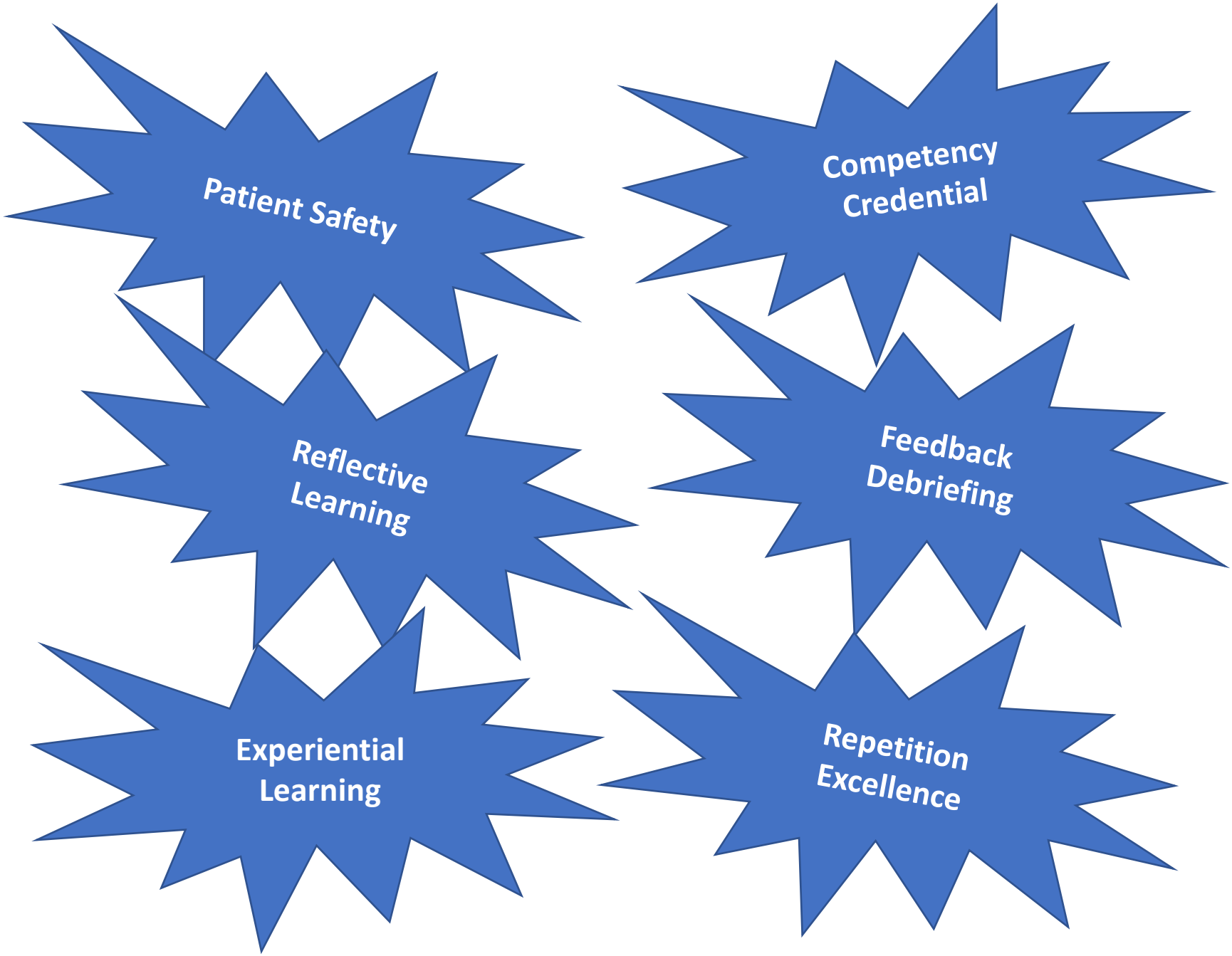
Application of Simulation to Improve Clinical Efficiency – Systems Integration

