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BEST CHILDREN'S HOSPITALS U.S.News CARDIOLOGY & HEART SURGERY 2021-22

Integrating Simulation into Your Healthcare Setting

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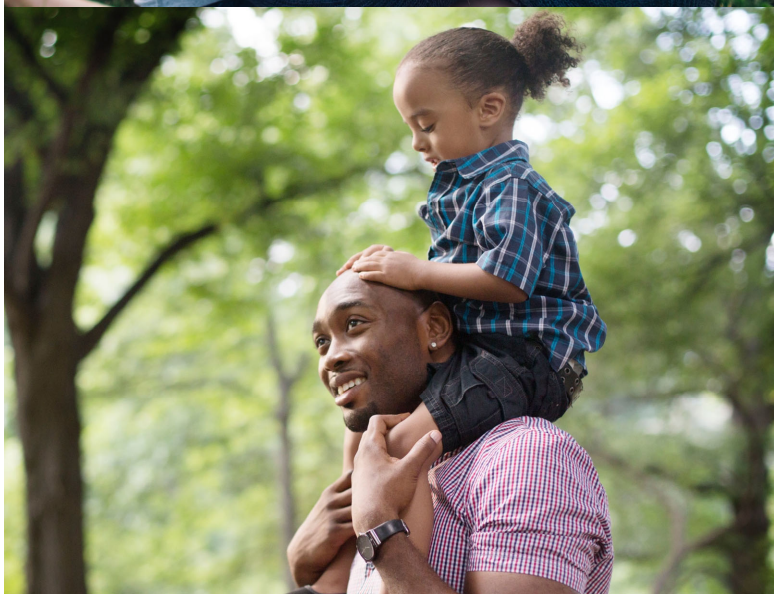
University of Kentucky / Kentucky Children's Hospital

The Joint Heart Program, a collaboration of Kentucky Children's Hospital and Cincinnati Children's, is jointly ranked by *U.S. News and World Report*.



Disclosures

- I have no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this activity.
- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

The Prebrief (AKA Ground Rules)

- Simulation requires **active participation** from both facilitators and learners to be the most successful
- As this is a talk on simulation…
  - I'm going to ask for your help or for examples during this talk
  - You will be able to unmute yourself and talk and/or type in the chat

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Learning Objectives

Upon completion of this activity, you will be better able to:

1. Identify the importance and benefits of healthcare simulation as a modality of medical education
2. Develop a simulation course that addresses your learners' needs and addresses a current performance gap
3. Implement a low-cost *in situ* pediatric simulation within your healthcare setting

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What is simulation?

- Type of experiential learning
  - A person, device, or set of conditions which attempts to present education and evaluation of problems authentically.
  - The student or trainee is required to respond to problems as he or she would under normal circumstances.
- Origins in the aviation industry
- Prevents participants from making mistakes in the future by providing a set of clinical circumstances in which it is *permissible to make mistakes and learn from them*.
- Allows the acquisition of clinical skills through *deliberate practice.*

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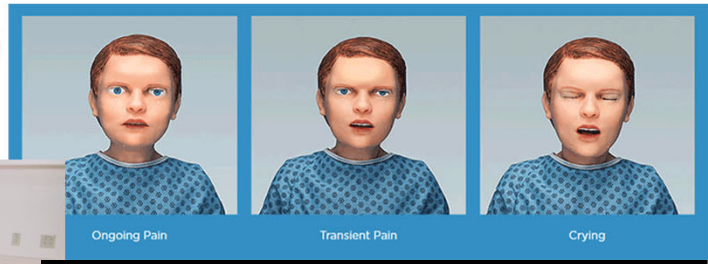
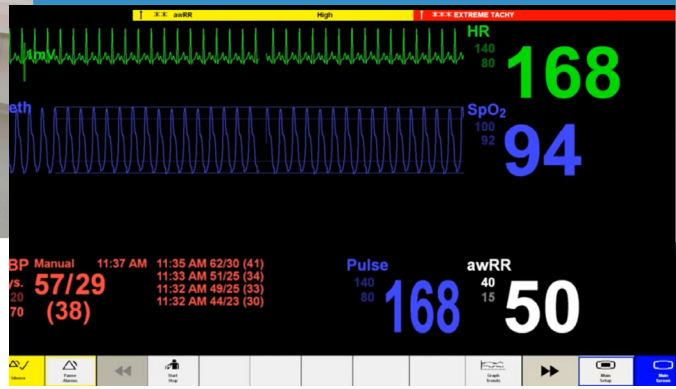
Issenberg SB, *et al*. *Med Teach.* 2005.; Lewis, *et al*. *Open Nurs J*. 2012.

Healthcare Simulations

- Task trainers
- Standardized patients (SPs)
- Simulation manikins
  - Low-technology to high-technology
- Virtual reality/augmented reality
- Remote/distance-based/telesimulations





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Foundations of Simulation-Based Medical Education (SBME) - Understanding Your Learners

Adults aren't just big children!

Pedagogy	Andragogy
Method of teaching children	Method of instructing adults

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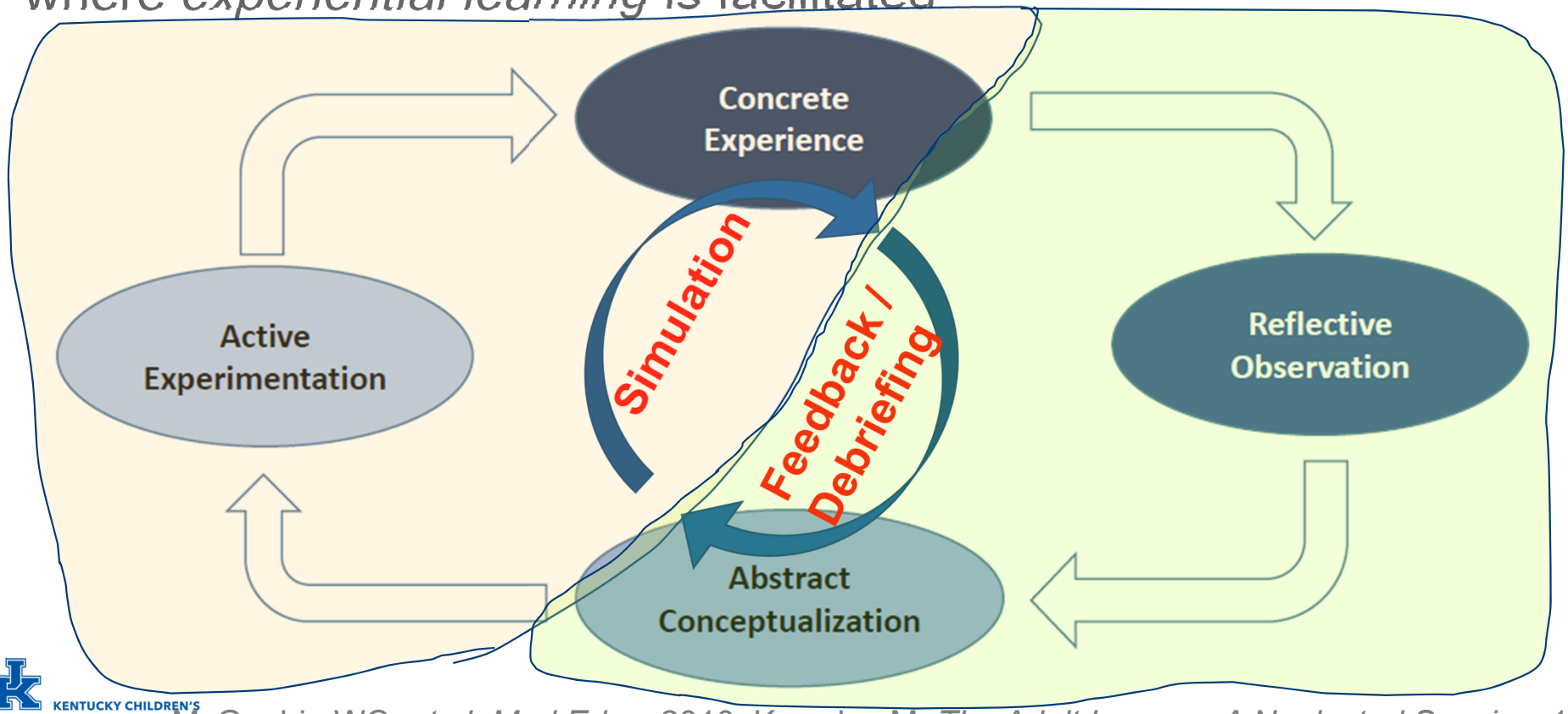
Knowles M. *Andragogy in Action*. 1984.

