

Simulation in Training



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April 1, 2016

How do you currently use simulation in your CV fellowship?

- 1) Vascular access – venous or arterial
- 2) Intervention – coronary or structural
- 3) TEE
- 4) EP – ablation or device
- 5) Temporary pacemaker
- 6) Patient communication
- 7) Other
- 8) We do not use simulation

Objectives

Identify opportunities for use of simulation in modern CV training

- Vascular access
- Intervention (STEMI)
- In-Hospital Cardiac Arrest (IHCA)

Why use simulation?

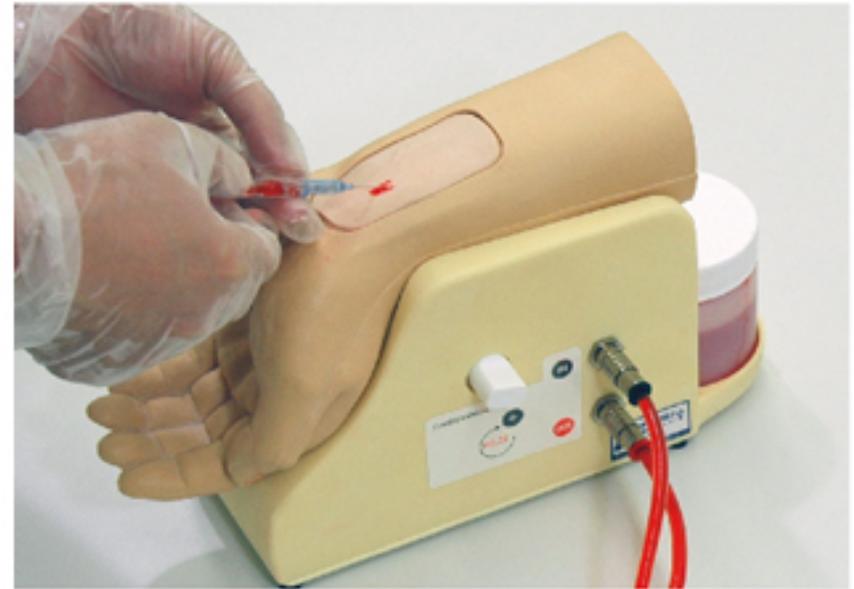
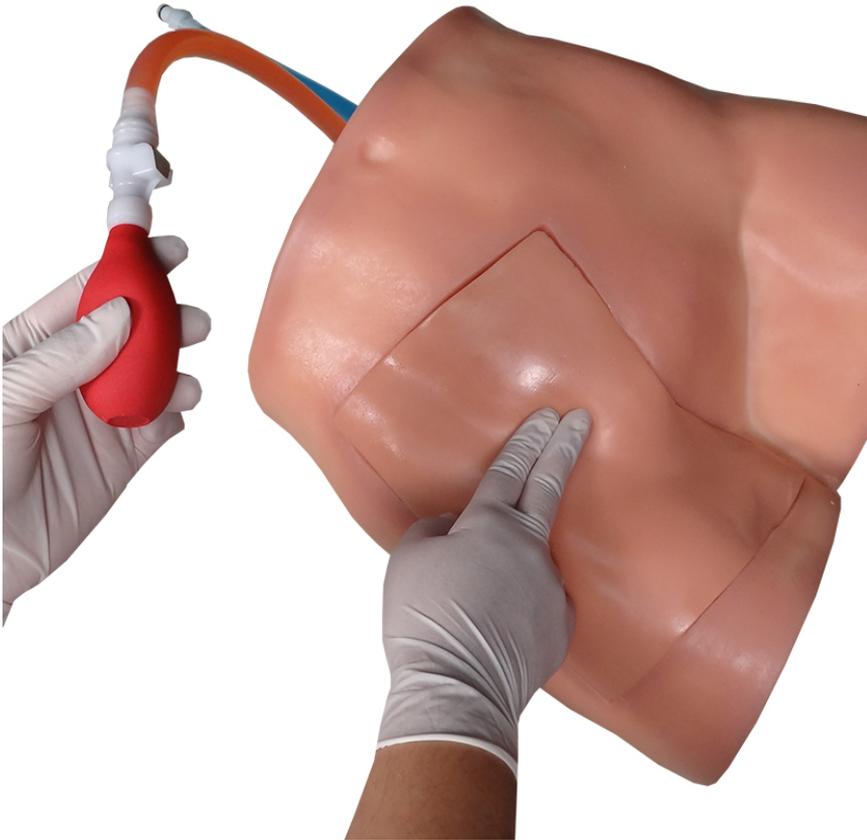
“Watch one, do one, teach one”

