

# MULTIDISCIPLINARY SIMULATION EDUCATION: IMPROVING CARE OF PATIENTS WITH NEUROLOGICAL EMERGENCIES

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## OUTLINE

- Limitations of traditional medical education model
- Best strategies for medical learning
- Neuro Emergency simulation and education
- Results, takeaways
- Conclusion and Future
- Discussion/Questions?

## TRADITIONAL RESIDENCY TRAINING

- William Halsted, 1890

“See one, do one, teach one...”

“We need a system, and we shall surely have it, which will produce not only doctors but doctors of the highest type, men who will stimulate the first youths of our country to study medicine and surgery and to devote their energies and their lives to raising the standard of health science”.



- Residency unchanged for over 100 years.

Is there a better way to train and educate medical providers?

# CHALLENGES FACING TRADITIONAL RESIDENCY EDUCATION & TRAINING

- In 2003, ACGME instituted the 80 hour work week.
- Increasing medical-legal concerns.
- Desire for decreased adverse patient outcomes.
- Residency training is hard!
- High acuity, complex patients
- Increased focus on subspecialty training before generalist training has taken shape.
- Steep learning curve
- Requires several years



## HOW DO WE LEARN BEST?

- We know what doesn't work.
- Active physical or mental involvement is best!
- Multisensory tasks.



# DELIBERATE PRACTICE

- Versus repetition= Plateau less than maximal level
- Constantly setting new goals and seeking additional experience to achieve
- Doing the same thing= automated, increased repetition no longer leads to improvement

## FOUR PRINCIPLES OF DELIBERATE PRACTICE

1. Have a task with a well-defined goal
2. Be motivated to improve
3. Be provided with immediate feedback
4. Be provided with ample opportunities for repetition and gradual refinements of performance

## WHY DOES SIMULATION MATTER IN NEUROLOGIC EMERGENCIES?

- TIME IS BRAIN!!
- Stroke, seizures and intracranial hypertension
  - Immediate response and treatment is essential to preventing long-term brain damage and disability
  - One way street!!
- The luxury of practice is not feasible in a real life emergency

## USING SIMULATION IN NEUROLOGIC EMERGENCIES MATTERS

- High acuity patients
- Multidisciplinary team – ED, Neurology, Neurosurgery, Trauma, Anesthesia ...
- Complex decision making
  - Time sensitive treatments available- tPA, Thrombectomy, ICP crisis
- Rapid decision making required to majority of cases
- Multiple factors in patient history, exam, radiologic studies needed

## USING SIMULATION IN NEUROLOGIC EMERGENCIES MATTERS

Limited exposure to Neuro Emergencies  
+  
High acuity patient, multiple team members, and  
complex decision making  
=  
**High risk for delays in treatment, decision  
errors**

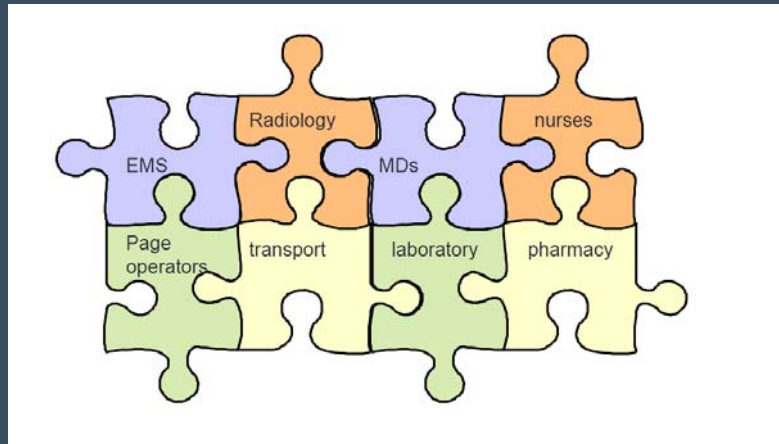
## DOES THIS MATTER?

High risk for delays in treatment, decision errors this can lead to

- Poor patient outcomes
- Decreased satisfaction of experience for patients and providers
- Increased cost burden to society with more disabled patients



# ALL THE PIECES OF THE PUZZLE



## CRISIS RESOURCE MANAGEMENT



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# SIMULATION FOR TRAINEES

## Learning objectives

- Abbreviated history
- Perform targeted exam (brief exam, NIHSS, tools for physical exam)
- Identify signs/symptoms of neurological emergencies including seizure, herniation syndromes, acute stroke
- Interpret non-contrast head CT
- Identify the indication and contraindication of tPA
- Call for appropriate consultation
- Courteous yet efficient manner with patient
- Coordination with other care providers

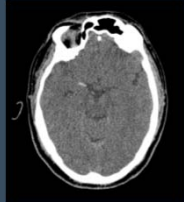
## METHODS

1. Stroke/Critical Care neurologist trained actor to play a standardized patient if needed
2. A stroke nurse interacted with trainees and carried out nursing duties.
3. 5-6 trainees attended a 4 hour training session with 3 scenarios
4. Trainees communicated with the simulation faculty and RN during scenario
5. Debriefing occurred after each scenario
6. Trainees completed evaluations after the simulation

