthal)
Radiology	Submitted (Eur. Radiology)
Orthopedics	Manuscript under preparation
Ear, nose, and throat	Manuscript under preparation
Cardiology	Manuscript under preparation
Anaesthesiology	Manuscript under preparation
Obstetrics & Gynecology	Data Collection
Paediatrics	Data Collection
Plastic Surgery	Data Collection
Thoracic Surgery	Data Collection

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Items: 3

1. Identifying content for simulation-based curricula in urology: a national needs assessment.

Nayahangan LJ, Bølling Hansen R, Gilboe Lindorff-Larsen K, Paltved C, Nielsen BU, Konge L.
Scand J Urol. 2017 Jul 26:1-7. doi: 10.1080/21681805.2017.1352618. [Epub ahead of print]
PMID: 28743217
Similar articles

2. A National Needs Assessment to Identify Technical Procedures in Vascular Surgery for Simulation Based Training.

Nayahangan LJ, Konge L, Schroeder TV, Paltved C, Lindorff-Larsen KG, Nielsen BU, Eiberg JP.
Eur J Vasc Endovasc Surg. 2017 Apr;53(4):591-599. doi: 10.1016/j.ejvs.2017.01.011. Epub 2017 Mar 1.
PMID: 28258884
Similar articles

3. Identifying Technical Procedures in Pulmonary Medicine That Should Be Integrated in a Simulation-Based Curriculum: A National General Needs Assessment.