“Learn the operation before the operating room”¹

ACGME requirement that cardiology fellows
“must participate in training using
simulation” (IV.A.6.b)²

1. Chaer *et al.*, Ann Surg 2006
2. ACGME 2013

Uses of Simulation in CV Training – Arterial Access



Uses of Simulation in CV Training – STEMI

A)



B)



C)



D)



Fig. 1. Currently available simulators. (A) CathLabVR (CAE Healthcare, Montreal, Quebec, Canada). (B) Angiommentor (Simbionix, Cleveland, OH). (C) Simsuite (Medical Simulation Corporation, Denver, CO). (D) Procedicus VIST (Mentice, Gothenburg, Sweden). [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Barriers to Implementation

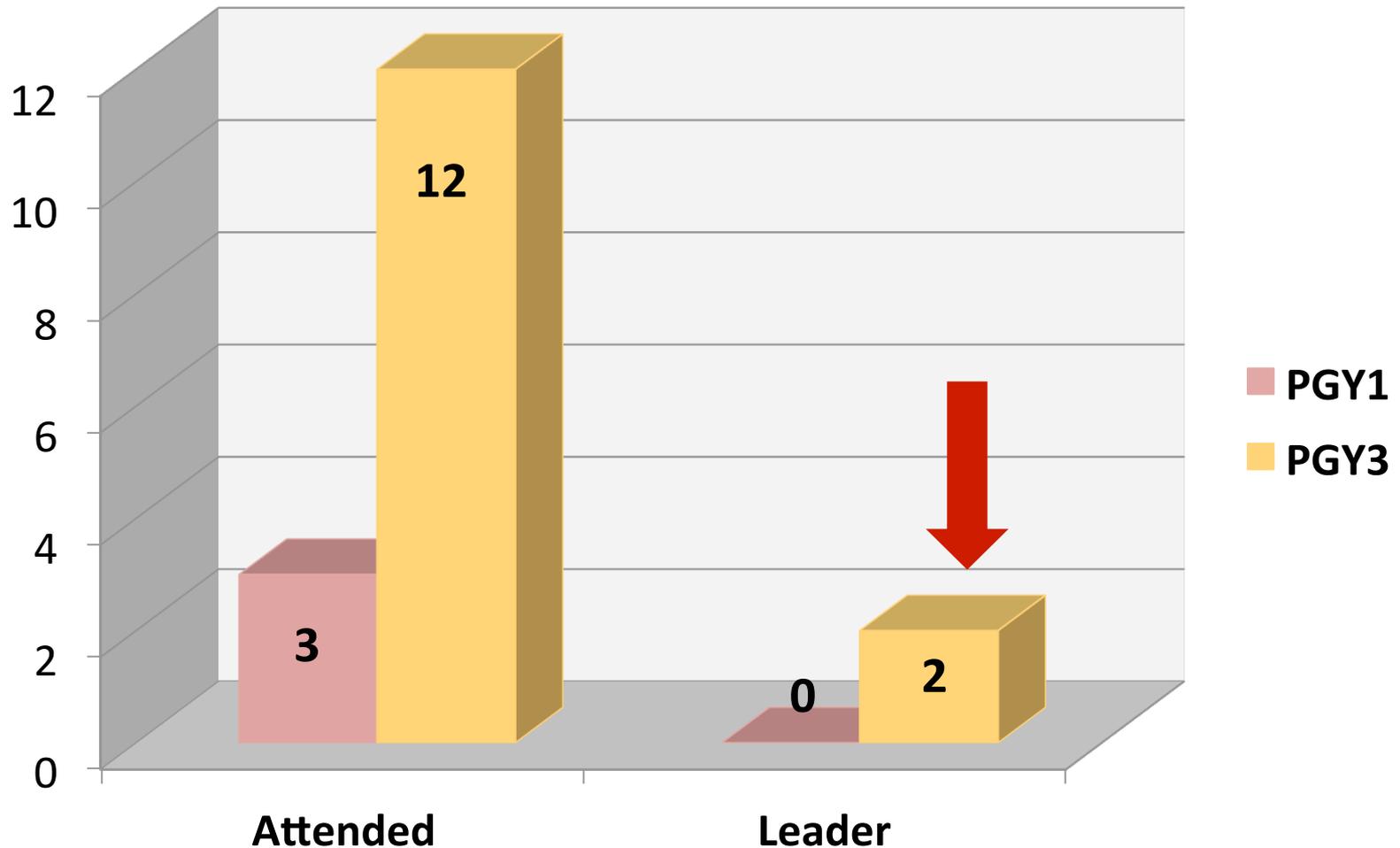
- Cost (equipment, personnel, time)
- Lack of standardized technology and curricula
- *Lack of evidence showing improved patient outcomes*