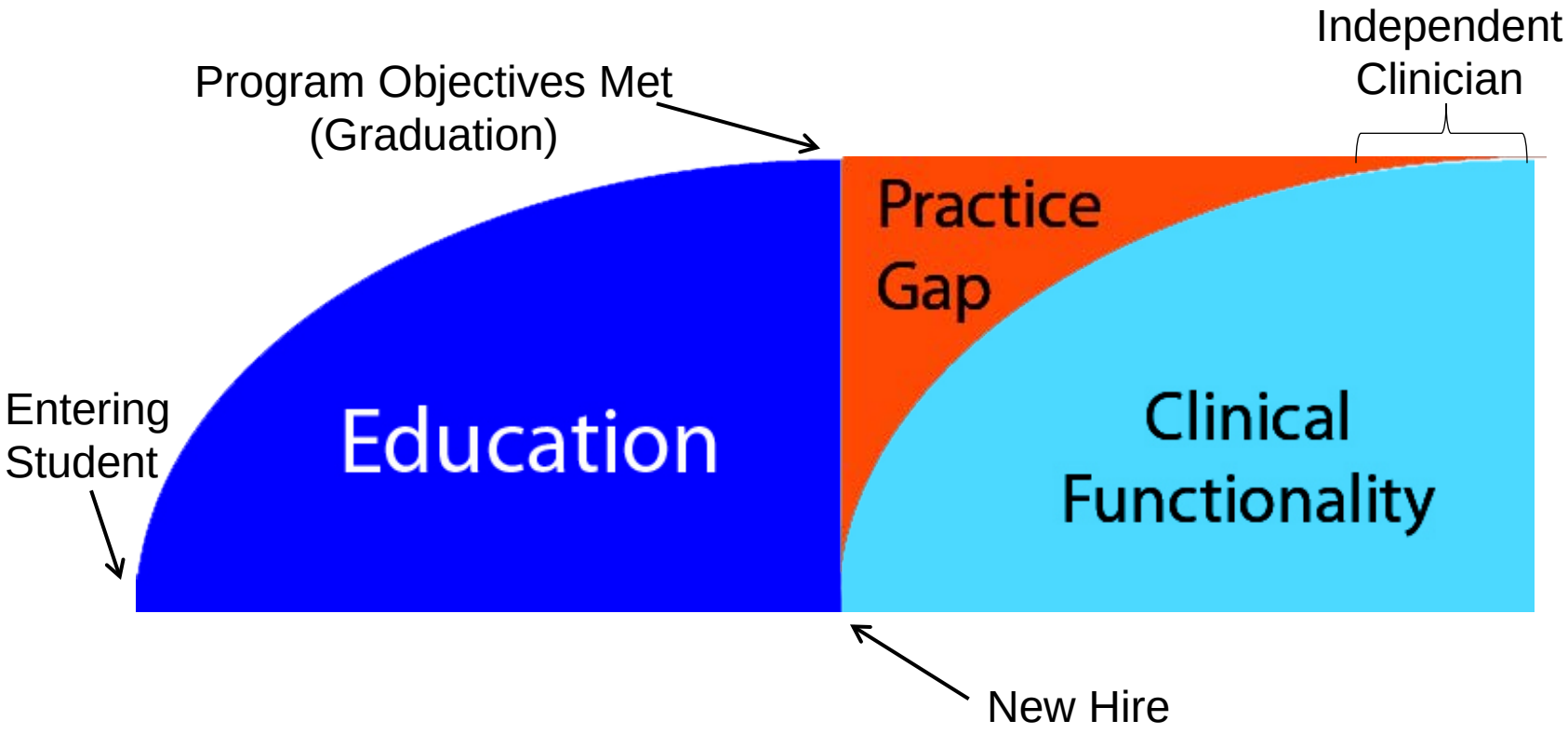
Hyun Soo Chung, MD, PhD
Professor, Department of Emergency Medicine
Director, Clinical Simulation Center
Yonsei University College of Medicine