Nayahangan LJ, Clementsen PF, Paltved C, Lindorff-Larsen KG, Nielsen BU, Konge L.
Respiration. 2016;91(6):517-22. doi: 10.1159/000446926. Epub 2016 Jun 9.
PMID: 27287472
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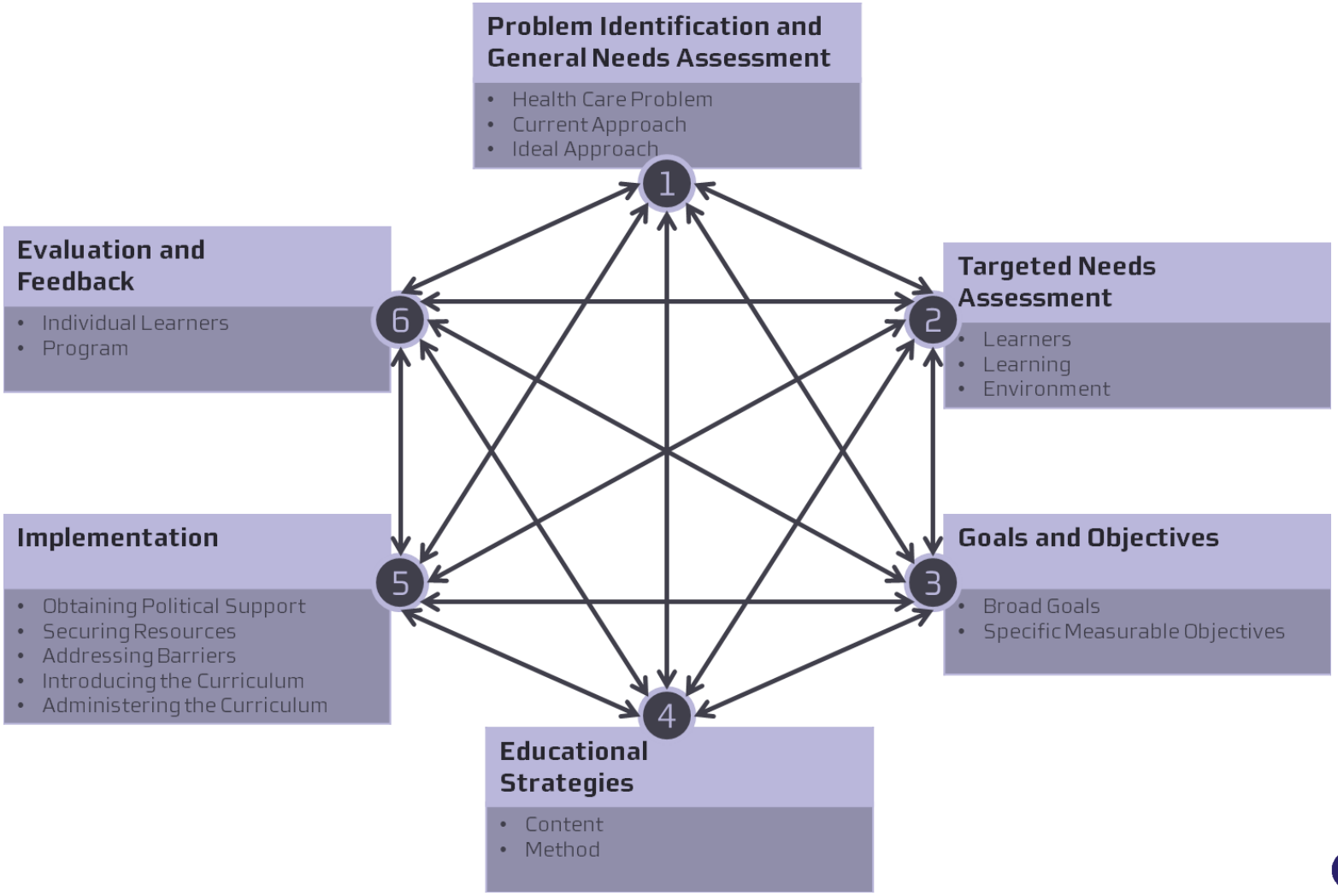
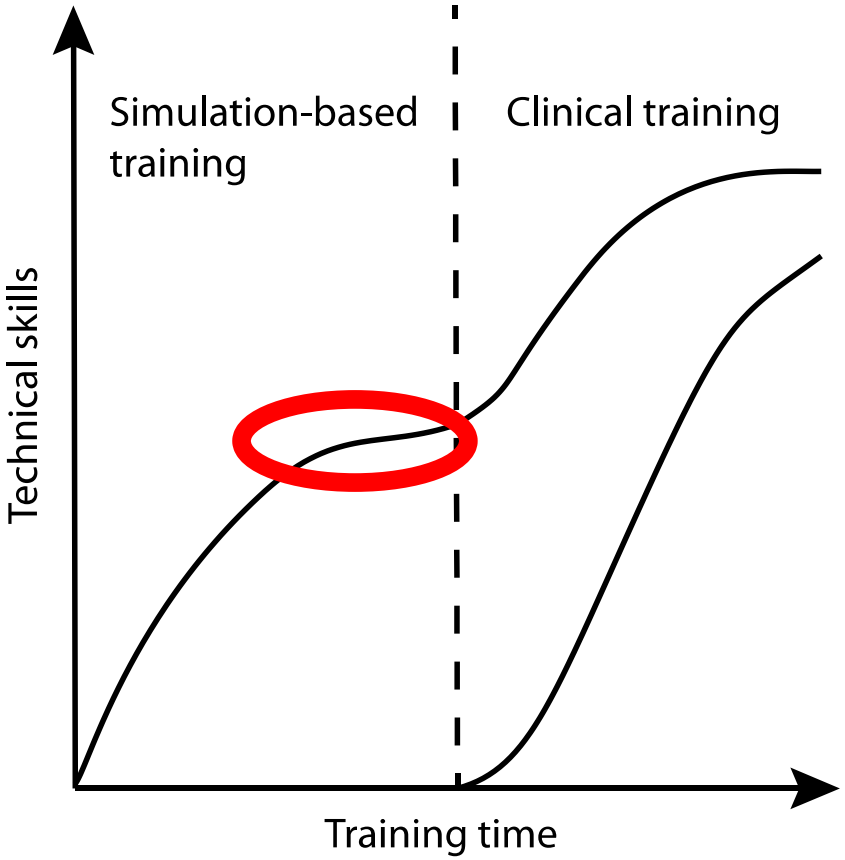
For each procedure on the lists we need to SET

Specific Measurable Objectives



We must ensure that EVERY trainee acquires basic competency on the simulator before advancing to supervised clinical training



- Why should we use simulation training?
- How can we create evidence-based training programs?
- **Why should we demand accreditation?**
- How can we implement accreditation?

Accreditation is the only way we can ENSURE competence

Self assessment is NOT reliable

Diplomas without final tests are just proof of attendance

Certificate of Completion

Simulation Centre Rigshospitalet

This is to certify that

Dr. John Doe

has demonstrated skills in

Basic Laparoscopy

Competencies covered

- Attended a one-day course - "Basic Laparoscopy" - focusing on the basic principles of laparoscopy
- Completed a training program by reaching technical proficiency on laparoscopic box trainers and virtual reality simulators
- Attended a one-day course "Practical Laparoscopy", focusing on entry techniques, instrument handling and complication management in laparoscopy.