Uses of Simulation in CV Training – **In-Hospital Cardiac Arrest (IHCA)**

Housestaff experience with IHCA:

Single-center, cross-sectional survey Dec 2015

Median number of IHCA **attended** and **led**



Residents feel unprepared and unsupervised as leaders of cardiac arrest teams in teaching hospitals: A survey of internal medicine residents*

49.3% felt inadequately trained to lead team

IHCA - RESIDENT EXPOSURE and TRAINING

- Insufficient exposure to IHCA
- Residents feel (and are) poorly prepared to serve as team leader
- **These residents become CV fellows...**
And may not possess skills we assume they learned during residency.

Code BLUE Team

At University of Louisville Hospital

- Inter-professional, simulation-enhanced, team-based monthly curriculum¹
- Participants (from the same unit):
 - MD trainees -- RT
 - PharmD -- ICU RN

1. Approved by University of Louisville IRB #14.1211
Supported by Innovations Seed grant from Alliance for Academic Internal Medicine

Code BLUE Team

At University of Louisville Hospital

- 90-minute session
 1. VT/VF arrest
 2. Debrief
 3. Repeat identical scenario
- Mock Code

Code BLUE Team

At University of Louisville Hospital

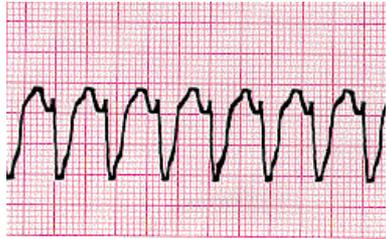


Code BLUE Team

At University of Louisville Hospital

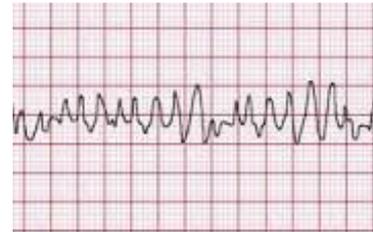
5 min

Stable VT →



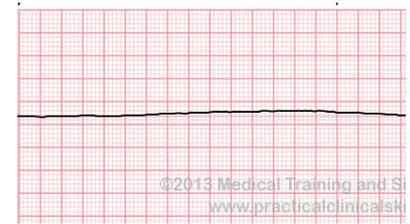
2.5 min

Pulseless VT →



7 min

VF →



Asystole

Successful resuscitation requires:

- ✓ 2 minutes of effective ventilation
- ✓ 2 minutes of effective CPR
- ✓ 2 defibrillations
- ✓ 1 dose of vasoconstrictor (vasopressin or epi)
- ✓ 1 dose amiodarone (code dose)

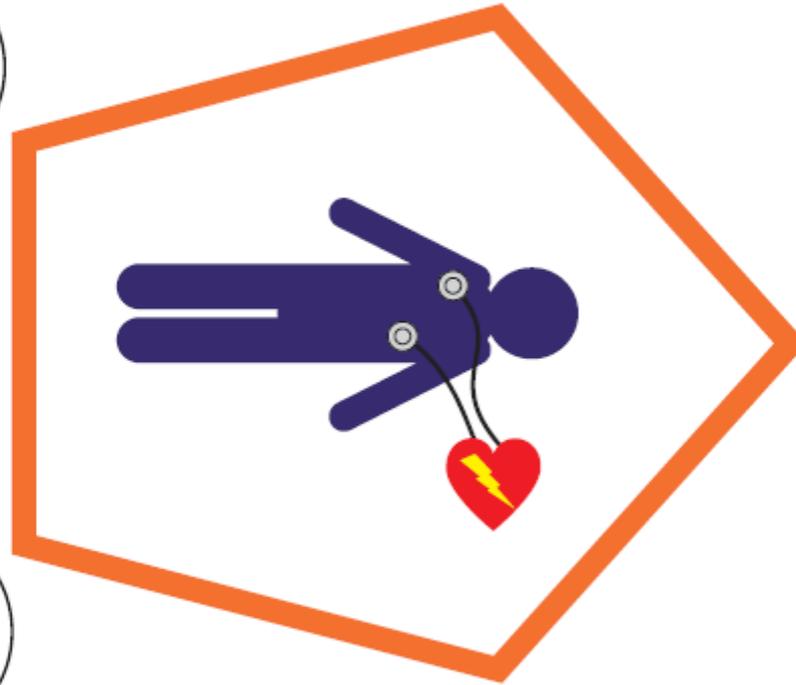
Skill Key: A = Done Correctly B = Done Incorrectly C = Not Done

