Just Like the Simulations: Improving Medical Student Confidence with Simulated Emergency Medicine Scenarios

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Background: *Incoming emergency medicine (EM) residents may feel unsure of their ability to handle common emergency department scenarios, even if they are well educated on the proper steps to take in those scenarios. This may not stem from a lack of skill so much as a lack of confidence in their ability to perform with skills they have.*
Objective: *We look to establish a link between completion of simulation-based training in common EM scenarios and learner self-reported confidence in their ability to perform competently in those scenarios.*
Methods: *Fourth-year medical students who matched into an EM residency program participated in a Transitional Educational Program (TEP) at the Interprofessional Immersive Simulation Center at the University of Toledo in April 2021. Simulations of 16 procedural skills and clinical judgement cases were carried out using high-fidelity mannequins and real medical equipment in a hospital-based setting. Subjects were given pre- and post-TEP survey questionnaires assessing their self-reported confidence to competently perform in common EM clinical scenarios, using a 5-grade Likert scale. Data were analyzed using a one-tailed Wilcoxon signed-rank matched-pairs test.*
Results: *Of 19 participating subjects, 16 (84.2%) consented and responded to the pre-survey. Of those 16 subjects, 10 (62.5%) completed the surveys at the correct time and order. The pre- and post-surveys consisted of the same 14 questions. In 11 of 14 survey questions, there was a significant increase in subject self-reported confidence ($p < 0.05$) between pre- and post-survey.*
Conclusions: *Simulation-based training in the setting of high-fidelity equipment and faculty guidance improved the self-reported confidence of incoming EM residents to perform in common EM scenarios.*

Keywords: *Simulation; medical education; emergency medicine; technology; confidence*

INTRODUCTION

Real-world clinical situations can be daunting for both medical students and residents. While clinical experience is a vital part of medical school and residency curricula, beginning learners of both levels may not feel confident in their ability to manage the clinical scenarios that they will face on these rotations.[1] Most medical students entering clinical education will have just completed several years of preclinical work, in which they learned about the foundations of medicine mostly through reading and attending lectures. Though incoming first-year residents have completed their medical school clinical rotations, they are quickly transitioning from those curated, supervised clinical experiences to real-world clinical scenarios in which they will be the primary decision makers in patients' medical care. While the preclinical and pre-residency education undertaken by these learners provides the groundwork for clinical competency, it does not always directly translate to clinical ability. For example, even though a first-year resident might know the proper steps for many various procedures or exams indicated in a trauma patient, they may lack confidence in their ability to adequately perform these steps in a real clinical setting, and thus can still 'freeze up' and find themselves unable to perform when needed. One way that medical education has evolved to help learners better navigate the transition to real-world clinical practice is through the use of simulations.

Several studies cited here have shown proof of concept for the ability of simulation-based educational programs to increase the self-reported confidence of medical students and incoming residents in their ability to perform emergency medicine (EM) procedures and make clinical decisions. However, available literature did not provide a standardized version of simulation-based education; variations in simulation programs include the use of mannequins, standardized patients, computer-based scenarios, replica equipment, and more. Several studies identified advantages of using the most lifelike

equipment available, while also eliminating any risk to real or standardized patients as learners complete the simulated procedures.[2–4] Therefore, our investigation explores specifically the use of a transitional education program (TEP) consisting of high-fidelity mannequin human patient simulators and real clinical equipment, taking place in a hospital-based simulation setting. The TEP was led by faculty in the Department of Emergency Medicine at the University of Toledo College of Medicine and Life Sciences (UTCOMLS) and was aided by other trained medical staff employed by the university. As the focus of this study is EM procedures, we restricted our subject population to graduating fourth-year medical students who had matched into an EM residency program that same year.

Our study investigates the use of simulation-based education for fourth-year medical students and assesses their self-reported confidence levels through scaled surveys both before and after they perform in the role of a first-year EM resident in several simulated clinical scenarios. Our primary outcome measure is the change in self-reported confidence measured by the Likert scale described here, with higher scores indicating higher confidence in each respective clinical scenario. We hypothesize that the use of simulation-based training will have a positive effect on self-reported confidence levels in this cohort's ability to perform the simulated procedures in real-world clinical practice. We hope to add to the available body of literature regarding simulation use in medical education, with an emphasis on self-reported confidence levels as an important factor alongside competence in evaluating medical learners' ability to perform in clinical scenarios.

METHODS

Settings and Participants

The TEP was held in April 2021 at the Interprofessional Immersive Simulation Center, a state-of-the-art facility at the University of Toledo Health Science Campus with capabilities including high-fidelity mannequins, advanced clinical simulations, virtual reality, and anatomy/surgical skills training. The TEP was designed by teaching and clinical faculty of both the Department of Graduate Medical Education and the Department of Emergency Medicine at the UTCOMLS. All designing and participating faculty had at least 5 years of experience, with most eclipsing 10 years. Participants in the TEP consisted of 19 fourth year medical students (M4s) who matched into an EM residency program and planned to enroll as a first-year resident upon graduation from medical school. The subjects volunteered to participate in the TEP by responding to an email sent to them several weeks prior to the event. The faculty and staff that conducted the TEP were all involved with the Department of Emergency Medicine or the Department of Graduate Medical Education at UTCOMLS. Each subject received the intervention (attended the TEP) and self-reported confidence in the ability to perform each procedure was assessed before and after the intervention.

Interventions

To better prepare graduating medical students for their intern year in the EM setting, the TEP was designed with 10 simulations of common EM skills, six simulations of common patient cases requiring rapid clinical judgment, and several structured and unstructured discussions with EM faculty and residents (Fig. 1) (Appendix A). The schedule of events was assembled after discussions with many medical students, residents, and faculty at UTCOMLS, who collectively identified the listed topics as areas in which first-year residents had a high potential to feel underprepared or unsure of their abilities.

Before the program started at 8:00 am, subjects were asked to complete the pre-survey individually. Subjects were then put into small groups of two to four and were randomly placed into one of the six morning session activities (three skill simulations and three case simulations). Subject groups spent 30 min at each station, including a briefing and debriefing before and after each simulation. After the station time had elapsed, subject groups rotated to the next station. This process repeated

Morning Sessions (8 AM - 12 PM)	Afternoon Sessions (1 PM - 5 PM)
Cases: Cardiac Pacing Airway: CHF or Asthma Trauma: ACLS	**Cases:** GI Bleed AMS: Hypoglycemia Stroke: Hemorrhagic vs. Ischemic
Skills: Placement: IO Splint Chest Tube Pigtail Suturing Lumbar Puncture	**Skills:** Urgent Airway: Intubation Emergent Airway: Cricothyroidotomy Sick vs. Non-sick: Identification Picking the Right Medication
3rd Year Clinical Horror Stories	**Q&A with Residents & Faculty**

Figure 1. TEP Schedule.

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until all morning session stations were completed. There was a 1-h lunch break between the morning sessions and the afternoon sessions. The afternoon session was completed in the same manner as the morning session. After the TEP was finished, subjects who completed the pre-survey were asked to complete the post-survey.

Outcomes Measured

To assess the impact of the TEP on M4 self-reported confidence in the EM setting, this study used a descriptive pre/post survey design, with the pre-survey given immediately prior to the simulations program and the post-survey given immediately after the program was completed. The study survey consisted of 14 statements asserting confidence in various EM procedures (all of which would later be topics covered in a simulation during the TEP), and subjects were asked to indicate their level of agreement with each statement on a standard 5-grade Likert scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree) (Appendix B). These survey questions were designed according to guidelines proposed by Nemoto and Beglar.[5] The pre-survey included the informed consent agreement, three demographic questions, the study survey, and a field for the entry of a unique 4-digit PIN that would be used to link pre- and post-survey responses to an individual without the need to collect any other identifiers. The post-survey included the PIN field, the study survey, and another 8-item survey (the secondary survey). The secondary survey asked the subjects to indicate their level of agreement, on the same 5-grade Likert scale used in the primary survey, with statements about the usefulness of simulations as an education tool, their perception of how closely the simulations matched real clinical scenarios that they had experienced, and their satisfaction with the TEP.

The pre-survey was made available at 9:30 pm the night before the start of the TEP, and submissions were accepted until the program started at 8:05 am. The post-survey was made available at completion of the TEP, and submissions were accepted for 10 days; this longer window was used to allow subjects adequate time for survey completion during a very busy time at the end of their medical school careers. Both surveys were administered with Microsoft Office Forms and sent to the subjects' personal email addresses. Likert scale data from each survey was exported from Office Forms, linked by PIN, and analyzed using Microsoft Excel. Data were only accepted for analysis if: (1) the pre-survey was completed before the start of the TEP (8:05 am on 4/6/2021) and (2) there was both a pre- and post-survey linked to the same PIN.

The primary outcome of this study is the measured change in self-reported confidence in subjects' ability to adequately perform in each situation that was covered in the TEP simulations, with a secondary outcome of the measure of participants' opinions on the effectiveness of simulations in medical education.

Analysis of Outcomes

Pre-TEP and post-TEP survey responses (n = 10) were analyzed using a one-tailed Wilcoxon signed-rank matched-pairs test.[6] Statistical significance was determined with a p-value of 0.05 and a critical value of 10, as per the critical value table computed by McCornack.[7] The secondary survey regarding simulation effectiveness in medical education was assessed for general positive or negative responses to each question by assigning numerical values to the Likert scale responses (−2 = strongly disagree, −1 = disagree, 0 = undecided, 1 = agree, 2 = strongly agree) and calculating average values for each question and each subject response.

IRB Statement

This study was approved as an institutional review board (IRB)-exempt study by the University of Toledo Institutional Review Board.

RESULTS

The study population was composed of fourth-year medical students at the University of Toledo who had matched into an EM residency program beginning after graduation. The TEP was advertised to all EM residency-matched students via email, and 19 signed up to attend the program. Of these 19 participants, 16 responded to the pre-survey and informed consent (84.2%). Of those 16 consenting subjects, 10 (62.5%) completed surveys at the correct times and used a PIN that linked a pre-survey response to a post-survey response, for a final study sample of 52.6% (10/19) of the available population. These 10 primary survey pairs comprised the analyzed data set (Tables 1 and 2).

Of the 14 questions on the primary survey, 11 showed a significant increase in subject self-reported confidence after the TEP (Fig. 2). Notably, the pre-survey had four total 'strongly agree' responses, and the post-survey had 29, an increase of over sevenfold. Similarly, the

Table 1. Demographic questions and responses given by the 10 study subjects.

		Demographics			
What Is your level of training?	M4 (10)	Other (0)			
What gender do you Identify with?	Man (6)	Woman (4)	Other (0)		
What Is your age?	21–25 (3)	26–30 (6)	31–35 (0)	36–40 (0)	40+ (1)

Table 2. Primary survey questions and responses, grouped by question and timing (whether pre- or post-survey).