This curriculum is based on the laparoscopic curriculum developed by the Juliane Marie Centre, Rigshospitalet for gynecology. The continued development and organization of the curriculum is done in collaboration with the Juliane Marie Centre.

The Capital Region of Denmark

CAMES Copenhagen Academy for Medical Education and Simulation

Flemming Bjerrum

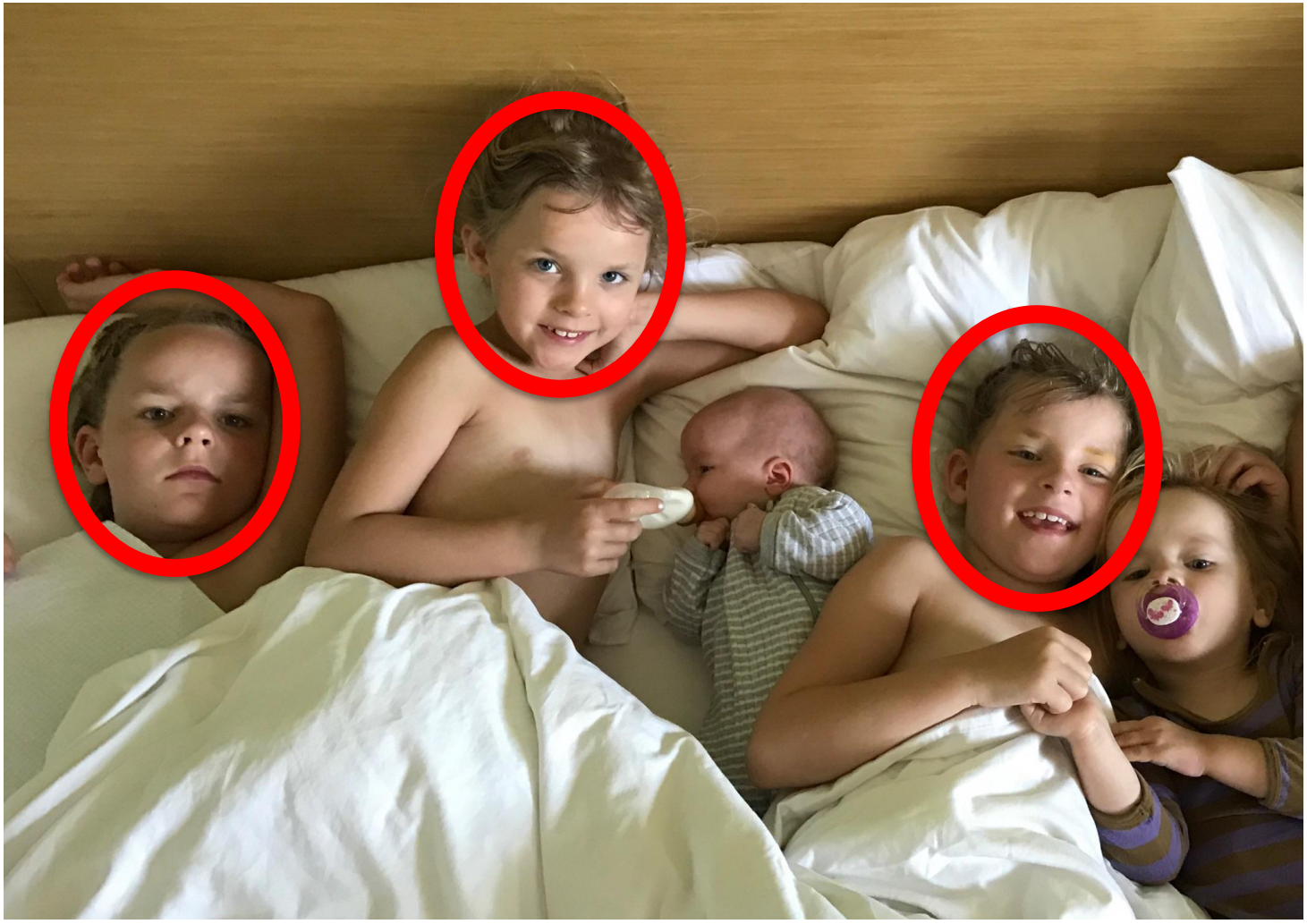
MD, Ph.D.,
CAMES Rigshospitalet
University of Copenhagen
Capital Region of Denmark

Lars Konge

MD, Ph.D., Professor
CAMES Rigshospitalet
University of Copenhagen
Capital Region of Denmark

Issued on 15 September 2017

Three of my five daughters (9, 7, and 7 years old) can pass ALL surgical courses that does not include a test



Assessment

...is the
engine
which drives
student learning

(John Cowan)

If failing has no consequences students will not prepare seriously.