Recognize pulseless patient within 10 seconds	A	B	C	n/a
Check responsiveness	A	B	C	n/a
Confirm patient code status	A	B	C	n/a
Get Help – Call Code	A	B	C	n/a
Assign roles – verbal or understood	A	B	C	n/a
Call for defibrillator	A	B	C	n/a
Initiate CPR within 10 seconds of recognizing pulseless	A	B	C	n/a
Adequate rate >100/min	A	B	C	n/a
Give oxygen.	A	B	C	n/a
Give respirations at rate of 8-10/min via bag-mask	A	B	C	n/a
→ Attach monitor/defibrillator and plug in/turn on	A	B	C	n/a
Check/Identify rhythm on monitor <10 sec	A	B	C	n/a
Charge while continuing CPR	A	B	C	n/a
Clear	A	B	C	n/a
Defibrillate #1 <i>as soon as defibrillator is attached to patient and shockable rhythm identified</i>	A	B	C	n/a
→ Immediately resume CPR	A	B	C	n/a
CPR 2 minutes	A	B	C	n/a
Adequate rate >100/min	A	B	C	n/a
Pulse/rhythm check <10 sec	A	B	C	n/a
Charge while continuing CPR	A	B	C	n/a
Clear	A	B	C	n/a
Defibrillate #2	A	B	C	n/a
Search 5H/5T	A	B	C	n/a
Change compressor every 2 minutes OR as needed	A	B	C	n/a
Immediately resume CPR	A	B	C	n/a
CPR 2 minutes – do not stop for meds	A	B	C	n/a
Adequate rate >100/min	A	B	C	n/a
Epinephrine 1mg IV push, repeat every 3-5 minutes OR Vasopressin 40 U IV single dose to replace 1 st or 2 nd dose of Epi	A	B	C	n/a