Survey Question	Q#	Survey	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I feel confident in my ability to manage an emergent airway, e.g. performing a cricothyrotomy	**Q1**	Pre	1	4	3	2	0
		Post	0	1	0	7	2
I feel confident in my ability to manage a urgent airway, e.g. intubation	**Q2**	Pre	0	2	1	7	0
		Post	0	1	0	3	6
I feel confident in my ability to provide ACLS care	**Q3**	Pre	0	1	2	7	0
		Post	0	1	0	4	5
I feel confident in my ability to place a splint	**Q4**	Pre	0	4	3	3	0
		Post	0	2	1	7	0
I feel confident in my ability to place an intraosseus line	**Q5**	Pre	0	3	3	3	1
		Post	0	1	1	6	2
I feel confident in my ability to effectively manage patient situations involving opioids	**Q6**	Pre	0	5	3	2	0
		Post	0	1	2	7	0
I feel confident in my ability to place a chest tube	**Q7**	Pre	2	5	3	0	0
		Post	0	1	1	7	1
I feel confident in my ability to place a pigtail catheter	**Q8**	Pre	1	6	3	0	0
		Post	0	1	4	5	0
I feel confident in my ability to suture a wound	**Q9**	Pre	0	1	1	6	2
		Post	0	1	0	2	7
I feel confident in my ability to perform a lumbar puncture	**Q10**	Pre	1	8	1	0	0
		Post	0	1	2	7	0
I feel confident in my ability to effectively manage a patient with an altered mental status	**Q11**	Pre	0	2	6	2	0
		Post	0	1	0	7	2
I feel confident in my ability to effectively manage a patient with a GI bleed	**Q12**	Pre	1	1	5	3	0
		Post	0	2	0	8	0
I feel confident in my ability to manage a stroke patient	**Q13**	Pre	1	1	4	4	0
		Post	0	2	0	7	1
I feel confident in my ability to identify patients that are truly sick in the ED setting	**Q14**	Pre	1	1	4	3	1
		Post	0	2	0	5	3

GI, gastrointestinal; ED, emergency department.

pre-survey had eight total 'strongly disagree' responses, where the post-survey did not have any.

The secondary survey yielded generally positive subject responses for each question (range 0.92–1.76) as well as generally positive responses by each subject across the survey (range 0–2), indicating the subjects generally supported the effectiveness of simulations as an educational tool (average overall score 1.52) (Table 3). Secondary survey responses for all 13 subjects who completed the post-survey were included, regardless of pre-survey completion status or PIN linking the post-survey to a completed pre-survey, because the secondary survey was only present on the post-survey and thus did not require comparison to pre-survey responses.

DISCUSSION

This study found a statistically significant increase in subject self-reported confidence to competently perform procedures and make clinical decisions common to EM after participating in simulated versions of those

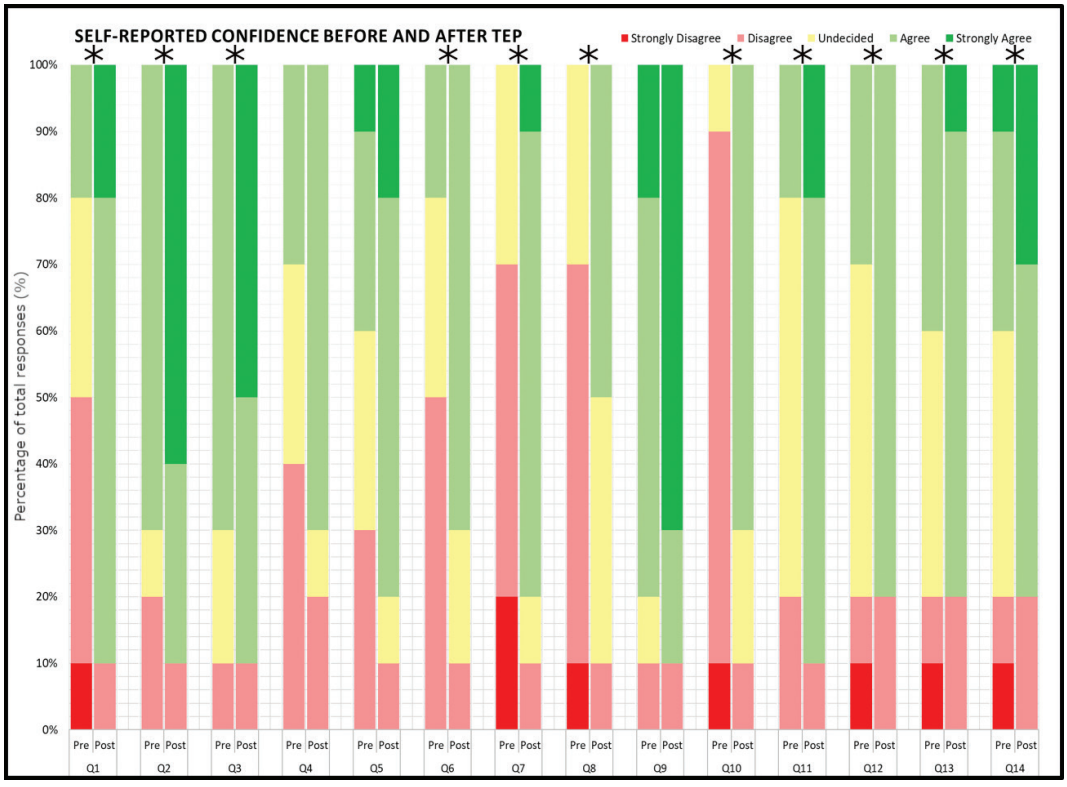

Figure 2. Results grouped by question. Pre-survey responses are on the left and post-survey responses are on the right; a star above a question column indicates a statistically significant increase in subject self-reported confidence from the pre-survey to the post-survey. The y-axis depicts the total responses, and each color band represents the percentage of total responses comprised by the corresponding response choice for each question. TEP, transitional education program. *: statistically significant, $p < 0.05$.

Table 3. Secondary survey questions and responses, grouped by question.

Secondary Survey Question	Q#	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Simulations are an effective method of training in general	1	0	0	1	2	10
Simulations are a productive way of learning how to respond to common patient presentations in emergency medicine	2	0	0	1	3	9
I was able to work with colleagues successfully during the simulations	3	0	0	1	1	11
I was able to practice the technique of each skill during the simulations	4	0	1	1	5	6
In my experience, these simulations were similar to responding to these patient presentations in a clinical setting	5	0	0	3	8	2
I was given ample opportunity for questions during the simulations	6	0	0	1	3	9
I felt that feedback given during the simulations was constructive and meaningful	7	0	0	1	3	9
Overall, I personally feel more confident in my ability to respond to these patient presentations after simulation training	8	0	0	1	2	10

procedures and cases. These simulations closely mirror real-world procedures and require many technical and management skills that first year residents are expected to perform. The results from this study support the growing trend found in medical education literature indicating some modality of simulation is beneficial in the training of medical students and residents – especially for those transitioning into real world clinical practice.[8–16] This study focused on those about to enter an EM residency program, but there are several other documented studies where the use of simulation has positively impacted the confidence of a broader range of students.[3,4,17–20]

Simulation has been established as a successful, evidence-based tool in medical education for several decades.[8,21] Simulation use in EM education – both in medical schools and residency programs – has become widespread in the last 20 years. Okuda et al[22] found that 91% of U.S. EM residency programs reported using some form of simulation in 2008, and other studies show even more 'boot camp'-style (defined as an early preparatory course or orientation sessions for learners undergoing a transition in medical education) simulation sessions are being developed at schools and residency programs across North America each year.[9–11,22,23]

The efficacy of simulation in medical education as a tool to facilitate *competency* in clinical skills is well supported in current literature.[8–11,21] However, studies assessing subject *confidence* in one's ability to perform procedures or make decisions in real-world clinical settings are substantially less prevalent in the current available literature. Okuda et al extensively aggregated evidence for the usefulness of simulations in several specific medical specialties, though their findings for EM focused more on competence in crew resource management and acute care team protocols, rather than self-reported confidence in the ability to independently perform procedures or make clinical decisions.[2] Gottleib thoroughly investigated the link between self-reported confidence and competence in learners and advocated for evaluation methods that consider both qualities simultaneously when assessing medical professionals' ability to perform tasks.[24]

Literature covering the correlation between subject confidence and simulation-based education in EM scenarios was severely lacking; however, several published studies supported a positive relationship between simulation-based education and subject confidence in specific medical skills or in other areas of healthcare. Bowers et al found that the comfort and confidence level of third and fourth year medical students increased after they participated in an advanced cardiac life support simulation training.[17] In a multi-specialty simulation-based course, Dermody et al observed that a majority of a cohort of 30 medical students had an increased confidence in their skills.[18] Biron et al observed that knowledge, skill, and confidence level increased between pre-session and post-session questionnaires and assessments in a cohort of 120 medical students participating in a multi-sensory cricothyrotomy educational experience.[12] Morgan and Cleave-Hogg demonstrated an increase in subject confidence in a population of 144 final-year medical students upon participation in several simulated anesthesia procedures.[25] Sattler et al found an increase in self-reported confidence in a population of internal medicine residents upon completion of a simulation course covering six invasive bedside procedures.[13]

Several studies, including this one, have used mainly self-reported perceived changes in their studied outcomes. Therefore, the role of simulations as an objective improvement tool in medical education is still unclear. A proposed solution to this limitation is a longitudinal approach assessing both competence and confidence, where students perform in these simulated scenarios across several sessions, studying both long-term retention and self-reported confidence in these skills, as well as objective measures of performance improvement in these skills. Other potential sources of bias in this study are the possibilities of central tendency bias in survey responses and observer bias during simulation sessions. The subjects were aware that they were part of a study investigating the effectiveness of simulations in education, creating some degree of bias in their responses. Central tendency bias is the tendency for subjects to avoid the extremes of a rating scale, for example, subjects avoiding the 'strongly agree' and 'strongly disagree' choices on the Likert scale in the study survey used here. Though this bias was likely present, its effect was unlikely to significantly sway results, and it has been argued to be closer to a data pattern than a bias.[26] Furthermore, simulations in general may be prone to some degree of inherent observer effect; participants are aware that there are likely no real consequences to failure, or at least none as severe as would be present in real-world scenarios, and therefore might not make the same decisions or actions in a simulation that they would in the real world. As the

technology underlying simulations advances, future studies might be able to simulate real-world scenarios even more accurately through the addition of virtual reality or related innovations, thus providing a more immersive experience and potentially an observer bias.

The secondary survey was included to gather general feedback about the TEP to identify subject perceived areas of strength and weakness in the TEP, which will serve to refine its implementation for future classes. Secondary survey responses indicated a generally positive perception of the use of simulation in medical education, which is consistent with prior studies.[2] The non-simulation sessions in the TEP, consisting of 3rd year clinical horror stories and Q&A sessions with residents and faculty, may have affected subject self-reported confidence as well. While these sessions were not focused on directly practicing a specific skill in a simulated scenario and thus were not addressed in the study surveys, they may have served to ease subject anxiety by establishing a sense of rapport and camaraderie between students and residents or faculty. The designers of the TEP wanted to include these sessions for student benefit but there is no good way to test the impact these sessions may have had on primary and secondary survey data, and thus we want to acknowledge these sessions as potential confounders.