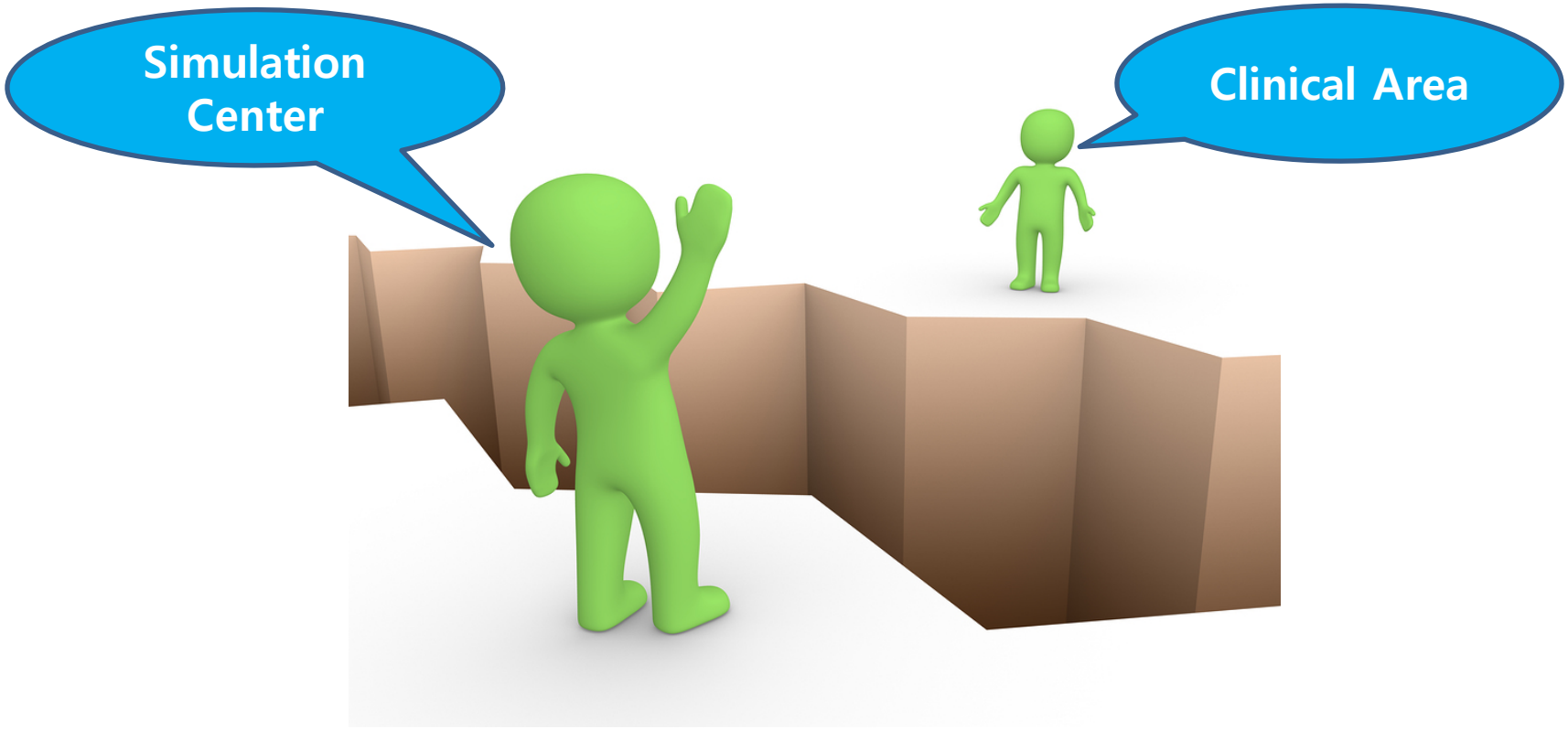
Disclosures

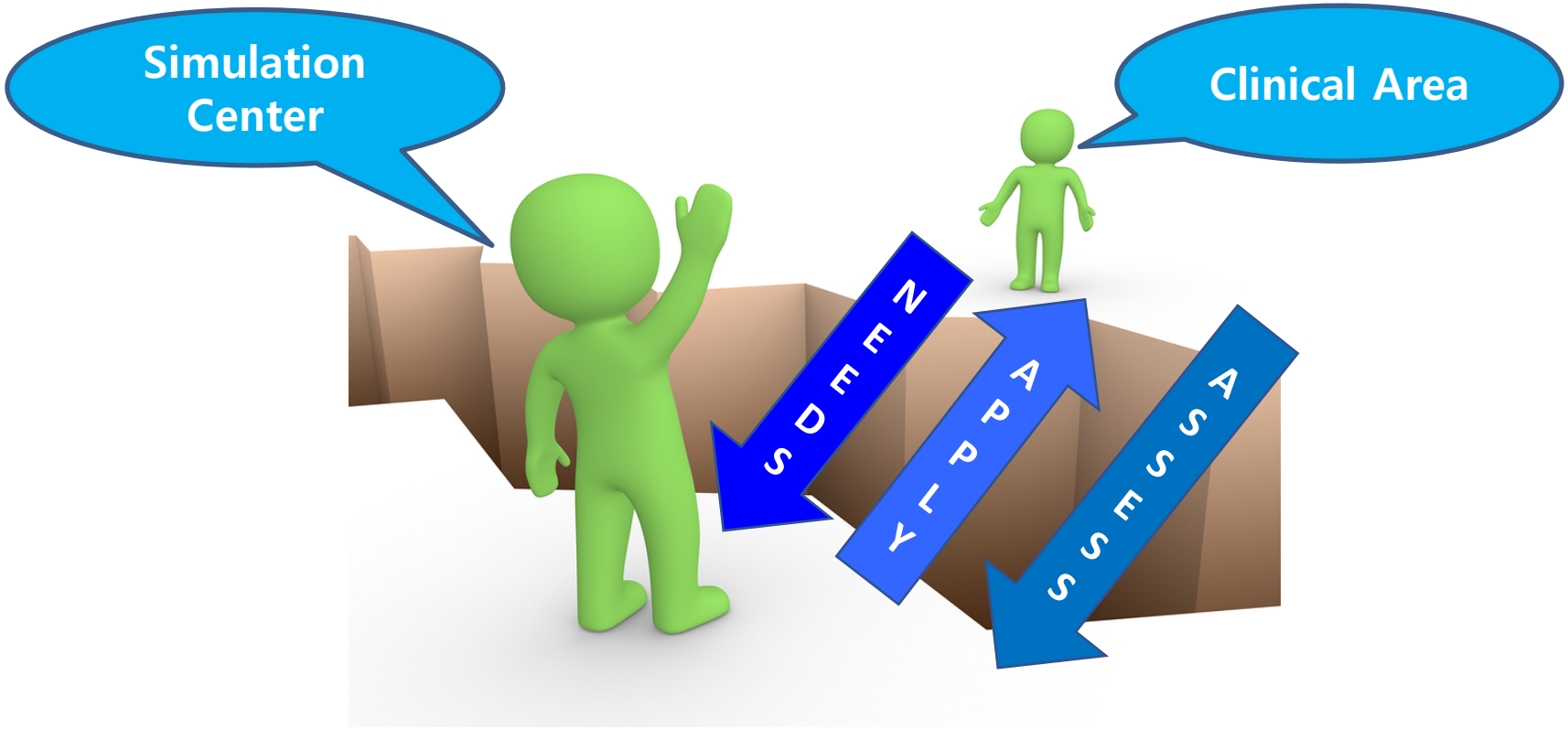
- None


Patient Safety
Competency Credential
Reflective Learning
Feedback Debriefing
Experiential Learning
Repetition Excellence

Simulation for Practicing Professional?