TEAM LEADER



CPR



O₂



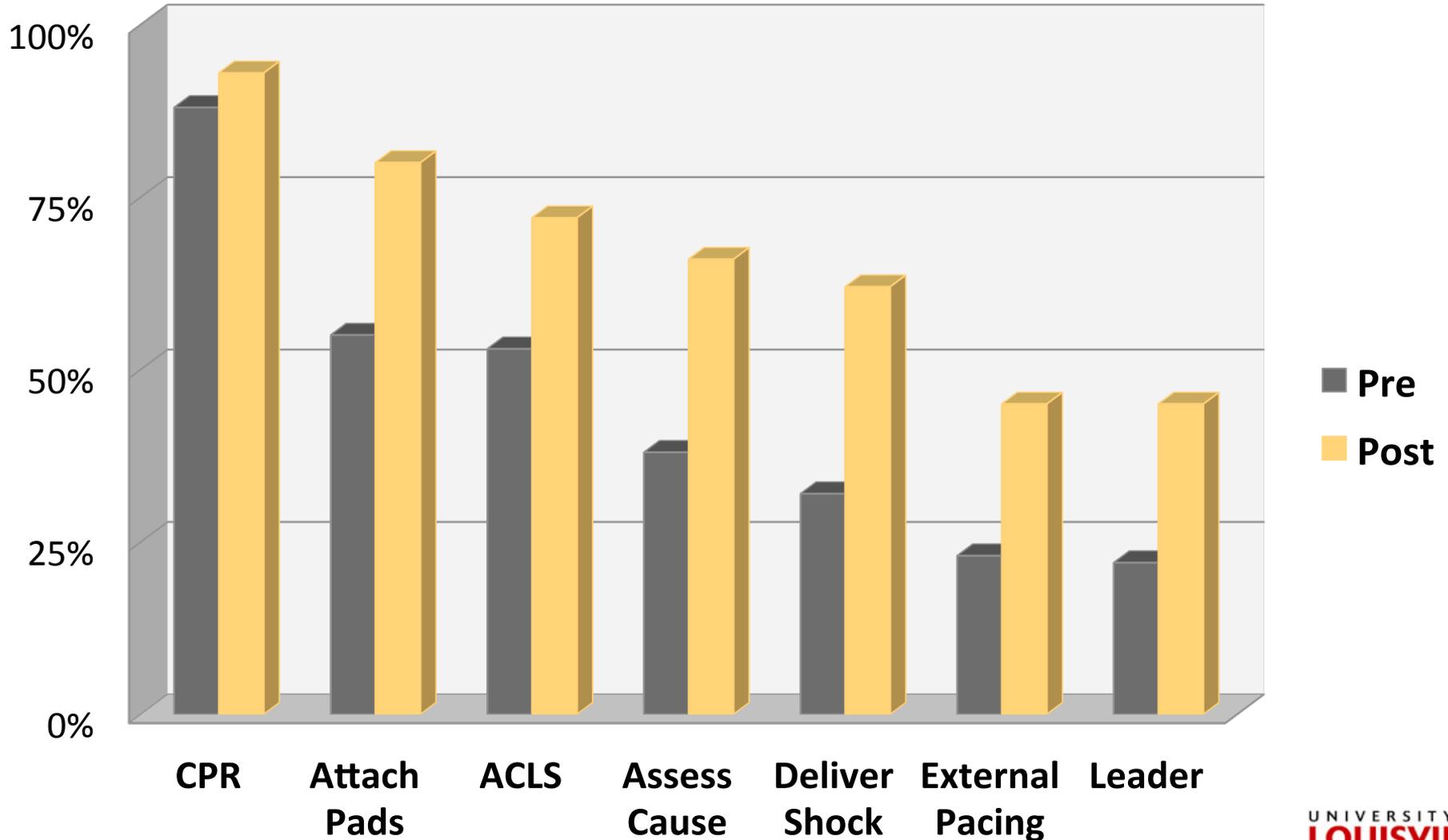
RX



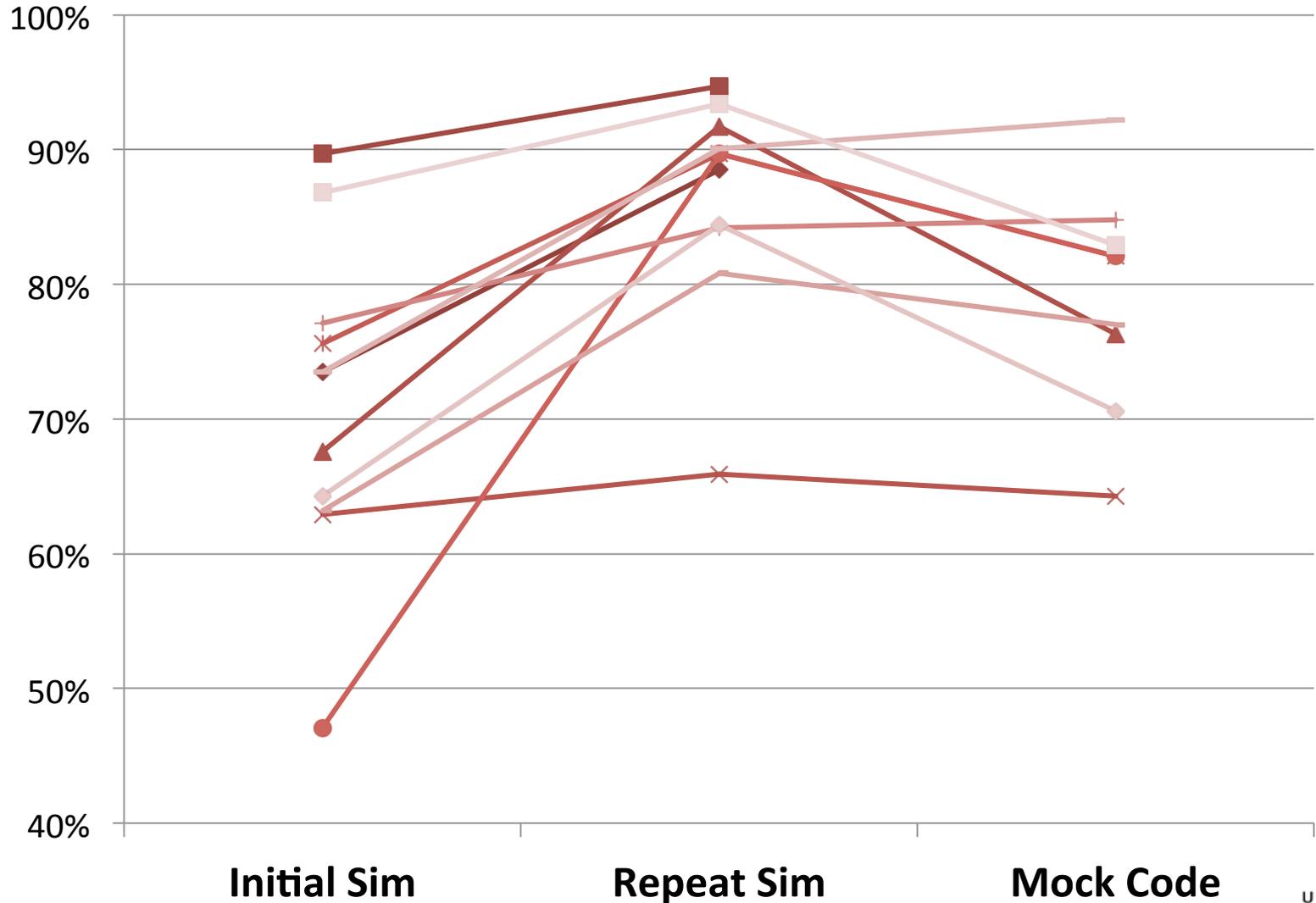
AED

OUTCOMES

% of MD Trainees Reporting