One limitation in our study is the small sample size of 10 subjects – a result of sampling only UTCOMLS students who had already matched into EM residency programs. Additionally, not every student in the study population participated or followed study procedures properly, which invalidated several survey responses and reduced our study sample. One way to increase the statistical power of this study would be to replicate the TEP annually with students in each year's graduating class and aggregate data to generate a larger sample size. We plan to employ this plan for the next several years and incorporate more measurable outcomes in future manuscripts.

CONCLUSION

Despite the small number of subjects in this study, we found a significant correlation between participation in simulated EM procedures and cases and student self-reported confidence in performing competently in those scenarios. The study also found a strongly positive opinion held by subjects regarding the effectiveness of simulations as an educational tool. This study supports current literature citing the educational and self-reported confidence benefits of participating in simulated medical procedures, particularly when using advanced high-fidelity simulation technology. We advocate for the use of simulations in medical education and training, especially for graduating students transitioning into the first year of EM residency programs.

CONFLICT OF INTEREST AND FUNDING

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Appendix A

INTERPROFESSIONAL
IMMERSIVE SIMULATION CENTER

Scenario Development Form

Date: 3/19/2019 **Discipline: Boot Camp Course**

Scenario name: CVA requiring tPA **Level: MS4**

Requester Name: Mohamad Moussa **Title: Dr.**
Email Address: mohamad.moussa@utoledo.edu **Phone Number: 419-383-6383**

Learning Objectives:
1. Recognize an acute CVA and initiate a stroke alert
2. Consider alternate causes and proceed to imaging
3. Know when to give tPA and major contraindications

ACGME Competencies to be demonstrated (check all that apply)

☒Patient Care	☒Medical Knowledge	☐Interpersonal and Communication Skills
☒Practice-Based Learning and Improvement	☐Professionalism	☐Systems-Based Practice

Research Information: (If this scenario is part of a research project please briefly describe the project and participants)
Critical Actions: 1. Recognize acute CVA by physical exam and initiate a stroke alert. 2. Consider hypoglycemia as a possible cause of symptoms and check a blood glucose. 3. Send patient to CT brain imaging and rule out intracranial hemorrhage. 4. Discuss benefits/risks of tPA thrombolytics and administer to patient.

Preparation:

Simulator:
☒ Adult Simulator
☐ Pediatric Simulator
☐ Childbirth Simulator
☐ Infant Simulator
☐ Standardized Patient
☐ Vitasim
☐ Other: Other Simulator

Machines:
☒ Code Cart
☐ Defibrillator
☐ Portable AED
☐ Rapid Infuser
☐ Ventilator
☐ Ultrasound
☐ Anesthesia Machine
☐ Broselow Code Cart
☐ Infant Warmer
☐ Fog Machine
☐ Other: Other Machines

Airway:
☒ Adult Nasal Cannula
☐ Pediatric Nasal Cannula
☐ Intubation Supplies
☒ Adult NRB
☐ Pediatric NRB
☐ Oral Airway
☐ Nasal Airway
☐ Adult BVM
☐ Pediatric BVM
☐ Crich Supplies
☐ Trach Supplies
☐ Other: Other Airway Supplies

Kits:
☐ Foley
☐ NG supplies
☐ Chest Tube
☐ L&D Delivery
☐ Jump Bag
☒ Other: NIH SS

Moulage/Scene/Setup (List Specifications): Specifications

Medications (List Specific Route/Dose): metoprolol 25 mg bid daily.

Additional Actors/Roles: students present can support the team leader learner.

Supporting Materials (Please attach):
☒ Imaging
☐ Labs

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☐ Handouts

Synopsis of Scenario (include story line of the patient, who, what, where, how & conditions):

64 year old female who is hospitalized for dizziness develops right sided hemiplegia with arm and leg weakness and facial drooping. Started 10 minutes before the learner's arrival to bedside in the general floor unit. Patient is confused, has gross weakness of the right arm and leg and is slurring her speech with an obvious droop. She is maintaining her airway but is not making much sense with her speech.

Patient background information and history:

Name: Linda Linders
Allergies: NKDA
Immunizations: utd
Current Medications: Lopressor 25 mg BID

Age: 64 **Sex: F** **DOB:** DOB
Wt: Weight **Ht:** Height **BMI:** BMI
LMP: LMP **G:** G **P:** P **A:** A **Code Status:** Code
Race: Race

Medical History: HTN

Surgical History: none

Family History: CAD

Social History (to include tobacco, alcohol, and illicit drug usage): smoker

Clinical Course of Scenario
*List additional parameters as needed (Ex: PAP, CVP)

State Name	Patient Status (Include VS, ABG, etc.)	Learning Outcomes or Actions Desired	Transitions (Method to go from one state to another)
1. Ex. Baseline	**HR: 92** **BP: 165/75** **ECG (rhythm): NSR** **RR: 20** **SpO2: 100%** **Breath Sounds: clear** **Bowel Sounds: clear** **Skin: dry** **LOC: alert, confused** **Pain: 0/10** **Temp: 37.1 C**	Learner comes to bedside and must evaluate patient and recognize confusion which should prompt learner to ask for a blood glucose level. Case should be delayed from progressing until this is done. Soon after, physical exam shows right sided defits and speech problems and stroke alert needs to be activated.	If learner orders glucose, results as normal 88, activates stroke alert for patient to go to CT. Do not let patient go to CT if no glucose or activation of stroke alert.
	Additional Hemodynamics: Hemodynamics	**Labs:** **Any labs asked for are normal**	**Patients responses and actions:** **Unchanged at this point as no intervention.**

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2. After CT	**HR: same** **BP: same all** **ECG (rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Patient back from CT and emergent radiologist report indicates no bleed, but positive left MCA sign indicative of ischemic stroke. Learner needs to call for tPA. Can ask pharmacy for help dosing it. Family at bedside and can discuss benefits and risks and need and reduction of disability with the medication.	After administering the tPA, patient motor function improves and speech improves. If no tPA given, patient deteriorates,needs airway, vomits, difficult intubation.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** **Improves with tPA**
3. State 3	**HR:** HR **BP:** BP **ECG(rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Ex. Learner should give drugs and defibrillate utilizing ACLS protocol.	Ex. If drugs and defibrillation are given, proceed to State 2.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

Supporting Materials (Please attach imaging, labs, photos, handouts, etc.):
Supporting Material

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Facilitator Debriefing Guide

What went well:
- How do you think the scenario went?
- How successful were you as a team?
- Were directions clear?

What else happened:
- What were some of your challenges?
- How could you have been more effective?
- What were your favorite and least favorite aspects?
- Did anything make you uncomfortable?
- What emotions did this experience trigger?

How did the team function:
- What was your role?
- Would you have performed better in a different role?
- How did you contribute to the team effort?
- What happened to the team during the simulation?
- Did team members act professional?
- Did a leader emerge? Why or why not?
- Was important information shared clearly?
- How would you describe the communication among the team?
- How could communication within the team have been improved?

How would this improve patient care:
- What new knowledge did you gain?
- Are you comfortable with your knowledge/skill level?
- How would this help you in practice?
- How will you apply what you learned to the clinical setting?

Summarize:
- These are the things you identified as going well…
- These are the things you identified as needing to work on…
- I saw improvements in the areas of …

Process Analysis
- Teaching point – policy, procedure, guideline, evidence-based, pneumonic
- Provide example(s) of good interaction
- Discuss how this translates to actual patient care

Conclusion:
- Review points learned (Ex: actions/decisions/consequences-link to real life)
- Plan for next event or remediation
- Feedback provided from learner on the session overall
- Thank learners for participation

Scenario Development Form

Date: 3/19/2019 **Discipline: Boot Camp Course**

Scenario name: GI Bleed Resuscitation **Level: MS4**

Requester Name: Mohamad Moussa **Title: Dr.**
Email Address: mohamad.moussa@utoledo.edu **Phone Number: 419-383-6383**

Learning Objectives:
1. Recognize signs of an upper GI bleed immediately
2. Apply resuscitative measures to compensate for the bleeding
3. Contact GI Service after initial resuscitative measures.

ACGME Competencies to be demonstrated (check all that apply)

☒Patient Care	☒Medical Knowledge	☐Interpersonal and Communication Skills
☒Practice-Based Learning and Improvement	☐Professionalism	☐Systems-Based Practice

Research Information: (If this scenario is part of a research project please briefly describe the project and participants)
Critical Actions: 1. Recognize GI bleed is causing severe hypotension and begin measures to address hemodynamics. 2. Initiate proper medical management to support hypotension. 3. Understand that GI consult comes after initial resuscitation.

Preparation:

Simulator:
☒ Adult Simulator
☐ Pediatric Simulator
☐ Childbirth Simulator
☐ Infant Simulator
☐ Standardized Patient
☐ Vitasim
☐ Other: Other Simulator

Machines:
☐ Code Cart
☐ Defibrillator
☐ Portable AED
☒ Rapid Infuser
☐ Ventilator
☐ Ultrasound
☐ Anesthesia Machine
☐ Broselow Code Cart
☐ Infant Warmer
☐ Fog Machine
☐ Other: Other Machines

Airway:
☐ Adult Nasal Cannula
☐ Pediatric Nasal Cannula
☐ Intubation Supplies
☐ Adult NRB
☐ Pediatric NRB
☐ Oral Airway
☐ Nasal Airway
☐ Adult BVM
☐ Pediatric BVM
☐ Crich Supplies
☐ Trach Supplies
☐ Other: Other Airway Supplies

Kits:
☐ Foley
☐ NG supplies
☐ Chest Tube
☐ L&D Delivery
☐ Jump Bag
☒ Other: central line kit

Moulage/Scene/Setup (List Specifications): Upper GI bleed

Medications (List Specific Route/Dose): ibuprofen 800 mg tid for 60 days

Additional Actors/Roles: learner and supporting medical students

Supporting Materials (Please attach):
☐ Imaging
☒ Labs

☐ Handouts

Synopsis of Scenario (include story line of the patient, who, what, where, how & conditions):

68 year old man who was admitted to the hospital because of black tarry stools and dizziness. Admitted to observation because hemoglobin was 11.2 and the GI team was going to perform an EGD the next morning. Its 3:00 am in the morning and the MS4 AI learner is on call and receives a page from the nurse indicating that patient is having dizziness and more abdominal pain. Nurse asks you to come to the room to assess the patient. Upon the learners arrival, patient vomits a large amount of hematemesis but remains completely coherent and awake.