Foundations of SBME – Identify the Ideal Learning Approach

- Adult participants learn better in a *safe and supportive environment* where *experiential learning* is facilitated



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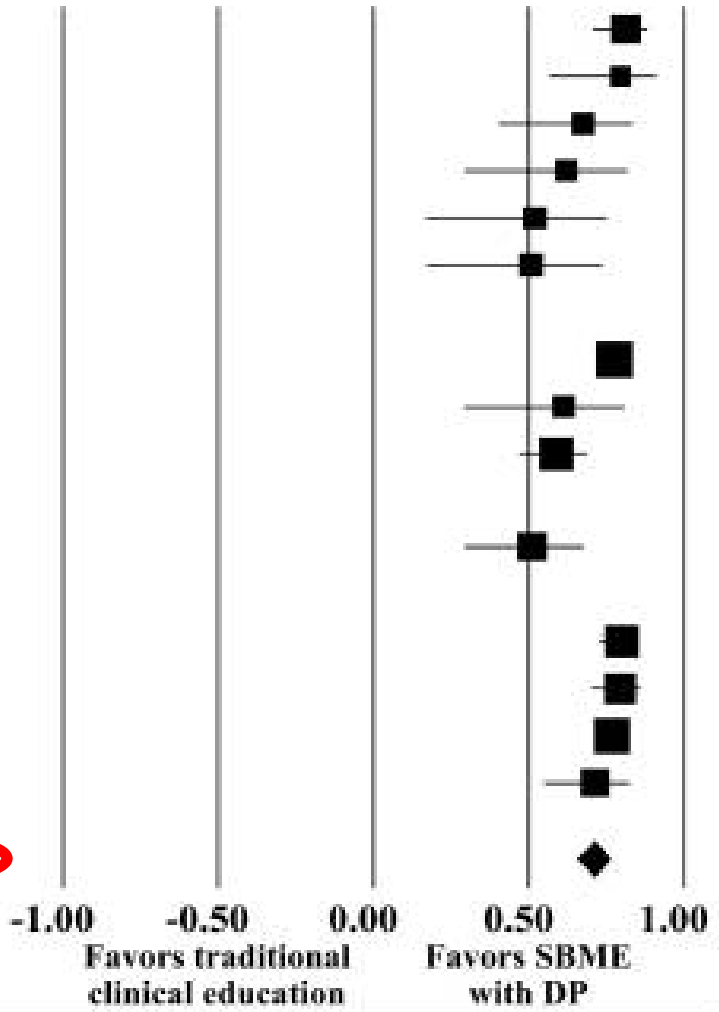
McGaghie WC, *et al. Med Educ*. 2010; Knowles M. *The Adult Learner: A Neglected Species*. 1973.

Research design and study	Correlation	Lower limit	Upper limit	*P*-Value
Randomized trials				
1. Wayne et al, 2005[21]	0.81	0.70	0.88	.000
2. Ahlberg et al, 2007[22]	0.80	0.56	0.91	.000
3. Andreatta et al, 2006[23]	0.67	0.40	0.84	.000
4. Korndorffer et al, 2005[24]	0.62	0.29	0.82	.001
5. Korndorffer et al, 2005[25]	0.52	0.17	0.75	.006
6. Van Sickle et al, 2008[26]	0.51	0.17	0.74	.005
Cohort studies				
7. Issenberg et al, 2002[27]	0.78	0.73	0.82	.000
8. Barsuk et al, 2009[28]	0.61	0.29	0.81	.001
9. Butter et al 2010[29]	0.59	0.47	0.69	.000
Case-control studies				
10. Wayne et al, 2008[30]	0.51	0.29	0.68	.000
Pre-post baseline studies				
11. Wayne et al, 2008[31]	0.80	0.72	0.86	.000
12. Barsuk et al, 2009[32]	0.79	0.70	0.86	.000
13. Barsuk et al, 2009[33]	0.77	0.71	0.82	.000
14. Stefanidis et al, 2006[34]	0.71	0.55	0.83	.000
Overall effect size	0.71	0.65	0.76	.000



Where do you begin?

- Course development is not just creating high-level scenarios but also requires:
  - Problem identification
  - Needs assessment
  - Development of learning objectives
  - Scenario design
  - Piloting
  - Scheduling of session(s)

Problem Identification

- Crucial first step that **informs** the learning objectives, simulation curriculum design, delivery, and evaluation of training
- Ensures that curriculum **aligns** with the goals and needs of the learners/organization
- How do I identify the problem?
  - Look for areas where there is a perceived **performance gap** between *current* practice and *ideal* practice
    - Was there a serious safety event that may have been avoidable?
    - Is your staff self-identifying gaps in skills or knowledge?
    - Was there a sub-optimal morbidity or patient outcome?
    - Is your team not adhering to hospital policy or established guidelines?