Comfort with Resuscitation Skills



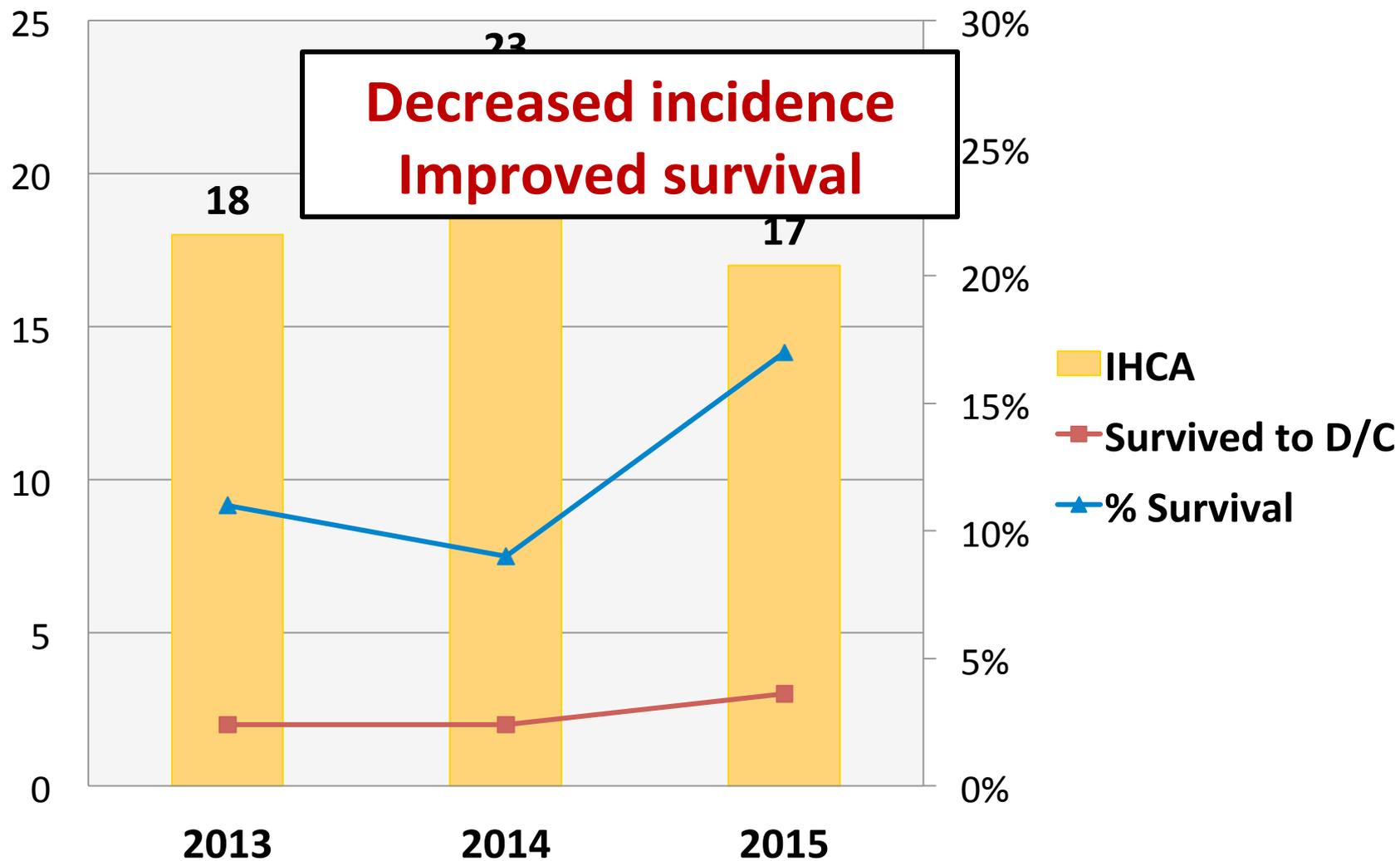
ACLS Adherence Scores – Initial simulation, repeat simulation, and mock code