Patient background information and history:

Name: Henry Hemridge **Age: 68** **Sex: M** **DOB:** DOB

Allergies: nkda **Wt:** Weight **Ht:** Height **BMI:** BMI

Immunizations: utd **LMP:** LMP **G:** G **P:** P **A:** A **Code Status:** Code

Current Medications: ibuprofen 800 mg tid 60 days **Race:** Race

Medical History: stomach ulcer

Surgical History: none

Family History: arthritis

Social History (to include tobacco, alcohol, and illicit drug usage): ETOH daily

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Clinical Course of Scenario
*List additional parameters as needed (Ex: PAP, CVP)

State Name	Patient Status (Include VS, ABG, etc.)	Learning Outcomes or Actions Desired	Transitions (Method to go from one state to another)
1. Ex. Baseline	**HR: 105** **BP: 92/65** **ECG (rhythm): ST** **RR: 22** **SpO2: 100%** **Breath Sounds: clear** **Bowel Sounds: clear** **Skin: pale** **LOC: A&OX4** **Pain: 5/10** **Temp: 37.2 C**	Upon learner's arrival to bedside, patient vomits a huge amount of bright red blood. Prior to this he had coffee ground emesis but scant amount. Learner needs to call for help, rapid response, ask for 2 large bore IVs, antiemetic, type & screen, Saline bolus fluids 2 Liters, protonix drip, octreotide.	If all of this is done, patient remains stable to call GI. If any of these are missing, patient deteroriates to be more hypotensive
	Additional Hemodynamics: **BP drops to 80/P**	**Labs:** **Hemoglobin is 7.4**	**Patients responses and actions:** **improves**

2. Post meds	**HR: 125** **BP: 70/35** **ECG (rhythm): ST** **RR: 24** **SpO2: 100%** **Breath Sounds: clear** **Bowel Sounds: clear** **Skin: diaphoretic** **LOC: no change** **Pain: no change** **Temp:** Temp **C**	Learner must place an emergent central line for rapid fluid boluses, and blood administration.	If not completed, PEA arrest, can run a code. If above is administered, patient stabilized, GI comes in to perform EGD on patient.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response
3. State 3	**HR:** HR **BP:** BP **ECG(rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Ex. Learner should give drugs and defibrillate utilizing ACLS protocol.	Ex. If drugs and defibrillation are given, proceed to State 2.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

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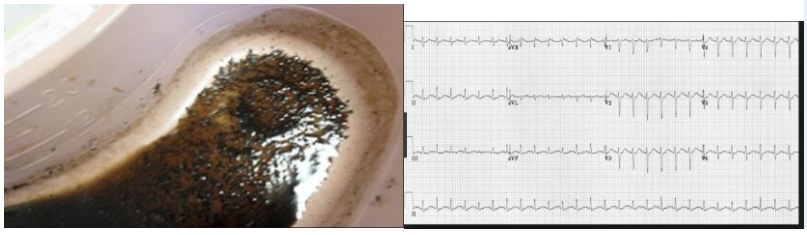
4. State 4	**HR:** HR **BP:** BP **ECG(rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Ex. Learner should give drugs and defibrillate utilizing ACLS protocol.	Ex. If drugs and defibrillation are given, proceed to State 2.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

***Additional states may be added, if necessary.**

Supporting Materials (Please attach imaging, labs, photos, handouts, etc.):
Supporting Material



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- I saw improvements in the areas of …

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- Discuss how this translates to actual patient care

Conclusion:

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- Thank learners for participation

INTERPROFESSIONAL
IMMERSIVE SIMULATION CENTER

Scenario Development Form

Date: 12/26/2021

Discipline: Emergency Medicine

Scenario name: Status asthmaticus

Level: PGY3

Requester Name: Dohar/Guinness/Aouthmany

Title: Resident

Email Address:

Phone Number: Phone Number

Learning Objectives:

1. Assess Asthma process, order applicable tests (EKG, CXR, Labs etc) and initial therapy (Duoneb, steroid: PO or IM)

2. a) Recognize Status Asthmaticus / impending respiratory failure (respiratory rate may be too fast for successful BIPAP . IV fails: Give EPI 0.5 mg IM and start I/O .)

b) Pre-oxygenate: (Non-rebreather mask at 15 l/min with BVM support plus high flow N/C at 15 L/min, possibly 30-50 L/min : Head elevation 30 degrees, jaw thrust).

3a) Induction: (etomidate, ketamine or propofol; Sux or rocuronium (best for long time on vent and while establishing proper vent settings))

b) Intubation; (large tube, eg 7.5 or 8.0 if possible for quick inspiratory flow rate (Badi) sedation on vent: drip fentanyl or propofol or precedex).

4a) Vent Settings: (FiO2 !00 % , titrate later to pulse ox > 90%
Tidal volume 6-7 ml/kg over 1-1.5 seconds
Resp rate at 10-12/min ie: insp/exp ratio: approx 1:4. adjust insp flow rate.
Peak press < 30 mm Hg (can be slightly more if obese/ heavy chest)

b) Ventilator alarms loudly: (suspect high pressure alarm from breath stacking with resultant auto peep : Disconnect from ventilator, press on chest, reconnect to vent, decrease resp rate, check sedation)

5) Additional Therapy: (Continuous albuterol, Mg SO4, steroid, EPI if needed for airway relaxation or hypotension on vent)

6 Disposition : Call Pulmonary/Critical Care for consult and admission to ICU.

ACGME Competencies to be demonstrated (check all that apply)

☒Patient Care	☒Medical Knowledge	☒Interpersonal and Communication Skills
☐Practice-Based Learning and Improvement	☐Professionalism	☐Systems-Based Practice

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Research Information: (If this scenario is part of a research project please briefly describe the project and participants)

Research Criteria

Preparation:

Simulator:

☒ Adult Simulator

☐ Pediatric Simulator

☐ Childbirth Simulator

☐ Infant Simulator

☐ Standardized Patient

☐ Vitasim

☐ Other: Other Simulator

Machines:

☐ Code Cart

☐ Defibrillator

☐ Portable AED

☐ Rapid Infuser

☐ Ventilator

☐ Ultrasound

☐ Anesthesia Machine

☐ Broselow Code Cart

☐ Infant Warmer

☐ Fog Machine

☐ Other: Other Machines

Airway:

☐ Adult Nasal Cannula

☐ Pediatric Nasal Cannula

☐ Intubation Supplies

☐ Adult NRB

☐ Pediatric NRB

☐ Oral Airway

☐ Nasal Airway

☐ Adult BVM

☐ Pediatric BVM

☐ Crich Supplies

☐ Trach Supplies

☐ Other: Other Airway Supplies

Kits:

☐ Foley

☐ NG supplies

☐ Chest Tube

☐ L&D Delivery

☐ Jump Bag

☐ Other: Other Kit

Moulage/Scene/Setup (List Specifications): Specifications

Medications (List Specific Route/Dose): Spec

Additional Actors/Roles: Additional Roles

Supporting Materials (Please attach):

☐ Imaging

☐ Labs

☐ Handouts

Synopsis of Scenario (include story line of the patient, who, what, where, how & conditions):

You are at UTMC. 55 year old obese (120kg) male with history of asthma presents with dyspnea. Had a breathing treatment by EMS with some improvement. Patient is alert, feels short-winded, but speaking in complete sentences. Reports mildly worsening cough over past few days but no other symptoms.

Video: Note for Simulation Technicians: Please have this very instructive and memorable video ready to display at the end of the case: This is a YouTube video, 6 minutes, 49 seconds.
General Title: " Videos of Status Asthmaticus"
Select : Status Asthmaticus (On The Vent) , by Meredith Greer ,
This should be the May 27 2019 presentation at 6 min, 49 seconds.
This video highlights ventilator alarms, auto peep, incomplete exhalation and the memorable, life saving management of this ventilator problem.

Patient background information and history:

Name: Meelungs **Hurtz** **Age:** Age **Sex:** Sex

Allergies: NKDA **Wt:** Weight **Ht:** Height

Immunizations: Immunizations **LMP:** LMP **G:** G **P:** P

Current Medications: albuterol, inhaled steroids, cetirizine, metformin **Race:** Race

Medical History: asthma, DM, HTN

Surgical History: n/a

Family History: n/a

Social History (to include tobacco, alcohol, and illicit drug usage): tobacco smoker

Scenario Development Form

Date: 3/19/2019 **Discipline: Boot Camp**

Scenario name: Vfib-MI **Level: MS4**

Requester Name: Mohamad Moussa **Title: Dr.**
Email Address: mohamad.moussa@utoledo.edu **Phone Number: 419-383-6383**

Learning Objectives:
1. Respond to an inpatient unresponsive patient
2. Initiate resuscitative care to a patient having an MI/Vfib episode
3. Defibrillate a patient in active ventricular fibrillation

ACGME Competencies to be demonstrated (check all that apply)

☒Patient Care	☒Medical Knowledge	☐Interpersonal and Communication Skills
☒Practice-Based Learning and Improvement	☐Professionalism	☐Systems-Based Practice

Research Information: (If this scenario is part of a research project please briefly describe the project and participants)
The critical actions for this case are: 1. Support airway with any measure: oxygen, BVM, intubation, etc. 2. Recognize v-fib on monitor and call for defibrillatior. 3. After return of pulses, recognize inferior STEMI—patient to cath lab.

Preparation:

Simulator:
☒ Adult Simulator
☐ Pediatric Simulator
☐ Childbirth Simulator
☐ Infant Simulator
☐ Standardized Patient
☐ Vitasim
☐ Other: Other Simulator

Machines:
☒ Code Cart
☒ Defibrillator
☐ Portable AED
☐ Rapid Infuser
☐ Ventilator
☐ Ultrasound
☐ Anesthesia Machine
☐ Broselow Code Cart
☐ Infant Warmer
☐ Fog Machine
☐ Other: Other Machines

Airway:
☐ Adult Nasal Cannula
☐ Pediatric Nasal Cannula
☒ Intubation Supplies
☒ Adult NRB
☐ Pediatric NRB
☒ Oral Airway
☐ Nasal Airway
☒ Adult BVM
☐ Pediatric BVM
☐ Crich Supplies
☐ Trach Supplies
☐ Other: Other Airway Supplies

Kits:
☐ Foley
☐ NG supplies
☐ Chest Tube
☐ L&D Delivery
☐ Jump Bag
☐ Other: Other Kit

Moulage/Scene/Setup (List Specifications): Cardiac inpatient for chest pain, becomes unresponsive having an MI then v-fib

Medications (List Specific Route/Dose): epinephrine 1mg IV, amiodarone 300 mg IV push

Additional Actors/Roles: MS4 on Acting InternshipNurse

Supporting Materials (Please attach):
☐ Imaging

Developed by:
The University of Toledo
Interprofessional Immersive Simulation Center

☐ Labs
☐ Handouts

Synopsis of Scenario (include story line of the patient, who, what, where, how & conditions):

Patient admitted to Cardiac ICU because of active, exertional chest pain for 12 hours prior to arrival. Worse with going up the stairs and also associated with nausea. Took an antacid with no relief. Admitted on heparin drip and nitro gtt.