Needs Assessment

- Next – Perform the Needs Assessment
  - Meet with key stakeholders (i.e. unit directors, educators, hospital leadership, etc.) and content experts
  - Survey at least 10-20% of the intended learners
    - May need to include multiple professions/specialties
  - **<u>Identify the KEY DIFFERENCES between the current and ideal approaches?</u>**

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Development of Learning Objectives

- *Directly informed* by the results of your needs assessment
- Consider both technical (e.g. intubation technique) and non-technical (e.g. team communication) needs

  Tip: I always include non-technical LOs, typically on communication, teamwork, leadership skills, and/or room/equipment orientation
- Utilize the expertise of your content experts
- Align with the hospital's/unit's mission and/or goals
- These LOs should be:
  - Specific
  - Measurable (ideally)
  - **REALISTIC**

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Development of Learning Objectives

- Frequently used verbs for your LOs:
  - *Cognitive*
    - *Identify…*
    - *Recognize…*
    - *Interpret…*
    - *Distinguish…*
  - *Psychomotor*
    - *Demonstrate…*
    - *Show…*

Scenario Design

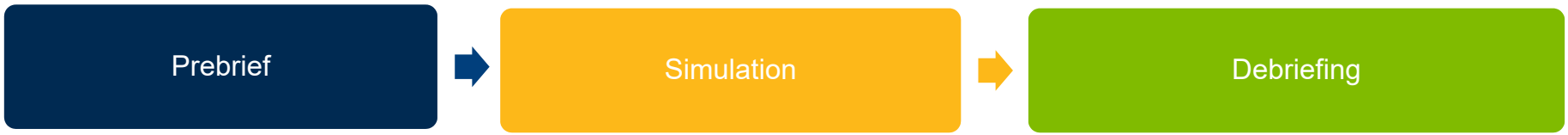
- Three GENERAL types of scenarios to design:
  - To mimic a real event that occurred
    - REMEMBER: **don't use identifying information!**
  - To practice low-frequency, high-stakes events (without necessarily a specific case in mind)
    - Consider using resources like MedEd Portal
  - To fine-tune existing processes OR to train staff on new processes/protocols
    - → design a scenario that "guarantees" that the learners will get to the point of when the checklist ideally would/should be used

Scenario Design

- Develop the scenario in a way that will provide the *concrete experience* for the learners to *actively reflect upon* in the debriefing to achieve your **desired learning objectives/goals**
  - *"Recognition"* LO? → may embed subtle verbal or non-verbal cues if the team fails to recognize what's going on
    - e.g. a facilitator/parent asking, "Why are his lips swelling?"
  - *"Demonstration"* LO? → make the disease process/scenario more obvious to focus on the technical skills
    - e.g. less subtle cues of anaphylaxis or even stating that "EMS just dropped off this patient with suspected anaphylaxis…" and focusing on correct administration of IM epinephrine

Scenario Design

- Main Components of a Simulation



Prebrief

- Introduce simulation
- Fiction Contract
- Confidentiality
- Psychological safety
- **Possibly list your learning objectives for the training
- Orientation to manikin, equipment, room

Simulation

- Brief report
- Learners progress through scenario
- Prepare for intended and unintended pathways
- Pre-specified maximum time limit vs case-completion

Debriefing

- **Most important part of the learning experience!**
- ****Should be TWICE as long as the simulation itself**
- Facilitator helps learners:
  - Reflect on experiences
  - Understand learners' frames of reference
  - Identify any inconsistencies
  - Help learners generate new hypotheses/thinking for how to approach/recognize/manage a problem

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A Word On Debriefing…

- Example Format:
  1. Reactions Phase?
  2. Case Summary
     - Leave no ambiguity!
     - Can have a learner try to summarize first.
  3. Analysis Phase
     - Plus/Delta **easiest**
  4. Learner Summary
     - Have each learner state one take-away before leaving!

+	Δ
Great teamwork!	Didn't order Abx
Closed-loop communication	Unclear roles
Early IV access	Undertreated respiratory failure
Quick fluid bolus	

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Implementing Your Simulation Curriculum

- Focused/brief *in situ* simulation for staff during a shift?

- More time dedicated to learning/education?

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Piloting

- Make sure to **PILOT/PRACTICE** your scenario at least a few times before unleashing it on your learners!

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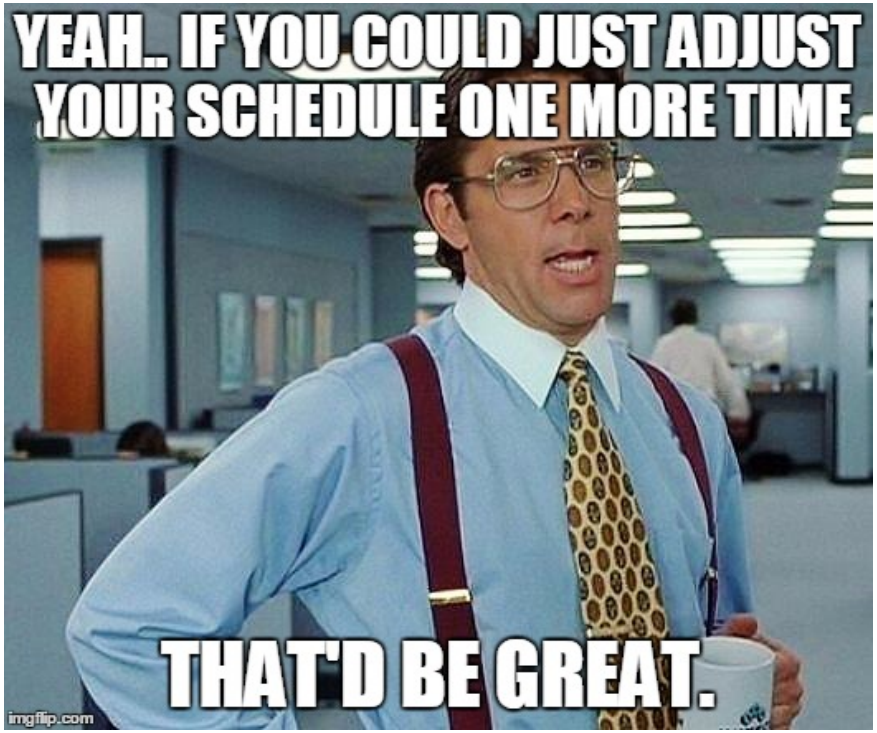
Scheduling of Session(s)

- Make it easy for your learners!



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Are there any questions about course design before we jump into designing a course together?

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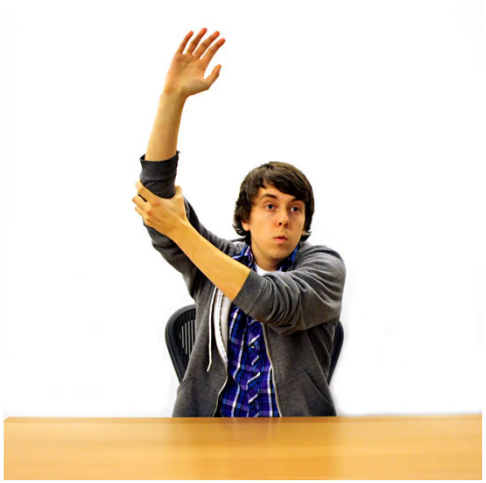
Let's Design a Simulation Course!

- **At this point, please unmute yourself and talk or type in the chat!**
- Does anyone have any real-life examples of problems at their institution, a recently-identified performance gap, or an example of something you want to tackle with a simulation course? If so, **please share!**



OR

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Let's Design a Simulation Course!

- Problem Identification
- Needs Assessment
- Development of LOs
- Scenario Design
- Piloting
- Scheduling of Sessions

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Let's Design a Simulation Course!