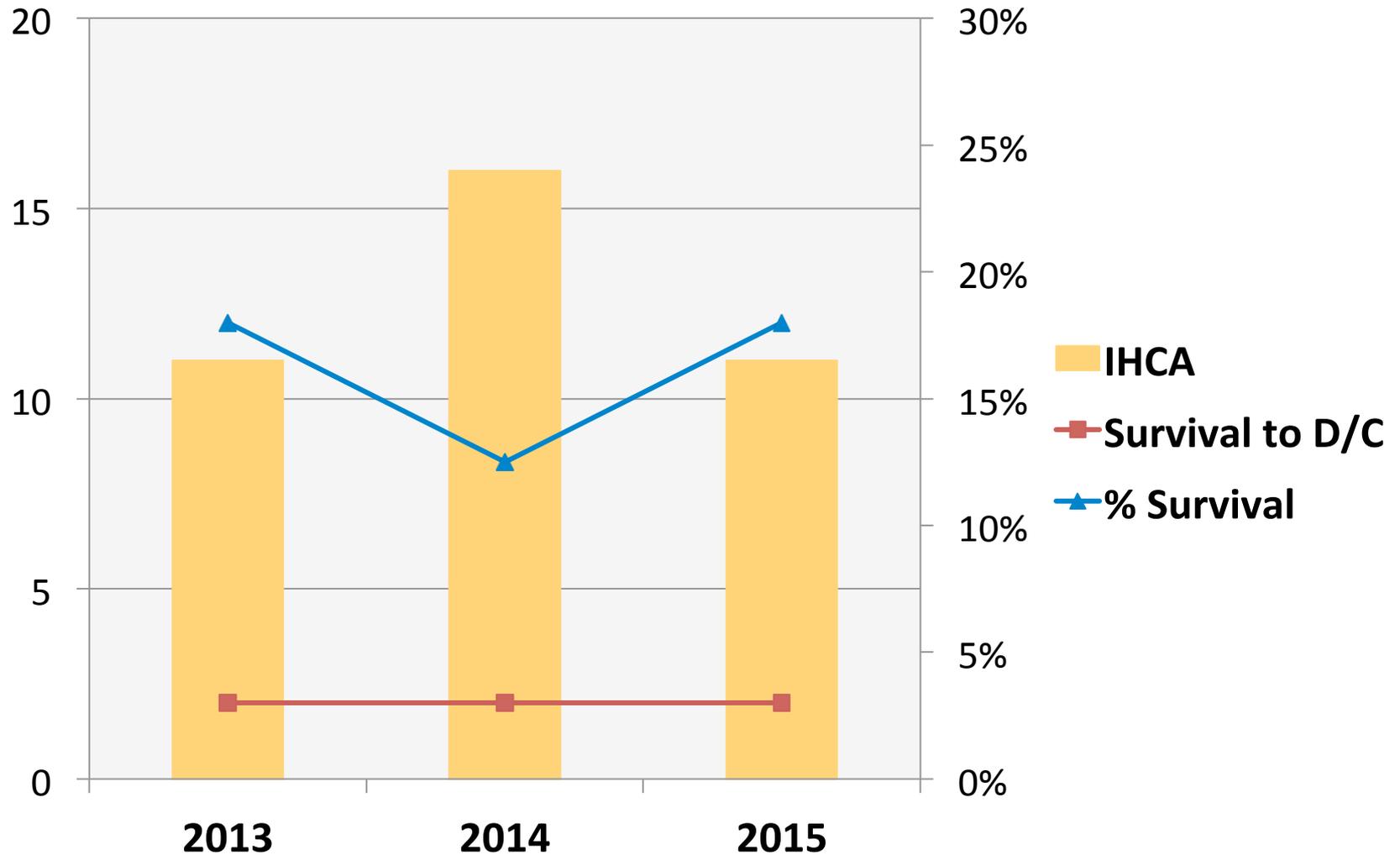
Observations

- MD struggle with defibrillator
- Most groups did a full 2-min round of CPR prior to defibrillation
- Obsession with epi
- Unfamiliar with post-arrest care for VT/VF
- Presence of even 1 well-trained or experienced provider changes the dynamic