Patient background information and history:

Name: Milton **Milts**
Allergies: NKDA
Immunizations: UTD
Current Medications: HCTZ

Age: 49 **Sex: M** **DOB:** DOB
Wt: Weight **Ht:** Height **BMI:** BMI
LMP: LMP **G:** G **P:** P **A:** A **Code Status:** Code
Race: Caucasian

Medical History: HTN, DM2

Surgical History: Hernia Repair

Family History: CAD

Social History (to include tobacco, alcohol, and illicit drug usage): Smoker 2PPD

Clinical Course of Scenario
*List additional parameters as needed (Ex: PAP, CVP)

State Name	Patient Status (Include VS, ABG, etc.)	Learning Outcomes or Actions Desired	Transitions (Method to go from one state to another)
1. Ex. Baseline	**HR: 45** **BP: 95/50** **ECG (rhythm): NSR** **RR: 20** **SpO2: 99%** **Breath Sounds: clear** **Bowel Sounds: clear** **Skin:** Skin **LOC:** LOC **Pain: 1/10** **Temp:** Temp **C**	Nurse pages MS4 acting intern (AI) to bedside because patient is having chest pain. Nurse informs MS4 AI that patient is maxed out on nitro gtt and morphine PRN. MS4 AI can ask nurse a few questions and then patient will go into ventricular fibrillation on the monitor and become unresponsive. MS4 AI should immediately call a CODE Blue, initiate airway support, and ask for defibrillator pads and code cart. If MS4 AI performs above, patient immediately regains pulses, EKG obtained and shows inferior STEMI, to the cath lab with cardiologist.	If MS4 AI does not support airway immediately, or begin CPR, or recognize v-fib, patient goes into asystole and expires. The point of this exercise is for MS4 AI to immediately intervene with airway, breathing, and circulation support. Defibrillation also must happen immediately even before intubation—BVM is okay until pulses re-established.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

2. Post defibrillation	**HR: 35** **BP: 75/45** **ECG (rhythm): NSR inferior STEMI** **RR: 16** **SpO2: 94% intubated** **Breath Sounds: clear** **Bowel Sounds: clear** **Skin:** Skin **LOC: intubated** **Pain:** Pain **Temp:** Temp **C**	Learner should give IV fluids, consider amiodarone, atropine, or epinephrine. Goal of this exercise again was to defibrillate at appropriate energy amount which should be 200 J biphasic. With low heart rate 35 bpm, learner can also initiate pacing, consider dopamine, these can all be discussed in the debrief.	This should be the end of the case. This case is not meant to go on and on: Remember, the learner is an acting intern who responds to a patient having severe CP and then patient goes into v-fib and learner must address the immediate interventions immediately. Can work as a team to delegate tasks such as intubation, medication administration, defibrillation, etc.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response
3. State 3	**HR:** HR **BP:** BP **ECG(rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Ex. Learner should give drugs and defibrillate utilizing ACLS protocol.	Ex. If drugs and defibrillation are given, proceed to State 2.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

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4. State 4	**HR:** HR **BP:** BP **ECG(rhythm):** ECG **RR:** RR **SpO2:** SPO2 **Breath Sounds:** Sound **Bowel Sounds:** Sound **Skin:** Skin **LOC:** LOC **Pain:** Pain **Temp:** Temp **C**	Ex. Learner should give drugs and defibrillate utilizing ACLS protocol.	Ex. If drugs and defibrillation are given, proceed to State 2.
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs	**Patients responses and actions:** Patient Response

***Additional states may be added, if necessary.**

Supporting Materials (Please attach imaging, labs, photos, handouts, etc.):
Supporting Material

Facilitator Debriefing Guide

What went well:

- How do you think the scenario went?
- How successful were you as a team?
- Were directions clear?

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- How could you have been more effective?
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- Did anything make you uncomfortable?
- What emotions did this experience trigger?

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- Would you have performed better in a different role?
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- Did team members act professional?
- Did a leader emerge? Why or why not?
- Was important information shared clearly?
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- How could communication within the team have been improved?

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Summarize:

- These are the things you identified as going well…
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- I saw improvements in the areas of …

Process Analysis

- Teaching point – policy, procedure, guideline, evidence-based, pneumonic
- Provide example(s) of good interaction
- Discuss how this translates to actual patient care

Conclusion:

- Review points learned (Ex: actions/decisions/consequences-link to real life)
- Plan for next event or remediation
- Feedback provided from learner on the session overall
- Thank learners for participation

Scenario Development Form

Date of case completion:

Discipline: Emergency Medicine

Scenario name: Altered Mental Status

Level: Medical Student

Requester Name: Aouthmany/Bustillo

Title: Altered Mental Status

Email Address:

Phone Number:

Learning Objectives and critical actions:

1. Perform thorough history and physical exam
2. Order a comprehensive work up for a poor historian with altered mental status
3. Diagnose patient with UTI and recognize it as probable source of AMS
4. Start patient on appropriate UTI treatment
5. Recognize allergic reaction
6. Prompt medical treatment of allergic reaction
7. Admit to hospitalist

ACGME Competencies to be demonstrated (check all that apply)

+Patient Care	+Medical Knowledge	+Interpersonal and Communication Skills
+Practice-Based Learning and Improvement	+Professionalism	+Systems-Based Practice

Research Information: (If this scenario is part of a research project please briefly describe the project and participants)
N/A

Preparation:

Simulator:

+ Adult Simulator (Adult computerized mannequin and non-computerized mannequin)

□ Human or animal cadaver

□ Childbirth Simulator

□ Infant Simulator

□ Standardized Patient

□ Vitasim

□ Other: Other Simulator

Machines:

+ Code Cart

□ Defibrillator

□ Portable AED

□ Rapid Infuser

□ Ventilator

□ Ultrasound

□ Anesthesia Machine

□ Broselow Code Cart

□ Infant Warmer

□ Fog Machine

□ Other: Other Machines

Airway:

□ Adult Nasal Cannula

□ Pediatric Nasal Cannula

□ Intubation Supplies

□ Adult NRB

□ Pediatric NRB

□ Oral Airway

+ Oxygen tubing

+ Adult BVM

□ Pediatric BVM

□ Crich Supplies

□ Trach Supplies

□ Other: Other Airway Supplies

Kits:

□ Foley

□ NG supplies

□ Chest Tube

□ L&D Delivery

□ Jump Bag

□ Other: Other Kit

Moulage/Scene/Setup (List Specifications): Elderly, frail, caucasian female, middle age, confused, pedestrian clothing

Medications (List Specific Route/Dose):
1000cc bag of NS
Rocephin

Additional Actors/Roles: none

Supporting Materials (Please attach):

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+ Imaging

+ Labs

+EKG

Brief Case Summary:

Elderly Caucasian woman (Betty) is brought in by car with her grandson for confusion. The grandson gives a brief history before leaving and the patient is too confused to give a complete history. A comprehensive work up is ordered revealing a UTI. Infectious work up is completed and patient is started on antibiotics. Patient admitted to hospitalist. While the patient is boarded in the ER the medication is started and patient has an allergic reaction to the medication requiring intervention. Student will need to discontinue offending agent, give medications, and notify admitting physician.

Detailed Case Summary:

Our patient is an elderly Caucasian woman named Betty that arrives to the ER by car/walk in with her grandson. The patient has no complaints but family brought her in for evaluation of altered mental status. He states that she is confused past her baseline today. They both are very poor historians. He reveals that they just moved to Toledo to be closer to family. He states that she is sometimes confused but more so today. He believes she takes blood pressure medication and "some other meds" but he is not sure. Neither of them are aware of any medication allergies. He then admits he has somewhere to be and leaves. She is not accompanied by anyone else and has no other contacts. She is pleasantly confused and oriented x1.

Initial exam will reveal a pleasantly confused elderly woman who is oriented x1 with general weakness and is frail appearing. The student running the case should ask for IV, monitors, glucose and vital signs. The rest of her exam is relatively normal aside from suprapubic tenderness. The student should recognize that the patient's differential diagnosis is very broad and a comprehensive work up should be ordered. The only significant finding is an abnormal urinalysis suggesting urinary tract infection. The student should complete an infectious/sepsis work up if not already done so, which should include lactate, blood cultures, urine cultures and official urinalysis. Antibiotics should be started and the resident should recognize that the patient is considered a "complicated" UTI due to age, AMS and her social situation and requires admission. Patient is clinically stable and is admitted to medical floor under the hospital service for altered mental status and complicated urinary tract infection.

The patient is boarded in the emergency department until a bed is available on the floor. The nurse starts the antibiotics. The patient is left in the room and appears stable. The nurse checks on her in about 30 minutes and discovers that the patient has broken out in an impressive full body rash consistent with hives and is now more confused. There is no airway compromise or hypotension. The student is informed and a secondary assessment is performed. The student should recognize that the patient is experiencing an allergic reaction and all medications should be discontinued immediately. The student should order appropriate medications that may include Benadryl, Pepcid, supplemental oxygen, normal saline bolus and an IV steroid. New antibiotic started. Ideally, the admitting physician is updated regarding the clinical change.

Patient background information and history:

Name: Betty **Age:** 80

Allergies: unknown **Sex:** female

Immunizations: unknown **Race:** Caucasian

Current Medications: BP? **Height:** 5'5"

Medical History: HTN? **Weight:** 60kg

Surgical History: unknown **DOB:** 9/20/1940

Family History: unknown **Code status:** Presumed full code

Social History (to include tobacco, alcohol, and illicit drug usage): Recently moved to Toledo, denies drugs, alcohol and tobacco products

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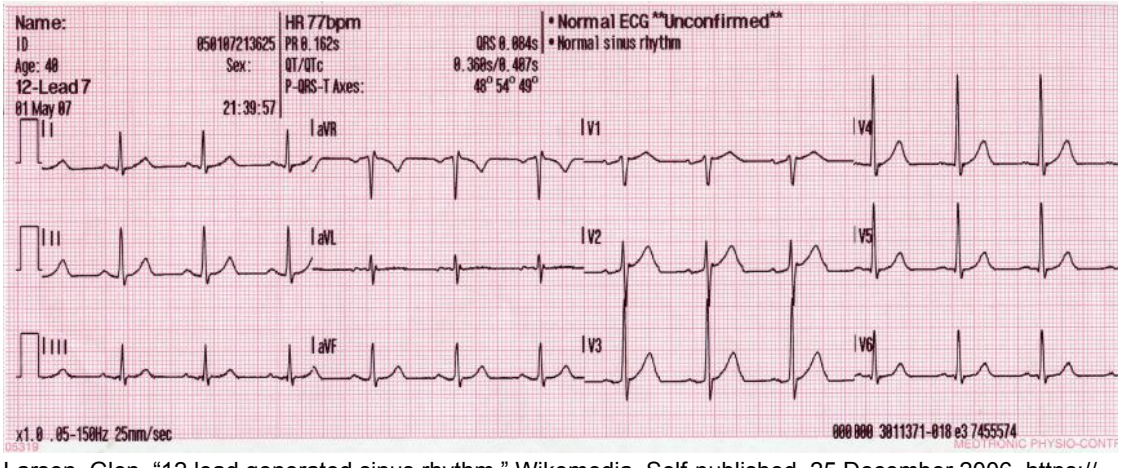
Case Progression:

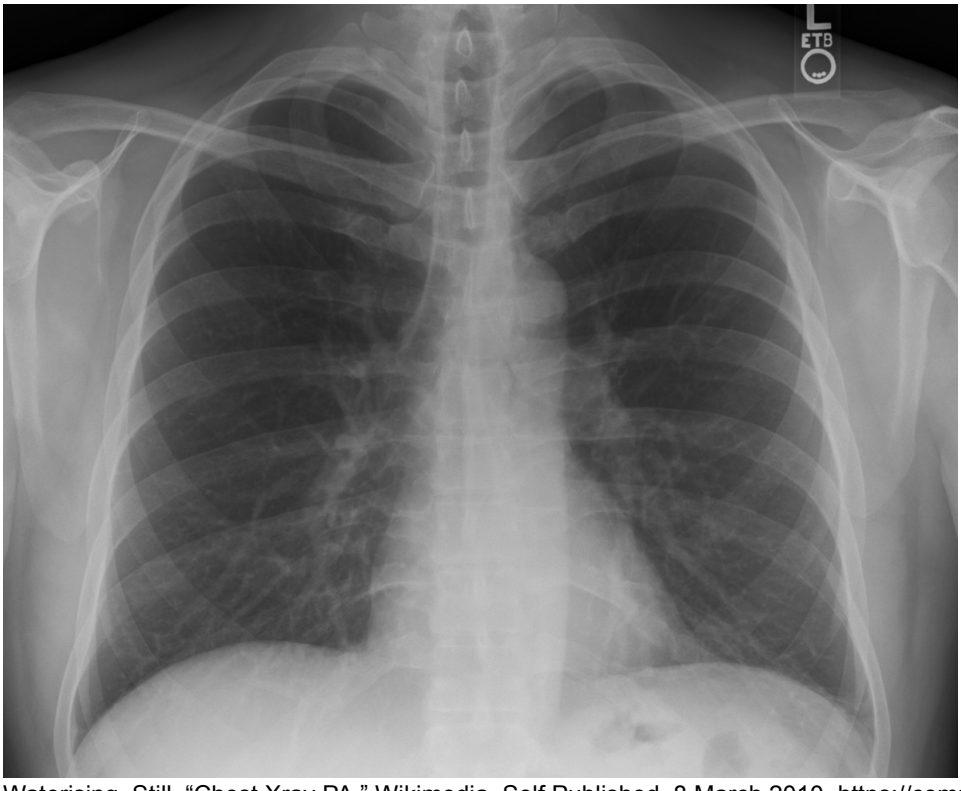
Scenario States, Modifiers and Triggers			
Patient State	Patient Status	Learner Actions, Modifiers & Triggers to Move to Next State	
1. Confused - Triaged and placed in normal ER exam room - Alert, A&O x1 - Pleasantly confused - 160/90, 98%, 98F, 16resp, 70bpm	Confused	Learner Actions - IV access, monitor, vitals, glucose - Obtain as much history as possible - Perform physical exam - Order a comprehensive work up - Interpret imaging and labs with UTI dx - Order appropriate abx - Admit to medicine	Modifiers -If UA not ordered the nurse will obtain sample and comment -Monitoring will be put on by nursing staff despite request -If resident wants to DC patient she will have no means of getting home Triggers -Admission → **2. Allergic rxn**
2. Allergic rxn - Patient boarded in ER until hospital bed opens - Nurse starts abx - Nurse recognition of allergic reaction - 110/60, 97%, 98F 20resp, 90bpm - Hives - Normal airway	Ill appearing Confused Vital sign changes	Learner Actions - Appropriate response to nurse concerns - Reassessment of patient - Recognition of allergic rx to abx - DC of antibiotics, new abx ordered - Fluid bolus - Allergic rxn meds ordered - admitting doc updated	Modifiers - Fluids, Benadryl, Pepcid, steroids, O2, albuterol → pt clinically improves - Prompted by nursing staff to DC meds and call admitting doc if needed Triggers - Meds of allergic reaction given → **END CASE**

Visual results:



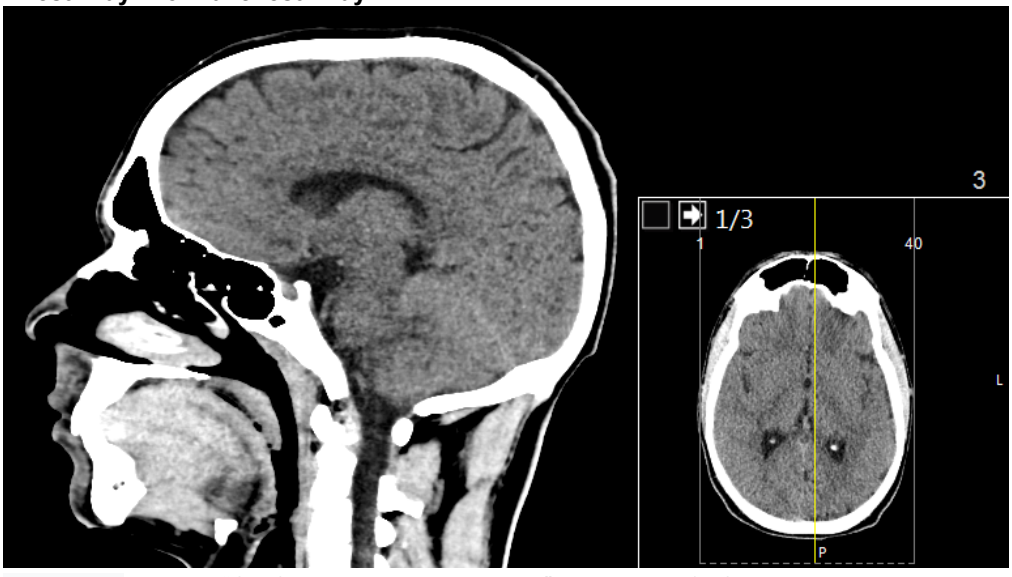
Larsen, Glen. "12 lead generated sinus rhythm." Wikemedia, Self-published, 25 December 2006, https://commons.wikimedia.org/wiki/File:12_lead_generated_sinus_rhythm.JPG

EKG: Sinus rhythm, regular rate



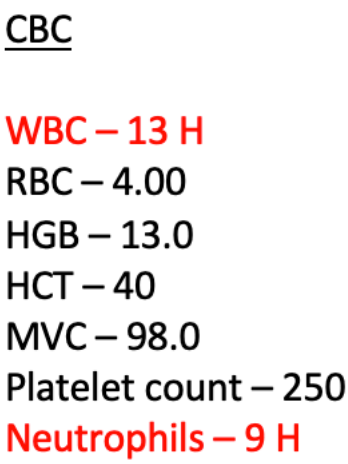
Waterising, Still. “Chest Xray PA.” Wikimedia, Self Published, 8 March 2010, https://commons.wikimedia.org/wiki/File:Chest_Xray_PA_3-8-2010.png

Chest Xray: Normal chest x ray



Häggström, Mikael. “CT if a normal brain, sagittal.” Wikimedia, Self-Published, 11 April 2019, https://commons.wikimedia.org/wiki/File:CT_of_a_normal_brain,_sagittal_22.png

Normal CT brain without contrast



CBC showing leukocytosis with increased neutrophils

CMP

Glucose – 200
BUN – 35
CREATININE – 1.5
Sodium – 137
Potassium – 3.7
Chloride – 100
Carbon dioxide – 25
Calcium – 10
Total bili – 0.6
Total protein – 6.0
Albumin – 4.0
AST – 21
ALT – 22
Alk phos – 43

CMP with high BUN and Creatinine

Urinalysis

Color – yellow
Appearance – cloudy
PH – 5.0
Specific gravity – 1.03 H
Protein – 1+
Glucose – negative
Ketone – 1+
Bilirubin – negative
Blood – trace
Nitrite – positive
Leuk esterase – moderate

Troponin – 0.00

Serum Creatinine Kinase – 30

Urine culture – pending

Blood culture - pending

Tox screen – negative

Alcohol – 0.000

Serum lactate – 2.0 mmol/L

Ammonia – 30 umol/L

Normal lab results for evaluation of altered mental status

Discussion:
-Review ddx for AMS
-Review of UTI
-Review of Anaphylactic reactions and shock

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Facilitator Debriefing Guide

What went well:
- How do you think the scenario went?
- How successful were you as a team?
- Were directions clear?

What else happened:
- What were some of your challenges?
- How could you have been more effective?
- What were your favorite and least favorite aspects?
- Did anything make you uncomfortable?
- What emotions did this experience trigger?

How did the team function:
- What was your role?
- Would you have performed better in a different role?
- How did you contribute to the team effort?
- What happened to the team during the simulation?
- Did team members act professional?
- Did a leader emerge? Why or why not?
- Was important information shared clearly?
- How would you describe the communication among the team?
- How could communication within the team have been improved?

How would this improve patient care:
- What new knowledge did you gain?
- Are you comfortable with your knowledge/skill level?
- How would this help you in practice?
- How will you apply what you learned to the clinical setting?

Summarize:

- These are the things you identified as going well…
- These are the things you identified as needing to work on…
- I saw improvements in the areas of …

Process Analysis

- Teaching point – policy, procedure, guideline, evidence-based, pneumonic
- Provide example(s) of good interaction
- Discuss how this translates to actual patient care

Conclusion:

- Review points learned (Ex: actions/decisions/consequences-link to real life)
- Plan for next event or remediation
- Feedback provided from learner on the session overall
- Thank learners for participation

Scenario Development Form

Date
Scenario name: Penetrating Neck trauma

Discipline: Emergency Medicine
Level: Resident

Requester Name:
Email Address:

Title: MD
Phone Number:

Learning Objectives:
1. Identify penetrating neck wound with soft signs of injury
2. Airway management for airway protection
3. CT Angiogram for vascular injury, patient to OR
4. Interpersonal communication with consults and patient

ACGME Competencies to be demonstrated (check all that apply)

☒Patient Care	☒Medical Knowledge	☒Interpersonal and Communication Skills
☐Practice-Based Learning and Improvement	☐Professionalism	☒Systems-Based Practice

Research Information: (If this scenario is part of a research project please briefly describe the project and participants)
Research Criteria

Preparation:

Simulator:
☒ Adult Simulator
☐ Pediatric Simulator
☐ Childbirth Simulator
☐ Infant Simulator
☐ Standardized Patient
☐ Vitasim
☐ Other: Other Simulator

Machines:
☐ Code Cart
☐ Defibrillator
☐ Portable AED
☐ Rapid Infuser
☒ Ventilator
☐ Ultrasound
☐ Anesthesia Machine
☐ Broselow Code Cart
☐ Infant Warmer
☐ Fog Machine
☐ Other: Other Machines