Simulation Center
Clinical Area


Simulation Center
Clinical Area
SCREEN
APPLY
ASSESS

Competency-based Medical Education

Public demands assurance that practitioners are competent

<u>Assessment</u> of core knowledge, skills, attitudes

Public demands assurance that competent learners can be entrusted

<u>Entrustable Professional Activities</u>

SSH Accreditation

Clinical Simulation Center
Yonsei University College of Medicine

Center for Disaster Relief, Training, and Research
Yonsei University Severance Hospital

SSH
Society for Simulation in Healthcare
Accredited Program
Assessment, Research, Systems Integration and Teaching/Education

Areas of Accreditation

- **Assessment Standards**
- **Core Standards**
- **Research Standards**
- **Teaching/ Education Standards**
- **System Integration & Patient Safety Standards**

Programs

- Undergraduate Training
- Postgraduate Training
- Hospital Wide Projects
- Collaboration Training
- Supports other

Undergraduate Training

- Basic skills for 1st and 2nd year
- Elective courses for 1st and 2nd year
- Core clinical examination for 2nd year
- Clinical skills examination for 3rd and 4th year
- Clinical clerkship for 3rd and 4th year
- Preparation for Medical License Examination

Postgraduate Training

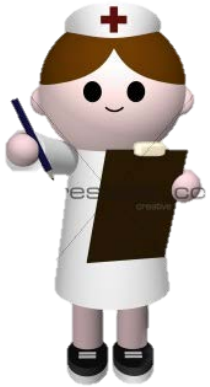
- Essential Skills Set
- EM Block Activity
- Pediatric Emergency & Critical Care
- Obstetrics Resuscitation
- Anesthesia Critical Care
- GS Laparoscopic Surgery
- Trauma Care
- Clinical Nursing Care
- Disaster Training

Hospital Wide Projects

- Cardiopulmonary Resuscitation
- Disaster Preparedness
- Personal Protective Equipment




Collaboration Training



- Nursing Department
  - PA Nurse Competency Training
- Quality Improvement Department
  - Time out (outside OR)
  - Communication (SBAR)
- Emergency Department
  - *in situ* System Integration

J Hosp Med. 2009 Sep;4(7):397-403. doi: 10.1002/jhm.468.

Use of simulation-based mastery learning to improve the quality of central venous catheter placement in a medical intensive care unit.

Barsuk JH[1], McGaghie WC, Cohen ER, Balachandran JS, Wayne DB.

Crit Care Med. 2009 Oct;37(10):2697-701.

Simulation-based mastery learning reduces complications during central venous catheter insertion in a medical intensive care unit.

Barsuk JH[1], McGaghie WC, Cohen ER, O'Leary KJ, Wayne DB.

Arch Intern Med. 2009 Aug 10;169(15):1420-3. doi: 10.1001/archinternmed.2009.215.

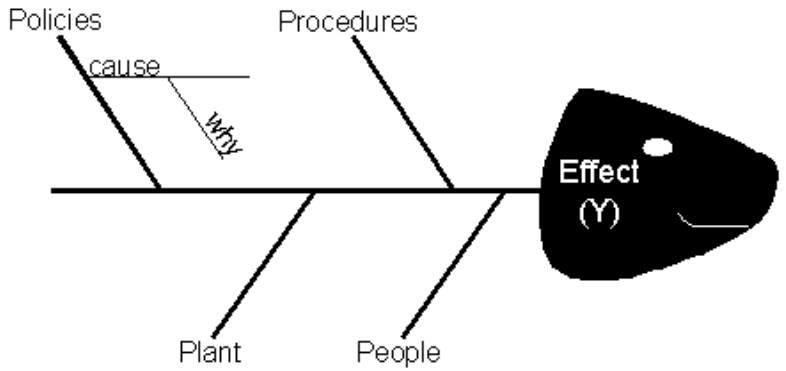
Use of simulation-based education to reduce catheter-related bloodstream infections.