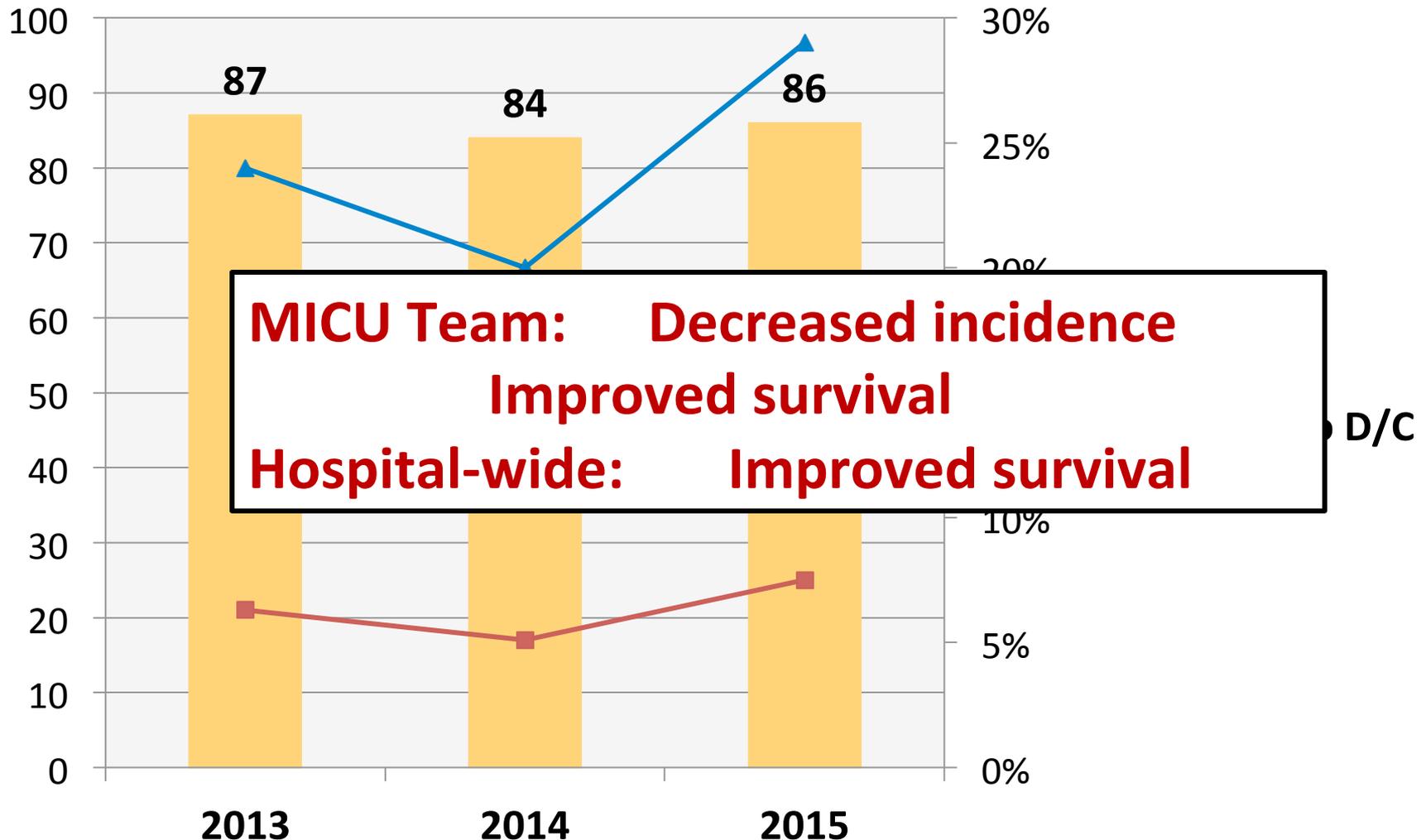
MICU Service IHCA Incidence and Survival



MICU Location IHCA Incidence and Survival



University of Louisville Hospital IHCA Incidence and Survival



Applications

- Procedural specialty
- Incoming fellows may not have the skills you assume they have
- Evaluation

“Any simulation in medical training... must be seen as a prelude to doing the real thing on a real patient, never as an end to itself.”

Kneebone 1999

“He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all.”

Sir William Osler