- **Problem Identification**
  - Describe the "problem."
  - What is the perceived performance gap?
- **Needs Assessment**
  - Who are your key stakeholders?
  - Who are your content experts?
  - How would you identify the needs of the learners?

Let's Design a Simulation Course!

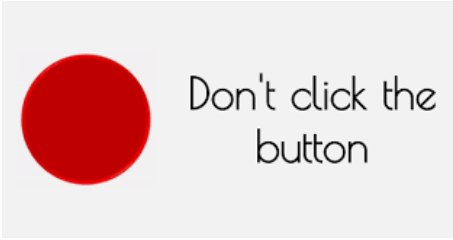
- **Development of LOs**
  - Identify technical LOs for this course.
    - Motor Skills:
    - Cognitive Skills:
  - Identify a non-technical LO for this course.

Let's Design a Simulation Course!

- **Scenario Design**
  - How long do you have for the whole session?
    - Planned prebrief time?
    - Planned simulation time?
    - Planned debrief time? (**twice as long as the simulation)
  - Who are your target participants?
  - Where will the sim take place? (Sim Center? *In situ* in the ED?)
  - What's the case outline?
  - How many people do you need to help you run the sim? (i.e. any other facilitators, patient actors/standardized patients, etc.)
  - What equipment do you need and how should it be set up?
  - Do you need any images, labs, etc.?

Let's Design a Simulation Course!

- **Piloting**
  - Who will you include in your pilot sessions?
- **Scheduling of Sessions**
  - Any special circumstances to consider with scheduling?
    - Cancellation policy based on workload (e.g. ED is ≥ 80% capacity)?
    - Are people coming in from home to do the training or is it during a work shift?



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Let's Design a Simulation Course!

- Problem Identification
- Needs Assessment
- Development of LOs
- Scenario Design
- Piloting
- Scheduling of Sessions

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Let's Design a Simulation Course!

- **Problem Identification**
  - Describe the "problem."
    - A 3yo ex-24wk patient with BPD, trach/vent dependence, and developmental delays recently presented to your ED/urgent care setting with profound hypoxemia, bradycardia, and ultimate cardiorespiratory arrest. CPR was performed for 20 minutes before identifying the patient's trach was dislodged and, only after being replaced, was ROSC achieved.
  - What is the perceived performance gap?
    - Trach wasn't changed/assessed ASAP.

Let's Design a Simulation Course!

- **Needs Assessment**
  - Who are your key stakeholders?
    - C-suite, department leadership, RT leadership, RN leadership, ?ENT, ?trach workgroups, ?EMS
  - Who are your content experts?
    - ENT? ED providers? RT? Someone else?
  - How would you identify the needs of the learners?
    - Survey intended participants re: comfort with caring for patients with trachs, knowledge of how to change trachs, knowledge of when to change trachs, ?quiz questions, interest in learning more about trach care.

Let's Design a Simulation Course!

- **Development of LOs**
  - Identify technical LOs for this course.
    - 1. Recognize trach dislodgement as an etiology for cardiorespiratory arrest in a pediatric patient with a tracheostomy.
    - 2. Demonstrate the ability to properly replace a tracheostomy in a pediatric patient according to hospital protocol.
  - Identify a non-technical LO for this course.
    1. Demonstrate effective team communication skills during a pediatric patient decompensation event.

Let's Design a Simulation Course!

- **Scenario Design**
  - How long do you have for the whole session? **1 hr**
    - Planned prebrief time? **~5-7min**
    - Planned simulation time? **~15min**
    - Planned debrief time? (**twice as long as the simulation) **35-40min**
  - Who are your target participants? **RNs, RTs, ED physicians/fellows/residents, ?EMS, ?Child Life, ?chaplain, ?airway team (?ENT, ?anesthesia)**
  - Where will the sim take place? (Sim Center? ***In situ*** **in the ED?)**
  - What's the case outline? **3yo with Hx as in problem ID, found cyanotic and unresponsive at home, developed PEA arrest en route to your ED, remains in PEA until trach is changed and ventilation is resumed via new trach.**

Let's Design a Simulation Course!

- **Scenario Design**
  - How many people do you need to help you run the sim? (i.e. any other facilitators, patient actors/standardized patients, etc.) **1 facilitator/running sim, 1-2 people to act as EMS for hand-off**
  - What equipment do you need and how should it be set up? **Airway equipment (intubation supplies, BMV, extra trachs – same size, 1 below), code cart + meds, defibrillator + pads, fluids, IV access supplies, ?I/O supplies**
  - Do you need any images, labs, task trainers (e.g. leg for I/O training), etc? **VBG/lytes, glucose, ?CXR**

Let's Design a Simulation Course!

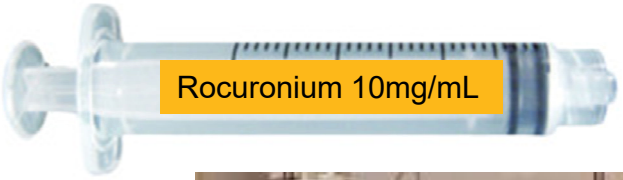
- **Piloting**
  - Who will you include in your pilot sessions? **First session with experienced RN/RT/physician team, next session with more junior team**
- **Scheduling of Sessions**
  - Any special circumstances to consider with scheduling?
    - Cancellation policy based on workload (e.g. ED is ≥ 80% capacity)? **Yes**
    - Are people coming in from home to do the training or is it **during a work shift**?

Designing an *In Situ* Simulation

- Advantages
  - No need for “bricks & mortar” simulation lab
  - Fewer scheduling conflicts with other trainings
  - Learners don’t need to come in from home – more flexible!
  - “Representative” teams
  - Likely more **cost-effective** than lab-based training
- Disadvantages
  - Generally less available time for sim & debriefing
  - Generally only run scenario once due to time constraints (fewer opportunities for active experimentation)
  - Higher cancellation rate (need to balance training with clinical care)

Can I Borrow This Forever?

- Syringes, pIVs, fluids, etc?
  - Ask institution if expired supplies can be donated to you or if you can use some non-expired supplies to facilitate education
- Medications
  - Label syringes or bags (filled with water)
  - May be able to have old medication bottles/syringes donated – MARK NOT FOR PATIENT USE
- Airway Equipment
  - Ask to use cleaned/disposable or expired equipment or for a donation
  - Remember other supplies like nasal cannula, BMV, etc. that team may request
- Other Equipment?



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Tip: Make a checklist of everything you need for a scenario!

Is This Thing Real?

- Standardized patient?
- Manikin?
  - **Tip: You may need to design your scenario(s) around what equipment you have available to you! (e.g. infant manikin = infant-based scenarios)**
- Family or others?
- Embedded participant?
  - **Example:** Nurse who intentionally sets-up a bolus on an infusion pump for a hypotensive patient rather than push-pull or rapid infuser.

Let's Kick It Up A Notch!

- You can take a low-technology manikin and make a simulation medium-fidelity by adding embedded visuals/exam findings and real-time vitals (for cheap or free!).
- Generates a more-realistic setting that can create a sense of urgency that **enhances learning.**

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No High-Tech Manikin? No Problem!