If trainees cannot fail they will not prepare.

The effect of testing on skills learning

Charles B Kromann, Morten L Jensen & Charlotte Ringsted

CONCLUSIONS Testing as a final activity in a resuscitation skills course for medical students increases learning outcome compared with spending an equal amount of time practising the skills.

Accreditation ensures competency, motivates trainees, and improves retention

WHY DON'T WE USE IT MORE?

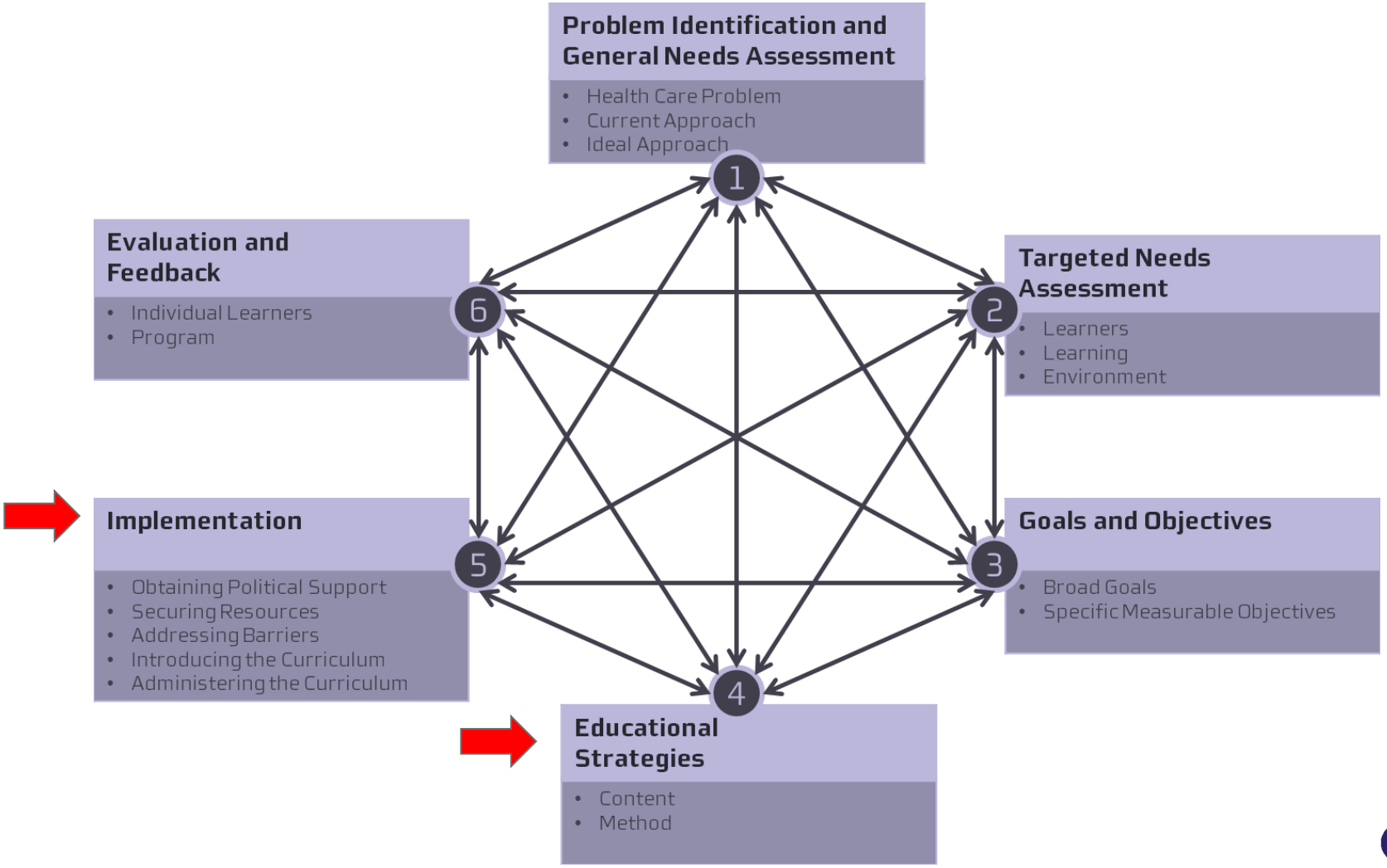
Accreditation needs to be mandatory and based on tests with solid evidence of validity