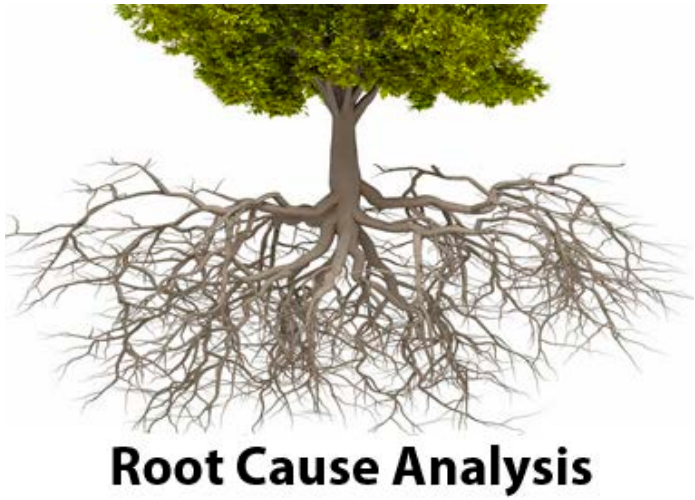
Barsuk JH[1], Cohen ER, Feinglass J, McGaghie WC, Wayne DB.

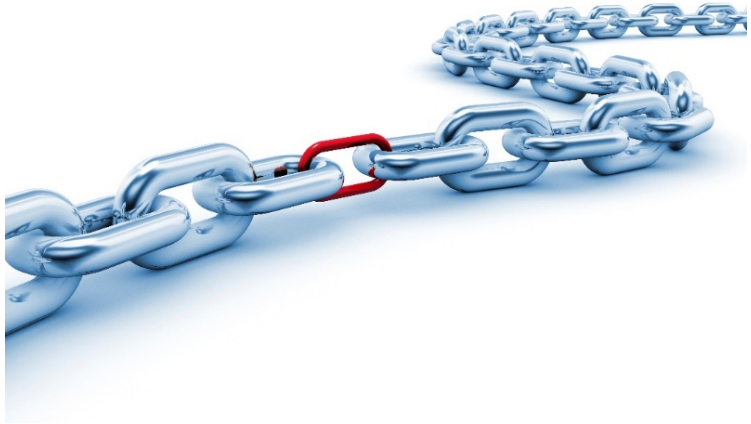
BMJ Qual Saf. 2014 Mar 14. doi: 10.1136/bmjqs-2013-002665. [Epub ahead of print]

Dissemination of a simulation-based mastery learning intervention reduces central line-associated bloodstream infections.

Barsuk JH[1], Cohen ER, Potts S, Demo H, Gupta S, Feinglass J, McGaghie WC, Wayne DB.


Policies
Procedures
cause
why
Effect
(Y)
Plant
People


Root Cause Analysis



Shock Management

- Shock treatment was not standardized
- Airway and central line insertion complication ↑
- Communication not efficient
- Respiratory failure management suboptimal/overtreatment
- No formal education in shock (except from clinical rounding)

Shock Management

- Quality Improvement Office
- Nursing Division
- Emergency Medicine
- Internal Medicine
- General Surgery
- Chest surgery
- Obstetric
- Pediatric
- Anesthesiology

“SimShock” Program

- To enhance competency in shock management
- To build competency in airway management
- To build competency in central line insertion
- To standardize shock management