- **Easiest:** Have the learner ask for the exam findings that the manikin can't display (if they are performing the exam correctly)!
- **Still Easy But Better:** Use videos or images in a PPT (or show a photo on paper)!

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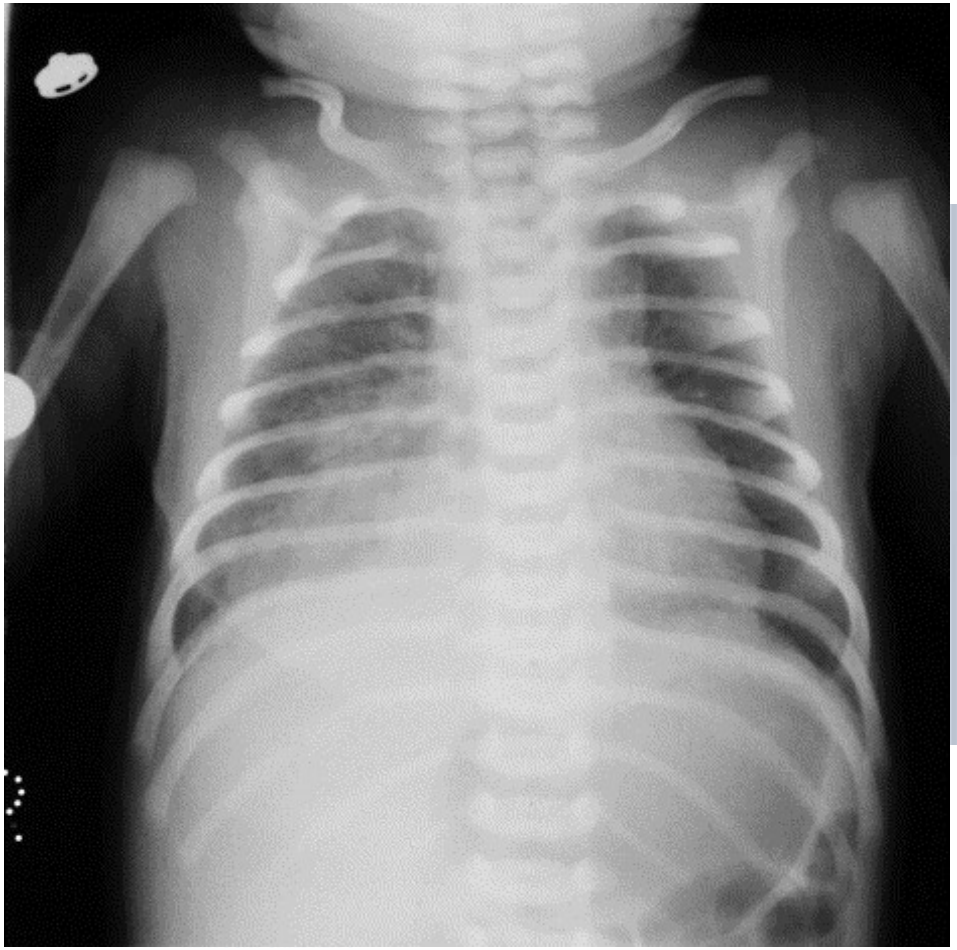
Get Creative!



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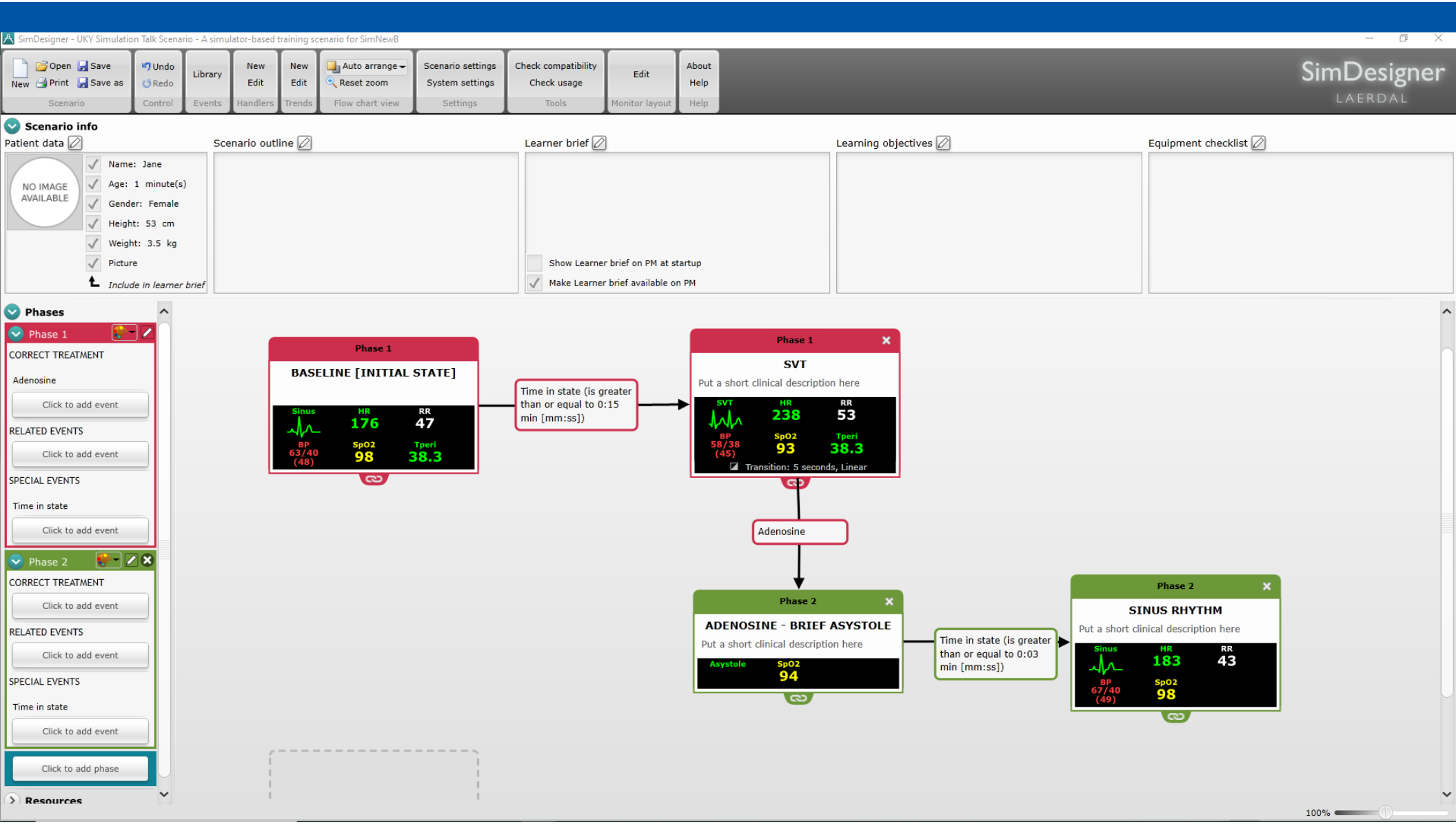
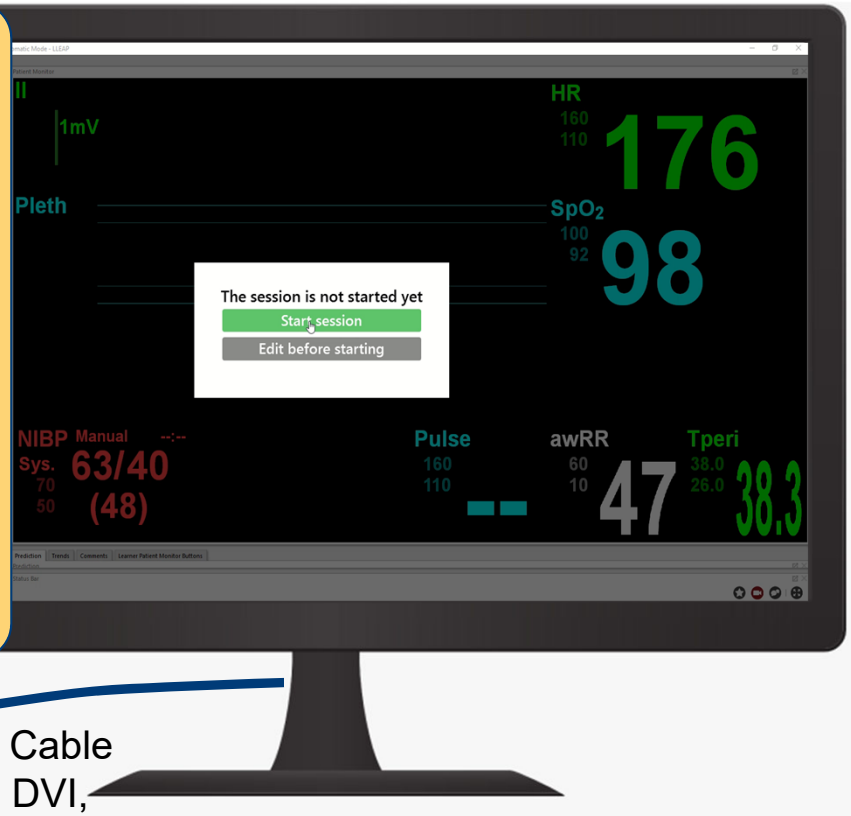