- **Would you take an exam if you did not have to?**

"Sorry, You failed your exam"

- Why should we use simulation training?
- How can we create evidence-based training programs?
- Why should we demand accreditation?
- **How can we implement accreditation?**

Now we know what we want and how much we want it
Decide the educational strategy and implement it



Remember: You need more than the simulators

Buy a simulator

Develop a curriculum

- Perform needs assessment
- Define learning objectives

- Flexibility
- Availability
- Certification
- Evidence-based
- Research generating

- Educate super users
- Involve key opinion leaders

Example from Copenhagen: The Four Steps Model

Theoretical Preparation – Through e-learning, watching instructional videos, and reading book chapters, articles and practical procedure handbooks specially prepared by the instructors at the centre.

Introduction To The Procedure - Clinical specialists are responsible for introducing the procedures to either an individual trainee or to small groups of 2-12 trainees.

Self-Training - Practicing in the simulators, with the help of simulation training assistants (i.e. directed, self-regulated learning).

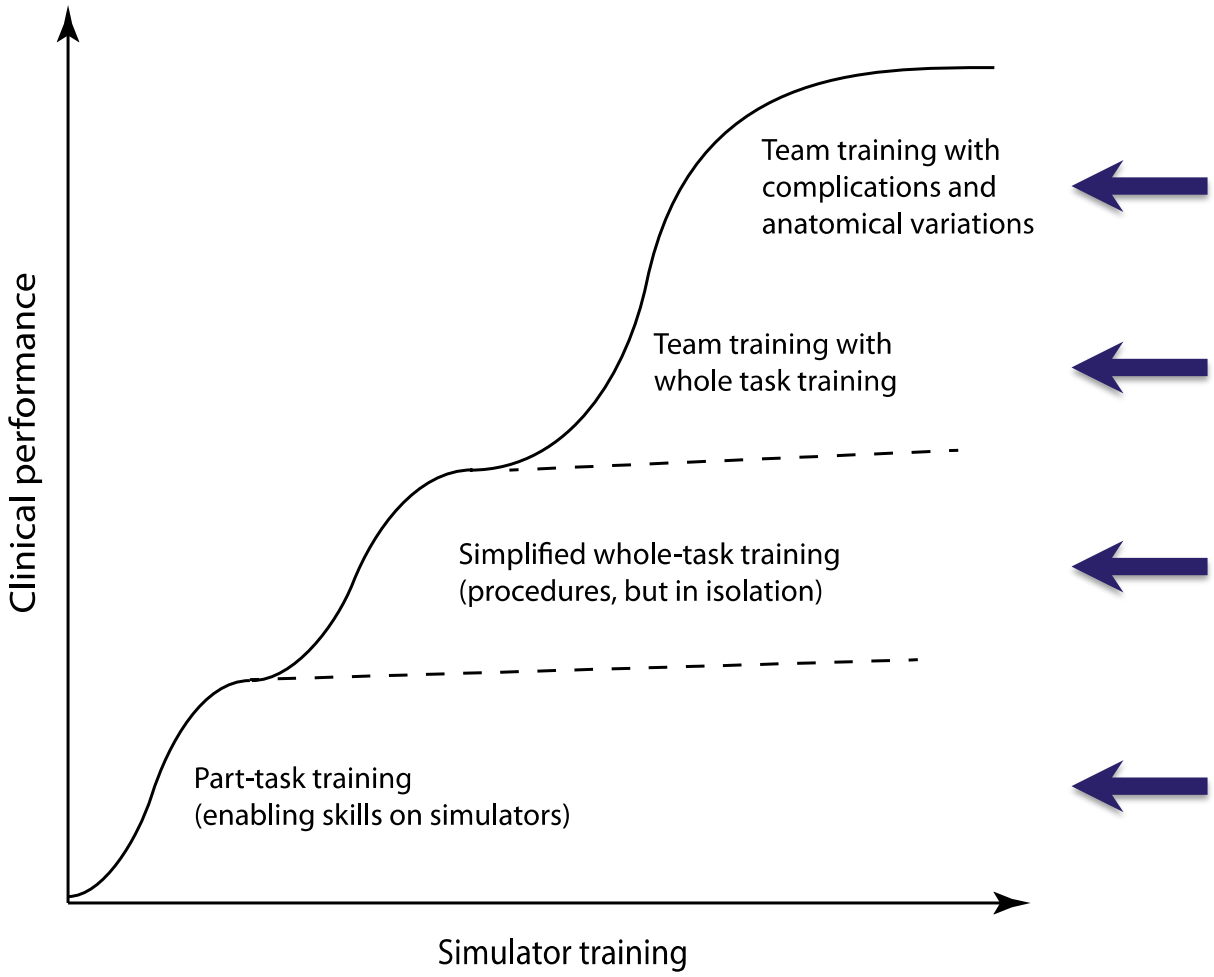
Final Practical Exam (Simulation-Based Certification) - Practical exam is assessed by a clinical specialist. All exams have evidence of validity and established pass-fail standards based on either virtual-reality metrics or expert assessments.