- All incoming new residents from the 7 clinical department

Program

Warming up simulation

- Obstructive shock

Lecture

- Introduction to shock

Skills Station

- CVP catheter insertion
- Endotracheal intubation
- Rescue airway

Program

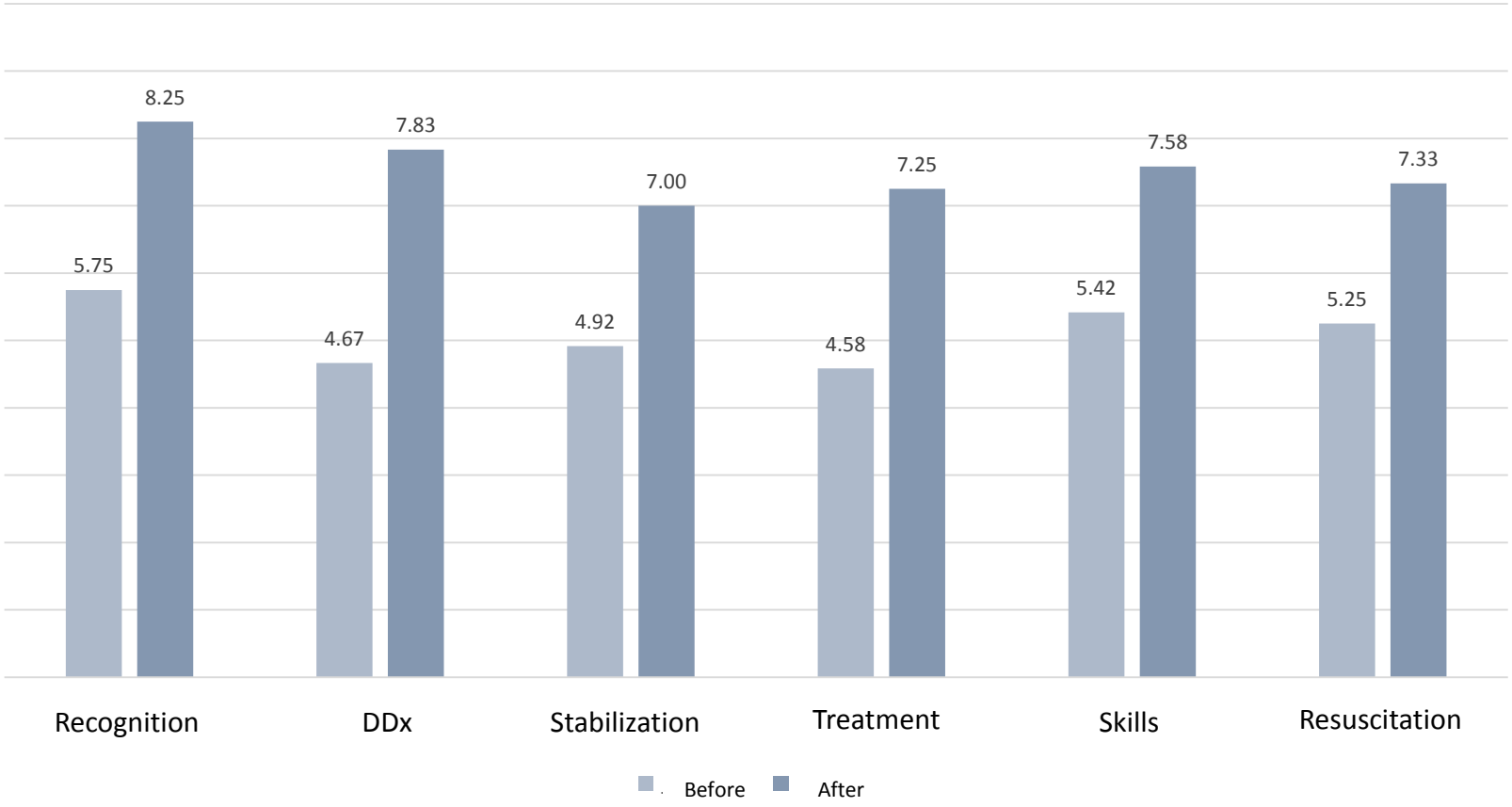
Simulation session with 4 scenarios

- Anaphylactic shock
- Cardiogenic shock
- Septic shock
- Hemorrhagic shock

Face and Content Validation

Face & Content Validity Questionnaire	Out of 10
I was fully immersed in the simulation	9.3
I behaved in the same way that I do in the real world	8.7
The scenario allows me to adequately demonstrate my technical skills	9.0
The scenario allows me to adequately demonstrate my clinical knowledge	9.1
The scenario allows me to adequately demonstrate my decision-making	9.2
The scenario allows me to adequately demonstrate my teamwork skills	9.3
The scenario allows me to adequately demonstrate situation awareness	9.3

Competency Improvement



Currently…

- Collecting data to compare changes in shock patient management before and after the course
- Scenarios are developed from actual shock cases from that department
- Expanded program to Neurology and Neurosurgery Department

“SBAR-SIM” Program

- Adverse patient occurrences are an extremely common outcome of communication failures
- The Joint Commission (US) reported 70% of RCA were due to communication failures, and approximately 75% of the patients involved died
- 63% of sentinel events are due to communication failures
- SBAR tool is widely used to enhance patient safety

  (Situation-Background-Assessment-Recommendation)

“SBAR-SIM” Program

- To standardize handover communication of critical patients
- To recognize the importance of proper communication for patient safety
- To reduce medical errors resulting from communication failure

- Incoming new registered nurses

	Before	After	Change
A	3	10	7
B	5	9	4
C	3	6	3
D	5	11	6
E	3	9	6
F	2	12	10
G	7	12	5
H	3	12	9
Average	3.88	10.13	6.25

	Before	After	3 months
Perception	6.91(±1.8)	8.34(±1.5)	8.95(±1.8)
Behavior	5.21(±1.3)	7.87(±1.4)	7.93(±1.9)

Management of respiratory difficulty

- Asthma, COPD, CHF patients in respiratory difficulty
- Tendency to intubate with ventilator care

- High flow oxygen therapy

"HiO_2-SIM" Program

- To recognize the benefits of high flow oxygen therapy
- To improve adherence of the high flow oxygen therapy protocol
- To improve care of patients in respiratory distress

- All emergency residents at our institution

“Time-Out” Protocol

- Wrong site surgery is a major threat in OR
- Invasive procedures are also performed outside OR
- Time out is not performed according to accurate process in the Ward or ER
- Sentinel events are reported

“Time-Out” Simulation

- To recognize the importance of time-out protocol
- To improve adherence of the time-out protocol
- To reduce errors related to wrong-site invasive procedures

- All ward nurses involved in invasive procedures

	Before	After	*p*
	Mean±SD	Mean±SD	
Adherence to protocol	1.70±2.22	9.79±0.68	<0.01

"*In Situ*" Simulation

- *In Situ*
  - "in the natural or original position or place"
  - Latin for "in place"
- *In Situ* Simulation
  - Simulation that occurs in the physical environment of the target audience.
  - A way to practice and plan for low volume but high risk patient scenarios

	SimLab	*In Situ*
Environmental Fidelity		✓
Control of Scenario	✓	
Less Stress on Educators & Learners	✓	
Logistical Control	✓	
Team & Systems Evaluation		✓
Realism		✓
Time	✓	

- Training based at a simulation center is often related to a curriculum or course and has objectives related to both technical and non-technical proficiencies.
- *In situ* simulation allows teams to review and reinforce their skills and to problem-solve in the clinical environment.
- Opportunities to identify hazards and deficiencies in the clinical systems, the environment, and the provider team.