SimDesigner - UKY Simulation Talk Scenario - A simulator-based training scenario for SimNewB
New
Open
Print
Save
Save as
Scenario
Undo
Redo
Control
Library
Events
New
Edit
Handlers
New
Edit
Trends
Auto arrange
Reset zoom
Flow chart view
Scenario settings
System settings
Settings
Check compatibility
Check usage
Tools
Edit
Monitor layout
About
Help
Help
SimDesigner
LAERDAL
Scenario info
Patient data
NO IMAGE AVAILABLE
Name: Jane
Age: 1 minute(s)
Gender: Female
Height: 53 cm
Weight: 3.5 kg
Picture
Include in learner brief
Scenario outline
Learner brief
Show Learner brief on PM at startup
Make Learner brief available on PM
Learning objectives
Equipment checklist
Phases
Phase 1
CORRECT TREATMENT
Adenosine
Click to add event
RELATED EVENTS
Click to add event
SPECIAL EVENTS
Time in state
Click to add event
Phase 2
CORRECT TREATMENT
Click to add event
RELATED EVENTS
Click to add event
SPECIAL EVENTS
Time in state
Click to add event
Click to add phase
Resources
Phase 1
BASELINE [INITIAL STATE]
Sinus
HR
176
RR
47
BP
63/40
(48)
SpO2
98
Tperi
38.3
Time in state (is greater than or equal to 0:15 min [mm:ss])
Phase 1
SVT
Put a short clinical description here
SVT
HR
238
RR
53
BP
58/38
(45)
SpO2
93
Tperi
38.3
Transition: 5 seconds, Linear
Adenosine
Phase 2
ADENOSINE - BRIEF ASYSTOLE
Put a short clinical description here
Asystole
SpO2
94
Time in state (is greater than or equal to 0:03 min [mm:ss])
Phase 2
SINUS RHYTHM
Put a short clinical description here
Sinus
HR
183
RR
43
BP
67/40
(49)
SpO2
98
100%

Laerdal's LLEAP Software

Paper Covering Controls



Connecting Cable (e.g. HDMI, DVI, DisplayPort, etc.)