Airway:
☐ Adult Nasal Cannula
☐ Pediatric Nasal Cannula
☒ Intubation Supplies
☒ Adult NRB
☐ Pediatric NRB
☐ Oral Airway
☐ Nasal Airway
☒ Adult BVM
☐ Pediatric BVM
☒ Crich Supplies
☐ Trach Supplies
☐ Other: Other Airway Supplies

Kits:
☐ Foley
☐ NG supplies
☐ Chest Tube
☐ L&D Delivery
☐ Jump Bag
☐ Other: Other Kit

Moulage/Scene/Setup (List Specifications): Male patient, 28 yo 6cm vertical Linear laceration to left side of anterior neck lateral to larynx in zone I and II with hematoma

Medications (List Specific Route/Dose): Specifications

Additional Actors/Roles: Additional Roles

Supporting Materials (Please attach):
☒ Imaging
☒ Labs

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☐ Handouts

Synopsis of Scenario (include story line of the patient, who, what, where, how & conditions):

28 yo M brought in By EMS for stab wound to the neck with kitchen knife. Injured by girlfriend during a domestic dispute. Deep stab wound to left neck in zone 1&2. Patient breathing, talking, denies any fall, head injury, LOC, or any other complaints. Learner should call a trauma alert, and airway will be intact on arrival, but patient exhibiting soft signs of vascular injury including hoarseness and subcutaneous emphysema. Intubation is not absolutely required, but patient will also exhibit signs of left sided hemopneumothorax. Intubation will not be required, but will also cause no problems, however a chest tube must be or tension will develop and patient will arrest. Learner should order CTA of neck to evaluate for any findings that would require surgical intervention, imaging will show injury to the left carotid and patient will be taken to OR by trauma surgery for neck exploration. Patient should be given tetanus and prophylactic antibiotics.

Patient background information and history:

Name: Jurj Clooners **Age:** **Sex:** **DOB:** DOB

Allergies: NKA **Wt:** 95 kg **Ht:** 180 cm **BMI:** BMI

Immunizations: Unknown tetanus **LMP:** LMP **G:** G **P:** P **A:** A **Code Status:** Full

Current Medications: None **Race:** W

Medical History: None

Surgical History: None

Family History: Father has "heart disease"

Social History: Drinks occasionally, no EtOH or street drugs

Clinical Course of Scenario
*List additional parameters as needed (Ex: PAP, CVP)

State Name	Patient Status (Include VS, ABG, etc.)	Learning Outcomes or Actions Desired	Transitions (Method to go from one state to another)
1. Arrival	**HR: 107** **BP: 116/78** **ECG (rhythm): Sinus** **RR: 24** **SpO2: 96% up to 99% if on oxygen** **Breath Sounds: Decreased on Lt** **Bowel Sounds: normal** **Skin: Laceration** **LOC: GCS 15** **Pain: 7** **Temp: 98.9** **Additional Hemodynamics:** Hemodynamics	**Call trauma team** **ATLS Primary survey** **Voice is slightly hoarse** **Recognize neck wound, subcutaneous emphysema** **Intubation okay but not mandatory** **May place chest tube at this point** **200 ML blood out of left chest tube** **IV access, normal saline** **Labs:** **Xray before tube will show small hemo-pneumothorax** **Normal**	If chest tube placed +/- intubation go to state 2 If 3 minutes without chest tube progress to State 3 **Patients responses and actions:** **Patient talking, complaining of neck pain, asking if he is going to die**

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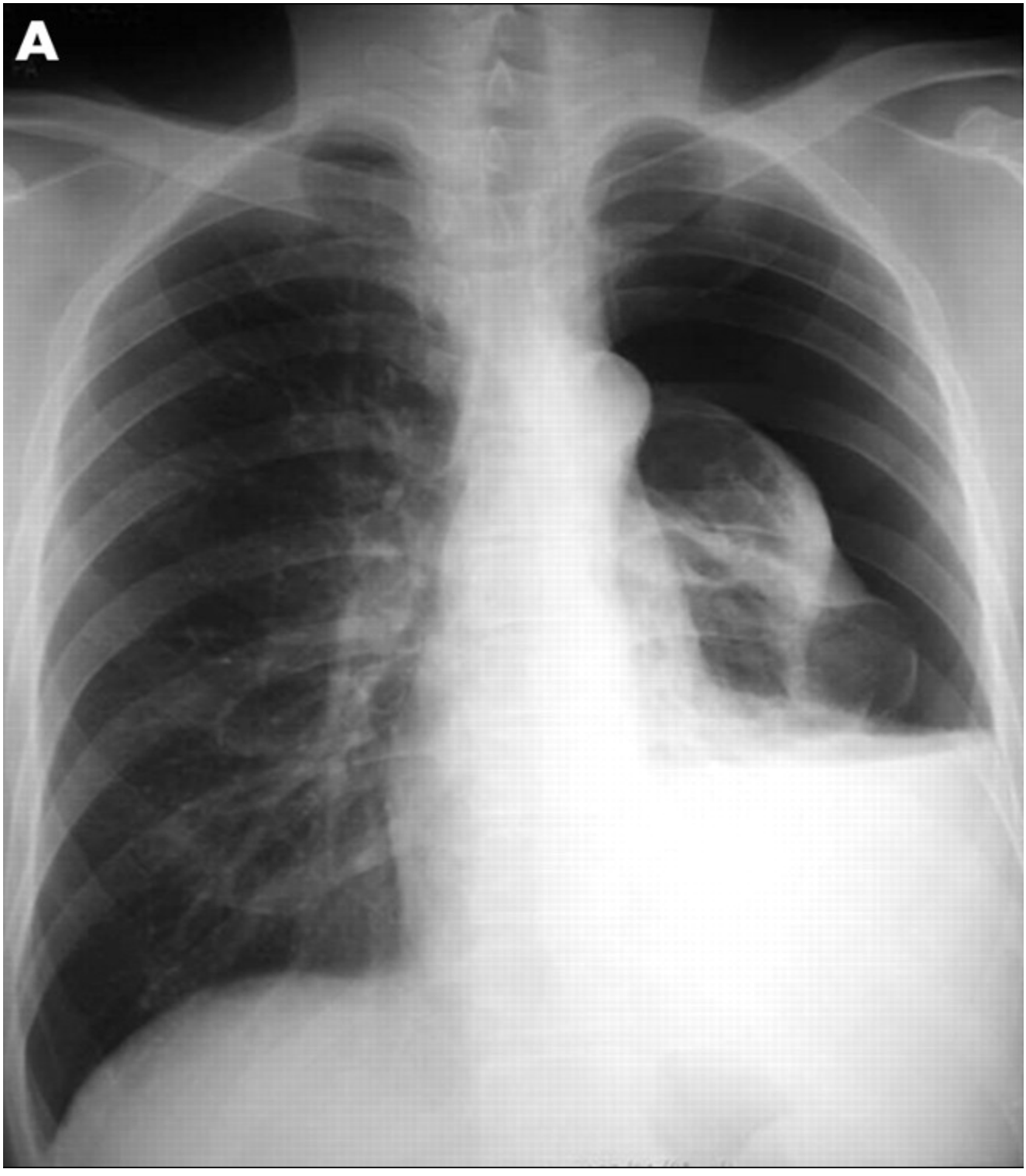
2. Ex. Post Treatment	**HR: 89** **BP: 126/89** **ECG (rhythm): Sinus** **RR: 16 or vent** **SpO2: 99%** **Breath Sounds: Bilateral** **Bowel Sounds: normal** **Skin:** Skin **LOC: GCS15 or 3 if intubated** **Pain:** Pain **Temp: 98.9 C**	**Obtain X-rays for tube placement** Sent Pt to CT for CTA neck Recognize carotid artery injury Consult trauma surgery or send patient to OR with trauma team if they have been called	Show CTA of neck Pt to OR and end of scenario
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs.	**Patients responses and actions:** **Pt complains of pain at site of chest tube, but breathing feels better if not intubated**
3. State 3	**HR: 150** **BP: 70/45** **ECG(rhythm): Sinus** **RR: 36** **SpO2: 82%** **Breath Sounds: diminished left** **Bowel Sounds:** Sound **Skin: pale** **LOC: Confused, agitated** **Pain: 7** **Temp: 98.9 C**	**Learner should place chest tube to relieve tension hemo/pneumothorax**	If no chest tube placed within 2 minutes go to state 4 If needle decompression, to state 2 vitals but decompensates again if no tube placed If chest tube placed go to state 2
	Additional Hemodynamics: Hemodynamics	**Labs:** **Xray – tension hemopneumothorax**	**Patients responses and actions:** **Patient now much more anxious, confused, breathing is more labored**

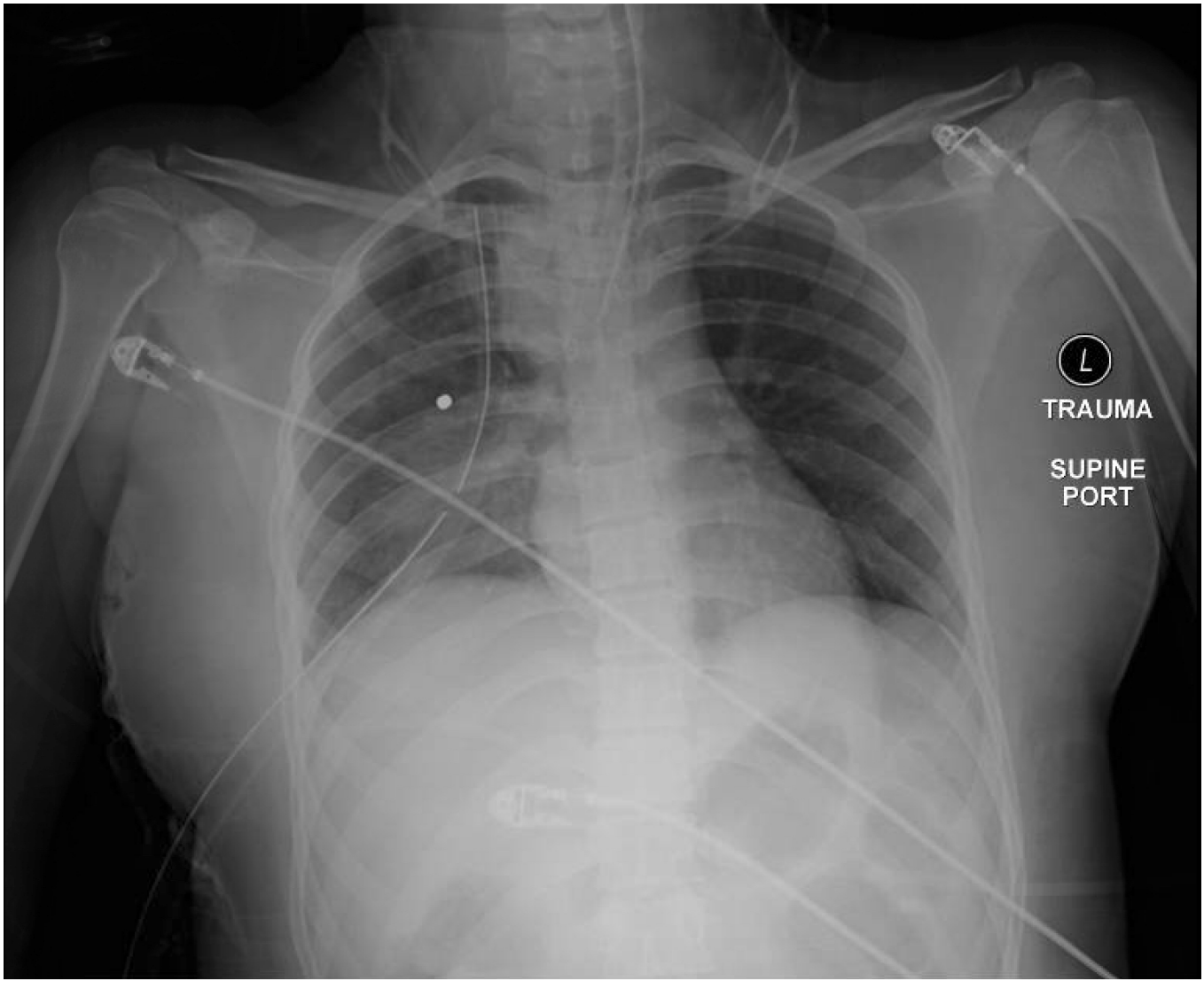
4. State 4	**HR: 90** **BP: 0** **ECG(rhythm): sinus PEA** **RR: 0** **SpO2: 60** **Breath Sounds: Decreased left** **Bowel Sounds:** Sound **Skin: Pale** **LOC: Nonresponsive** **Pain: --** **Temp: 98.7 C**	**ACLS protocol** **No improvement in patient status until chest tube is placed**	If no chest tube or needle placed – patient dies and scenario over If needle placed go to state 2 vitals but will decompensate again with no tube If chest tube is placed go to state 2
	Additional Hemodynamics: Hemodynamics	**Labs:** Labs.	**Patients responses and actions:** Patient Response