- Patient Safety Perspective
  - Most valuable benefits of *in situ* are related to identification of:
    - ✓ Latent hazards
    - ✓ Knowledge or skill gaps
    - ✓ Resource limitations- issues related to personnel, medications, equipment
  - *In situ* simulation can identify and mitigate hazards and defects before patient harm occurs

- Challenges
  - Technical issues
    - ✓ Transport of simulator
    - ✓ Use of medical supplies
    - ✓ Infection
  - Logistics
    - ✓ High-acuity, high-census areas (15% cancelled)
    - ✓ Time limitation
    - ✓ Delay in actual patient care
  - Culture
    - ✓ Patient and family perceptions
    - ✓ Study subjects

- Outcomes
  - Individual participant technical proficiency is improved.
  - Desirable individual and team behaviors are reinforced.
  - Active and latent systems issues are readily identified.
  - *In situ* simulation can be a catalyst for change in clinical care systems and improved clinical outcomes.

BMJ Open. 2016 Nov 7;6(11):e013683. doi: 10.1136/bmjopen-2016-013683.

Study protocol for a framework analysis using video review to identify latent safety threats: trauma resuscitation using in situ simulation team training (TRUST).

Fan M[1,2], Petrosoniak A[3,4], Pinkney S[2], Hicks C[3,4], White K[5], Almeida AP[6], Campbell D[5,7], McGowan M[3], Gray A[3], Trbovich P[1,2,8].

Simul Healthc. 2016 Oct;11(5):345-356.

Simulation for Operational Readiness in a New Freestanding Emergency Department: Strategy and Tactics.

Kerner RL Jr[1], Gallo K, Cassara M, D'Angelo J, Egan A, Simmons JG.

BMC Med Educ. 2015 Oct 29;15:189. doi: 10.1186/s12909-015-0472-5.

Inter-professional in-situ simulated team and resuscitation training for patient safety: Description and impact of a programmatic approach.

Zimmermann K[1], Holzinger IB[2], Ganassi L[3], Esslinger P[4], Pilgrim S[5], Allen M[6], Burmester M[7], Stocker M[8].

BMJ Open. 2015 Oct 6;5(10):e008344. doi: 10.1136/bmjopen-2015-008344.

Simulation-based multiprofessional obstetric anaesthesia training conducted in situ versus off-site leads to similar individual and team outcomes: a randomised educational trial.

Sørensen JL[1], van der Vleuten C[2], Rosthøj S[3], Østergaard D[4], LeBlanc V[5], Johansen M[6], Ekelund K[7], Starkopf L[3], Lindschou J[8], Gluud C[8], Weikop P[9], Ottesen B[1].

Simul Healthc. 2015 Jun;10(3):154-62. doi: 10.1097/SIH.0000000000000087.

In situ simulated cardiac arrest exercises to detect system vulnerabilities.

Barbeito A[1], Bonifacio A, Holtschneider M, Segall N, Schroeder R, Mark J; Durham Veterans Affairs Medical Center Patient Safety Center of Inquiry.

New Emergency Department

- MERS crisis – infection control
- Overcrowding
- Recently started construction, lasting until this August
- Major changes
  - Infection Room
  - Single unit cubicle
  - Fast track
  - New resuscitation room

- Test resuscitation room setting for pediatric patients
- Two separate resuscitation rooms for pediatrics: medical and trauma

- Monday early morning – least patient burden
- Cooperation from Pediatric Department & Nursing Division
- “Ready-to-move” in case of actual patient coming in
- Developed checklist and had the head and charge of department assess
- Debriefing after the session