Controller Laptop w/ LLEAP Software

Display Monitor

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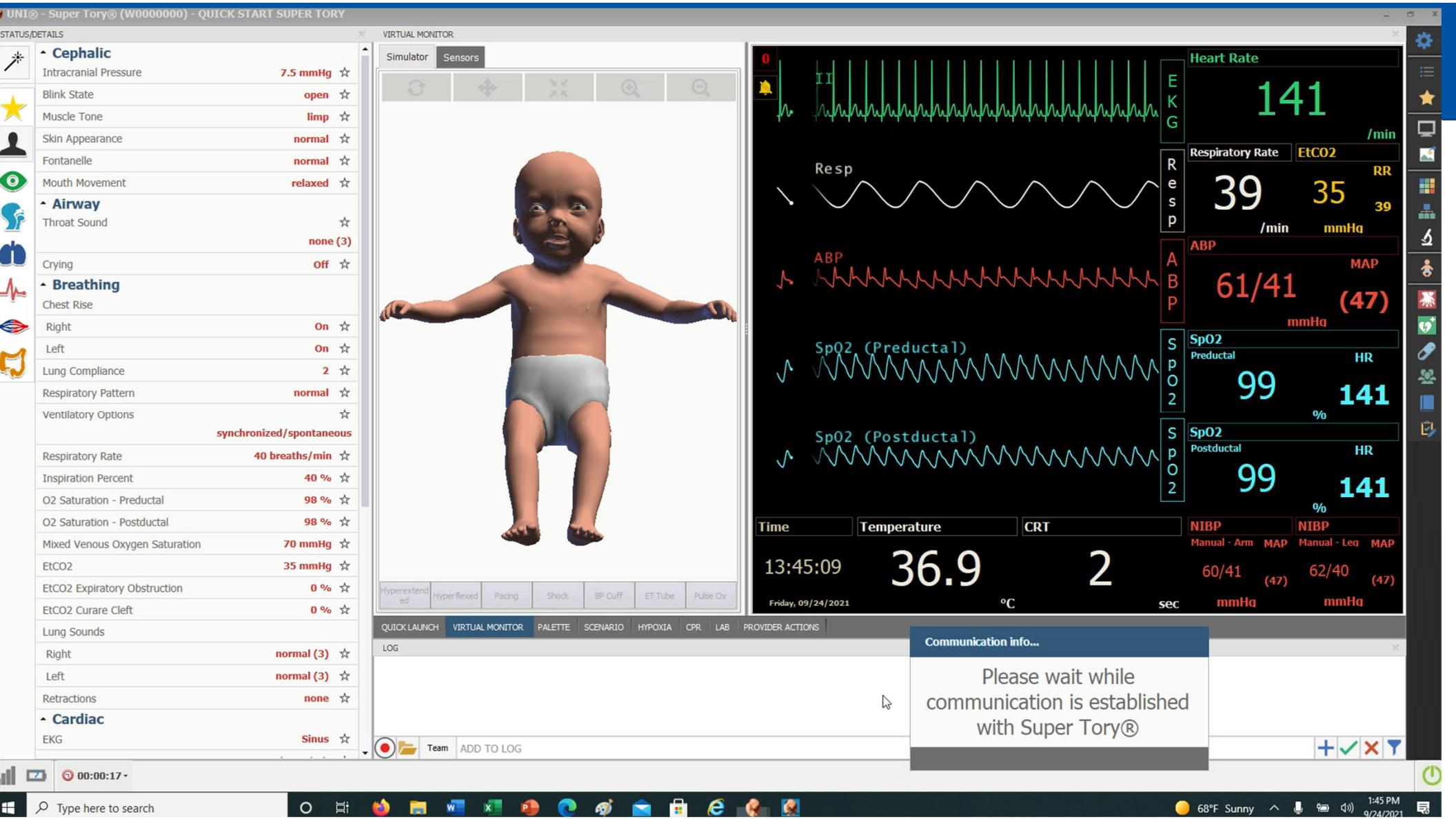
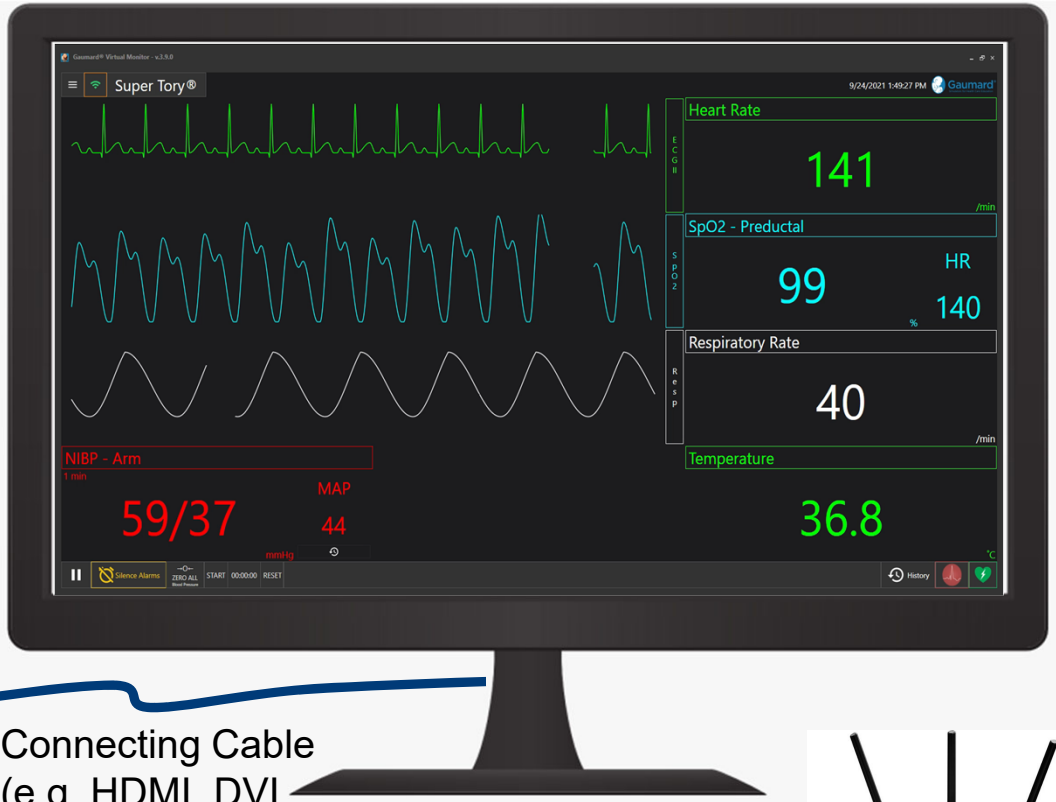
****DUPLICATE SCREEN****


UNI® - Super Tory® (W0000000) - QUICK START SUPER TORY
STATUS/DETAILS
Cephalic
Intracranial Pressure 7.5 mmHg
Blink State open
Muscle Tone limp
Skin Appearance normal
Fontanelle normal
Mouth Movement relaxed
Airway
Throat Sound none (3)
Crying Off
Breathing
Chest Rise
Right On
Left On
Lung Compliance 2
Respiratory Pattern normal
Ventilatory Options synchronized/spontaneous
Respiratory Rate 40 breaths/min
Inspiration Percent 40 %
O2 Saturation - Preductal 98 %
O2 Saturation - Postductal 98 %
Mixed Venous Oxygen Saturation 70 mmHg
EtCO2 35 mmHg
EtCO2 Expiratory Obstruction 0 %
EtCO2 Curare Cleft 0 %
Lung Sounds
Right normal (3)
Left normal (3)
Retractions none
Cardiac
EKG Sinus
VIRTUAL MONITOR
Simulator
Sensors
Hyperextended
Hyperflexed
Pacing
Shock
BP Cuff
ET Tube
Pulse Ox
EKG
Heart Rate
141
/min
Resp
Respiratory Rate
EtCO2
39
/min
35
mmHg
RR
39
ABP
ABP
MAP
61/41
(47)
mmHg
SpO2 (Preductal)
SpO2
Preductal
HR
99
%
141
SpO2 (Postductal)
SpO2
Postductal
HR
99
%
141
Time
Temperature
CRT
NIBP
Manual - Arm
MAP
NIBP
Manual - Leg
MAP
13:45:09
36.9
°C
2
sec
60/41
(47)
mmHg
62/40
(47)
mmHg
Friday, 09/24/2021
QUICK LAUNCH
VIRTUAL MONITOR
PALETTE
SCENARIO
HYPOXIA
CPR
LAB
PROVIDER ACTIONS
LOG
Communication info...
Please wait while communication is established with Super Tory®
Team
ADD TO LOG
00:00:17
Type here to search
68°F Sunny
1:45 PM
9/24/2021

Gaumard's UNI Software



Connecting Cable
(e.g. HDMI, DVI, VGA, DisplayPort, etc.)