***Additional states may be added, if necessary.**

Supporting Materials (Please attach imaging, labs, photos, handouts, etc.):



Before chest tube



After chest tube

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If chest tube not placed, peri-arrest xray

Labs

Hemoglobin: 13.2 **Hematocrit 42** **WBC 11.5** **Platelets: 278**	**Sodium 142** **Potassium 3.8** **Bicarb 26** **Chloride 109** **BUN 15** **Cr 0.76** **Lipase 34**	**Lactate 2.2** **INR 1.2** **LFTs normal**

Supporting Material

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- What emotions did this experience trigger?

How did the team function:
- What was your role?
- Would you have performed better in a different role?
- How did you contribute to the team effort?
- What happened to the team during the simulation?
- Did team members act professional?
- Did a leader emerge? Why or why not?
- Was important information shared clearly?
- How would you describe the communication among the team?
- How could communication within the team have been improved?

How would this improve patient care:
- What new knowledge did you gain?
- Are you comfortable with your knowledge/skill level?
- How would this help you in practice?
- How will you apply what you learned to the clinical setting?

Summarize:
- These are the things you identified as going well…
- These are the things you identified as needing to work on…
- I saw improvements in the areas of …

Process Analysis
- Teaching point – policy, procedure, guideline, evidence-based, pneumonic
- Provide example(s) of good interaction
- Discuss how this translates to actual patient care

Conclusion:
- Review points learned (Ex: actions/decisions/consequences-link to real life)
- Plan for next event or remediation
- Feedback provided from learner on the session overall
- Thank learners for participation

Appendix B

Emergency Medicine M4 Transitional Education Program - Consent and Pre Survey

Please answer the questions below

* Required

Section 1 - Consent Information Sheet

Emergency Medicine Department
3065 Arlington Ave
Toledo, Ohio 43614
Phone 419.383.6369

ADULT RESEARCH SUBJECT - INFORMED CONSENT FORM
(Fourth Year Medical Students Pre And Post Confidence Levels During A Transitional Education Program)

Principal Investigator: Shaza Aouthmany, MD, Assistant Dean of Graduate Medical Educationand Associate Program Director of Emergency Medicine Residency Program, Assistant Professor, 419.383.6369 or 419.281.8154

Other Investigators: Alexander Luna, 513.488.0384; Adam Pasquinelly, 308.520.9486; Alexander Belaia, 440.856.9591

Purpose: You are invited to participate in the research project entitled "Fourth Year Medical Students Pre- And Post- Confidence Levels During A Transitional Education Program" which is being conducted at the University of Toledo under the direction of Shaza Aouthmany MD, Alexander Luna, Adam Pasquinelly, and Alexander Belaia. The purpose of this study is to conduct a before and after survey to observe if there is a change in perceived confidence levels of fourth-year medical students after they undergo an immersive simulation training program in preparation for residency.

Description of Procedures: This research study will take place in the Lloyd A. Jacobs Interprofessional Immersive Simulation Center located at the University of Toledo Health Science Campus. This will take about eight hours, split between a four hour morning session and a four hour afternoon session. You will be asked to complete a before and after survey on your confidence in various clinical scenarios. The answers will be available on a scale format.

Potential Risks: No identifiers will be used and there is no risk to you.

Potential Benefits: The only direct benefit to you if you participate in this research may be that you will learn about how surveys are run and you may learn more about the perceived confidence of fourth-year medical students before and after they undergo a simulation training program. The field of medical education may benefit from this research by helping other medical school programs recognize the importance of simulation-type training before residency. Others may benefit by learning about the results of this research.

Confidentiality: We will not keep any record that contains your personal information.

Voluntary Participation: The information collected from you may be de-identified and used for future research purposes. As a reminder, your participation in this research is voluntary. Your refusal to participate in this study will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or any of your classes. You may skip any questions that you may be uncomfortable answering. In addition, you may discontinue participation at any time without any penalty or loss of benefits.

Contact Information: If you have any questions at any time before, during or after your participation you should contact a member of the research team.

If you have questions beyond those answered by the research team or your rights as a research subject or research-related injuries, the Chairperson of the SBE Institutional Review Board may be contacted through the Human Research Protection Program on the main campus at (419) 530-6167.

CONSENT SECTION – Please read carefully
You are making a decision whether or not to participate in this research study. By clicking next and completing the survey, you indicate that you have read the information provided above, you have had all your questions answered, and you have decided to take part in this research. You may take as much time as necessary to think it over.

By participating in this research, you confirm that you are at least 18 years old.

1. Do you agree to participate in the study? *

◯ I agree

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Section 2 -Survey

2. Please enter a 4 digit code with the first 2 digits being the month you were born and the last two digits being the last two digits of your phone number (example: Birth Date: 08/30/96 Phone Number: 419-555-3456 Code: 0856) *

3. What is your level of training? *

- ◯ M4
- ◯ Other

4. What gender do you identify with?

- ◯ Man
- ◯ Woman
- ◯ Other

5. What is your age?

- ◯ 21-25
- ◯ 26-30
- ◯ 31-35
- ◯ 36-40
- ◯ 40+

6. For the following questions, please rate from 1-5 with 1 being not confident to 5 being highly confident for the following skills; or strongly disagree=1; disagree=2; undecided=3; agree=4; strongly agree=5

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
I feel confident in my ability to manage an emergent airway, e.g. performing a cricothyrotomy	○	○	○	○	○
I feel confident in my ability to manage a urgent airway, e.g. intubation	○	○	○	○	○
I feel confident in my ability to provide ACLS care	○	○	○	○	○
I feel confident in my ability to place a splint	○	○	○	○	○
I feel confident in my ability to place an intraosseus line	○	○	○	○	○
I feel confident in my ability to effectively manage patient situations involving opioids	○	○	○	○	○
I feel confident in my ability to place a chest tube	○	○	○	○	○
I feel confident in my ability to place a pigtail catheter	○	○	○	○	○
I feel confident in my ability to suture a wound	○	○	○	○	○
I feel confident in my ability to perform a lumbar puncture	○	○	○	○	○
I feel confident in my ability to effectively manage a patient with an altered mental status	○	○	○	○	○
I feel confident in my ability to effectively manage a patient with a GI bleed	○	○	○	○	○
I feel confident in my ability to manage a stroke patient	○	○	○	○	○
I feel confident in my ability to identify patients that are truly sick in the ED setting	○	○	○	○	○

Emergency Medicine M4 Transitional Education Program - Post Survey

Please answer the questions below

* Required

1. Please re-enter the 4 digit code with the first 2 digits being the month you were born and the last two digits being the last two digits of your phone number (example: Birth Date: 08/30/96 Phone Number: 419-555-3456 Code: 0856) *

2. For the following questions, please rate from 1-5 with 1 being not confident to 5 being highly confident for the following skills; or strongly disagree=1; disagree=2; undecided=3; agree=4; strongly agree=5 *

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
I feel confident in my ability to manage an emergent airway, e.g. performing a cricothyrotomy	○	○	○	○	○
I feel confident in my ability to manage a urgent airway, e.g. intubation	○	○	○	○	○
I feel confident in my ability to provide ACLS care	○	○	○	○	○
I feel confident in my ability to place a splint	○	○	○	○	○
I feel confident in my ability to place an intraosseus line	○	○	○	○	○
I feel confident in my ability to effectively manage patient situations involving opioids	○	○	○	○	○
I feel confident in my ability to place a chest tube	○	○	○	○	○
I feel confident in my ability to place a pigtail catheter	○	○	○	○	○
I feel confident in my ability to suture a wound	○	○	○	○	○
I feel confident in my ability to perform a lumbar puncture	○	○	○	○	○
I feel confident in my ability to effectively manage a patient with an altered mental status	○	○	○	○	○
I feel confident in my ability to effectively manage a patient with a GI bleed	○	○	○	○	○
I feel confident in my ability to manage a stroke patient	○	○	○	○	○
I feel confident in my ability to identify patients that are truly sick in the ED setting	○	○	○	○	○

3. For the following questions, please rate from 1-5 with strongly disagree=1; disagree=2; undecided=3; agree=4; strongly agree=5 *

	Strongly Disagree	Disagree	Undecided	Agree	Strongly agree
Simulations are an effective method of training in general	○	○	○	○	○
Simulations are a productive way of learning how to respond to common patient presentations in emergency medicine	○	○	○	○	○
I was able to work with colleagues successfully during the simulations	○	○	○	○	○
I was able to practice the technique of each skill during the simulations	○	○	○	○	○
In my experience, these simulations were similar to responding to these patient presentations in a clinical setting	○	○	○	○	○
I was given ample opportunity for questions during the simulations	○	○	○	○	○
I felt that feedback given during the simulations was constructive and meaningful	○	○	○	○	○
Overall, I personally feel more confident in my ability to respond to these patient presentations after simulation training	○	○	○	○	○