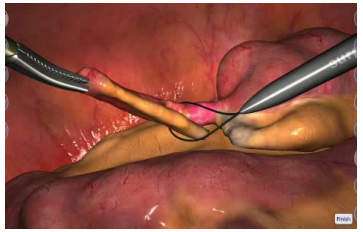
Konge L, Bjerrum F, Nayahangan L and Schroeder TV. Developing and running a surgical simulation centre. J Surg Sim 2015

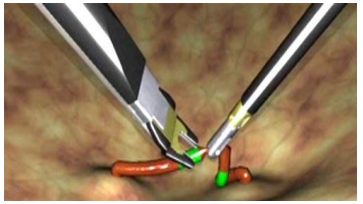
Accreditation MUST be based on tests with solid evidence of validity

Procedure	Publication	Journal
EVAR	*Assessment of competence in EVAR stent graft sizing and selection.*	European Journal of Vascular and Endovascular Surgery
Vitreo-retinal surgery	*Is there inter-procedural transfer of skills in intraocular surgery? A randomized controlled trial.*	Acta Ophthalmol
Lumbar puncture	*Assessment of Residents Readiness to Perform Lumbar Puncture: A Validation Study.*	J Gen Intern Med
Camera navigation (laparoscopy)	*Simulation-based camera navigation training in laparoscopy-a randomized trial.*	Surg Endosc
VATS lobectomy	*Using virtual reality simulation to assess competence in video-assisted thoracoscopic surgery (VATS) lobectomy.*	Surg Endosc
Colonoscopy	*Combining different methods improves assessment of competence in colonoscopy.*	Scand J Gastroenterol.
Cataract surgery	*Operating Room Performance Improves after Proficiency-Based Virtual Reality Cataract Surgery Training.*	Ophthalmology
Temporal Bone Drilling	*Mapping the plateau of novices in virtual reality simulation training of mastoidectomy.*	Laryngoscope.
Laparoscopy	*Ensuring Competency of Novice Laparoscopic Surgeons-Exploring Standard Setting Methods and their Consequences.*	J Surg Educ.
Emergency cricothyroidotomy	*Self-directed simulation-based training of emergency cricothyroidotomy: a route to lifesaving skills.*	Eur Arch Otorhinolaryngol.

Next step is team training







CONCLUSIONS

SIMULATION is safer, more effective, and cheaper than training on patients

You need to built an entire curriculum (not just buy the simulators)

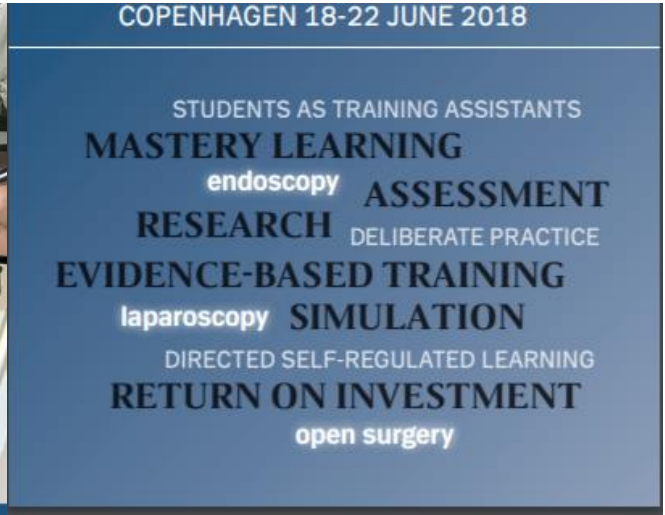
ACCREDITATION ensures competency, motivates trainees, and improves retention

You need to make it mandatory and based on solid evidence

THANK YOU FOR YOUR ATTENTION!

If you want to learn all the tips and tricks please join us in Copenhagen for the

CAMES Surgical Simulation Masterclass



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