Controller Laptop w/ UNI Software

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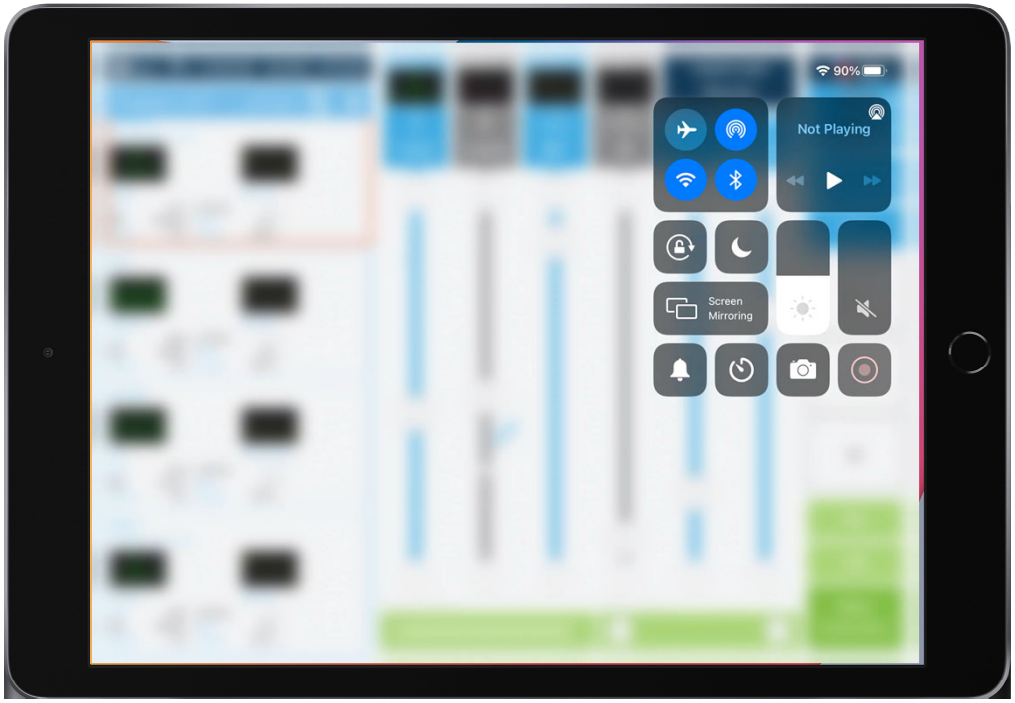
EXTENDED SCREEN

"Display" CPU
Display Monitor
(e.g. All-in-One CPU)

Router

iSimulate System



Controller iPad
(handheld)

Monitors/Receiver iPad
(larger)

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****CONNECT VIA WiFi****

Comparing the Options

Laerdal's LLEAP Software	Gaumard's UNI Software	iSimulate System

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You'll Be Ready In No Time!

UK HealthCare
KENTUCKY CHILDREN'S HOSPITAL

Learning Objectives

Upon completion of this activity, you will be better able to:

1. Identify the importance and benefits of healthcare simulation as a modality of medical education
2. Develop a simulation course that addresses your learners' needs and addresses a current performance gap
3. Implement a low-cost *in situ* pediatric simulation within your healthcare setting

UK HealthCare
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Special Thanks

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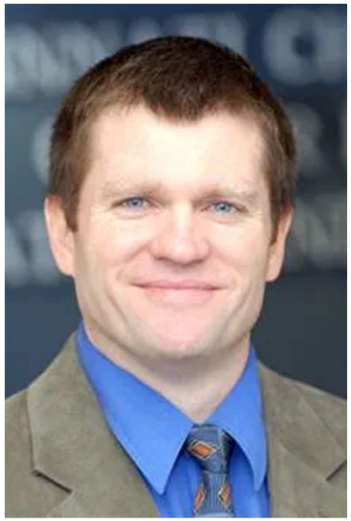

Gary L. Geis, MD
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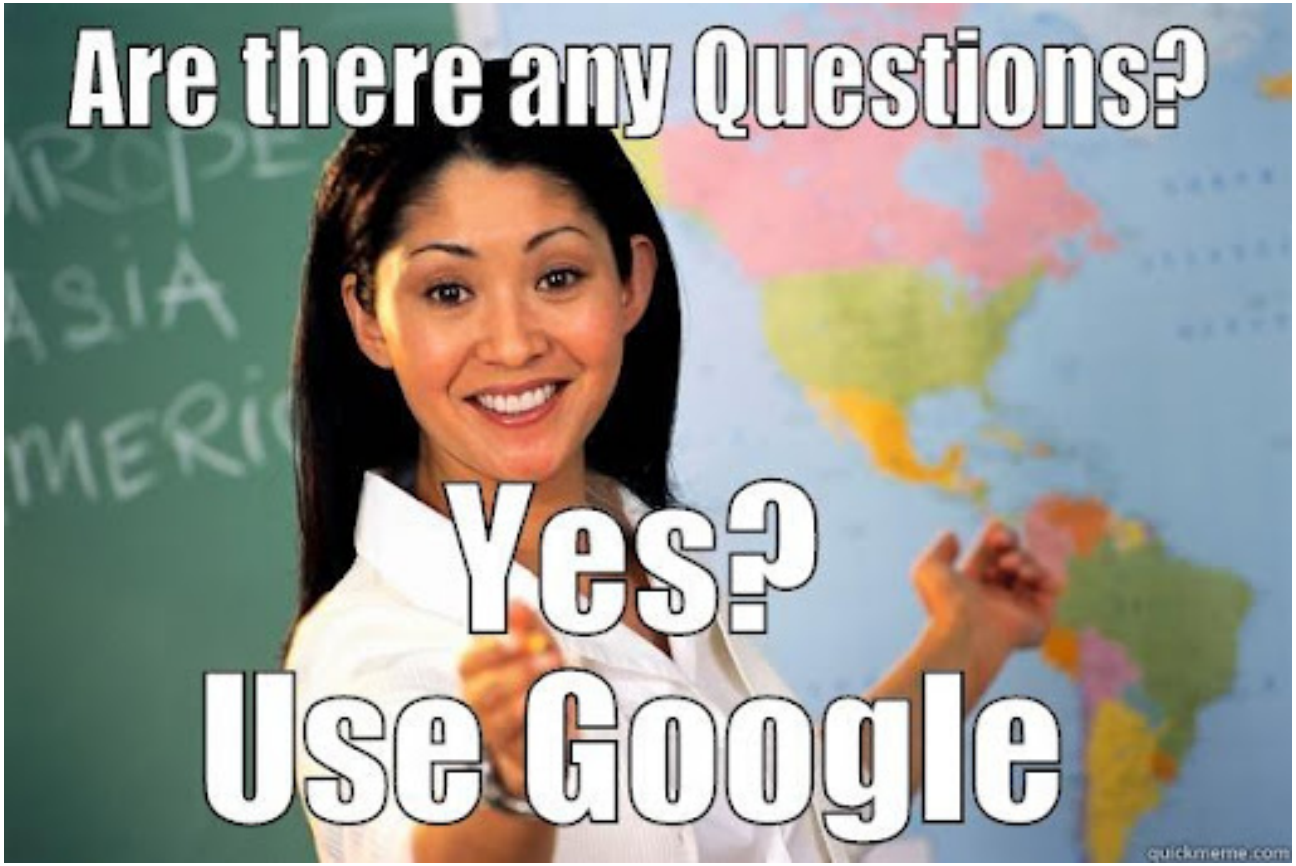
Medical Director, Center for Simulation & Research
Program Director, Medical Simulation Fellowship
Cincinnati Children's Hospital Medical Center

Thanks, and Good Luck!

Contact Information:
E-mail: Ryan.Fredericks@uky.edu



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