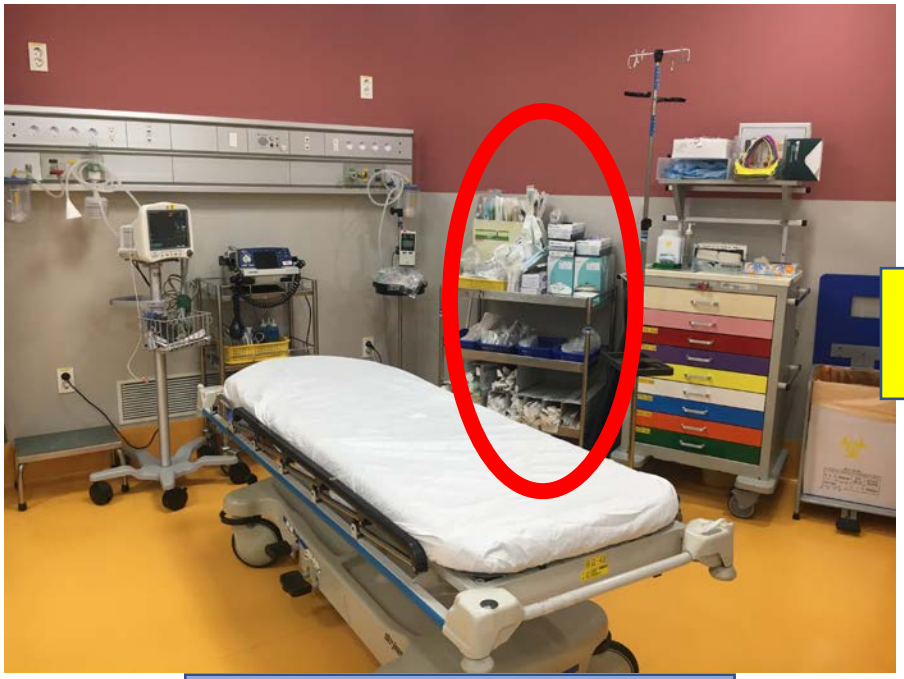
- Findings
  - Able to find out the actual performance competency for pediatric resuscitation
  - Able to find out teamwork factors that needed improvement
  - Able to find out setting problems that influenced patient management
  - Able to motivate participants in being proactive to making changes for the better care for the patients

Adult Resuscitation Room
(Temporary)

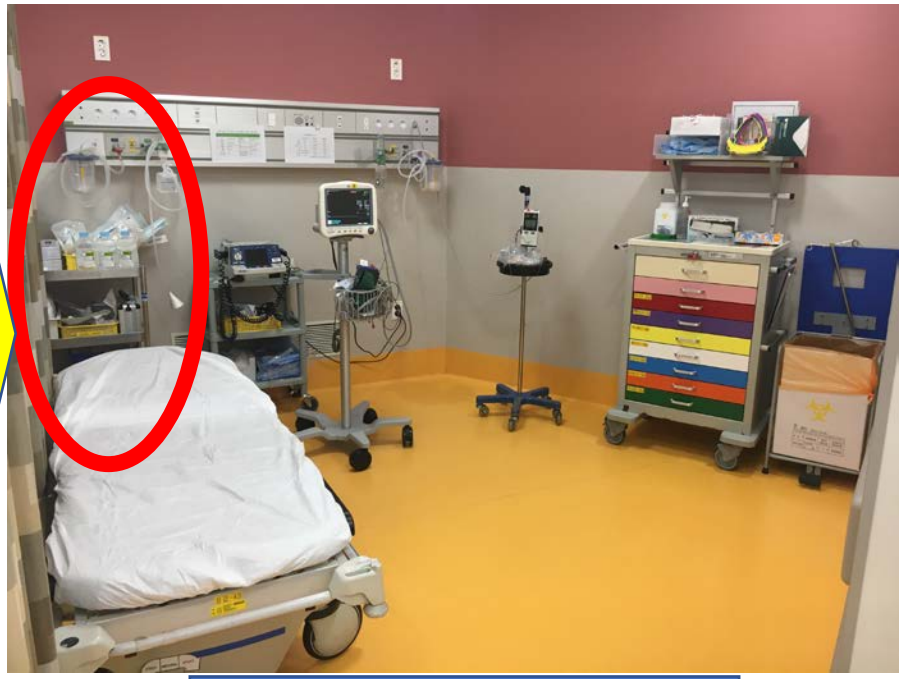
Before

After

Pediatric Resuscitation Room



Before



After

Conclusion

- Simulation can be utilized to improve care in the clinical setting, but the curriculum should be integrated with clinical practice
- *In situ* simulation and system integration is a relatively new and rapidly evolving tool with the potential to improve patient safety.
- It identifies latent hazards and knowledge gaps and strengthens communication, teamwork, and technical skills that are critical to high-functioning health care teams.
- Overcoming challenges will yield a rich return in benefits for improved patient safety.


Thank
You
Asante
Shukria
Dhanyavadagalu
Vinaka
köszönöm
Kiitos
Maake
Manana
Dankon
감사합니다
Kam Sah Hammida
شكرا
Matondo
Dank Je
Dankscheen
спасибо
Mauruuru
Biyan
Terima Kasih
Taiku
Tack
Blagodaram
Ngiyabonga
Dziekuje
Chokrane
Diolch i Chi
Grazie
Juspaxar
Arigato
Mochchakkeram
Gracias
Khap
Paldies
Tingki
நன்றி
धन्यवाद
cảm ơn bạn
Gratias Tibi
Ua Tsaug Rau Koj
Bedankt
Dakujem
Grazas
Di Ou Mèsi
Obrigado
Kia Ora
Khun
Kop
ありがとう
Děkuji
Nirringrazzjak
Suksama
Hvala
Djiere Dieuf
Rahmat
Nuwun
Matur
谢
Welalin
Misaotra
хвала
Danke
Merci
Go Raibh Maith Agat
Eskerrik Asko
Salamat
ขอขอบคุณคุณ
Najis Tuke
谢