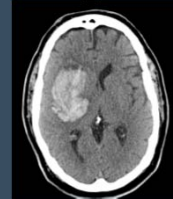


# SCENARIOS

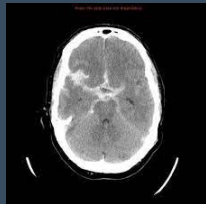
- Ischemic stroke with IV thrombolysis



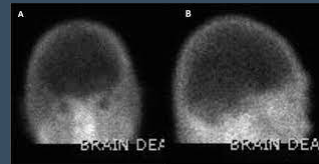
- Heparin-associated Intracerebral Hemorrhage



- Subarachnoid Hemorrhage



- Death by Neurologic Criteria

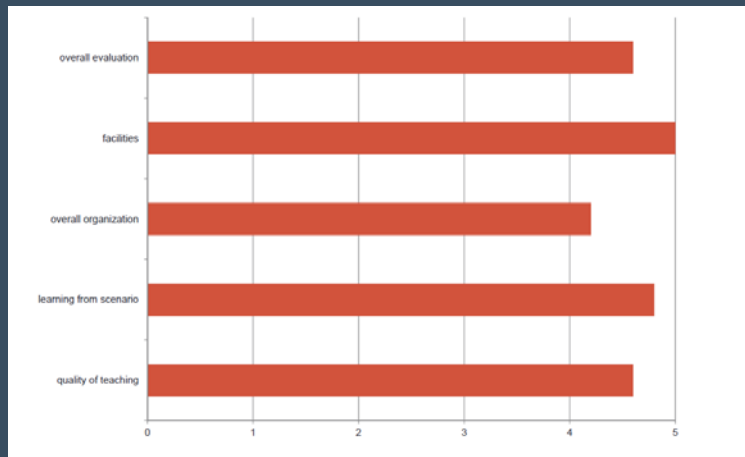


# ORDER SET

The screenshot displays a medical order set interface for the 'IP NEU TPA ALTEPLASE PROTOCOL'. The interface is organized into several sections:

- Order Set:** IP NEU TPA ALTEPLASE PROTOCOL
- Orders:** Select/Release Sign and Held Orders. Includes Pharmacy: R<sub>x</sub> WALGREENS DRUG STORE 11261 - 520 PALMETTO AVE - PACIFICA, CA (Patient Preferred) 650-355-9901. Order mode: Standard. Providers: [dropdown]. Buttons: Pending Orders, Sign & Hold, Sign Orders.
- Order Sets:** Manage Order Sets. IP NEU TPA ALTEPLASE PROTOCOL. Add Order.
- NOTIFY PHYSICIAN:**
  - Notify MD:  Notify MD. Routine: P01, 0. Severe Headache 2. Acute hypertension 3. Decline in neurological exam 4. Seizure or Vomiting.
  - Notify MD: Adverse Reactions to Alteplase. Routine: P01, 7. Adverse reactions to Alteplase please notify MD. Emergently and be prepared to discontinue the TPA infusion and obtain an emergent head CT scan.
- NURSING:**
  - Nursing Protocols:
    - Patient on TPA Alteplase Protocol. Patient: TPA Alteplase protocol. CONTINUOUS starting Today at 0930 Unit Specified.
  - Vital Signs:
    - Vital Signs During Infusion every 15 min. STAT, EVERY 15 MIN First occurrence Today at 0930 for 4 occurrences.
    - Neurological checks during infusion every 15 min. STAT, EVERY 15 MIN First occurrence Today at 0930 for 4 occurrences.
    - Vital Signs Q 15 min x 2 hr then q 30 min x 6, then q 1 hr. STAT, AS SPECIFIED starting Today at 0919 Unit Specified, Q 15 min x 2 hr then q 30 min x 6, then q 1 hr.
    - Neurological Checks q 15 min x 2 hr then q 30 min x 6, then q 1 hr. STAT, AS SPECIFIED starting Today at 0919 Unit Specified, Q 15 min x 2 hr then q 30 min x 6, then q 1 hr.
    - Pulse Oximetry/O2 Sat. STAT, CONTINUOUS starting Today at 0930 Unit Specified.
- MEDICATIONS:**
  - Thrombolytic Therapy:
    - alteplase (ACTIVASE) 100 mg IV infusion. 0.3 mg/kg, intravenous, ONCE.
  - Administration:
    - Administration.

# TRAINEE POST-EVALUATION



# POST SIMULATION KNOWLEDGE

- Included array of multiple choice questions covering clinical content
- Average score of 7.8-9/10 in post stroke knowledge assessment
- Crisis resource management

## TRAINEE FEEDBACK

*“Having a real life actor was really helpful to learn how to act quickly during an emergency.”*

*“Realistic situation without risk- this is great for learning.”*

## FUTURE EXPANSION

- Simulations for use in process flow improvements
  - Educating large group involved in those patient's care : ED, Critical Care Transport, Other Hospitals in Regional health System
- Supporting larger education efforts with broader simulation efforts
- Use of virtual and augmented reality

# The World of Virtual Reality and Health

## WHAT IS VIRTUAL REALITY

Real-time simulation where the user is effectively immersed in a responsive virtual world that provides visual and audio (and sometimes other) sensory inputs that make the virtual world seem real and helps user feel present in the simulation.

Virtual world + real inputs

# MILITARY AND VR/AI

- VA and DoD are leading development of VR and AR healthcare apps
- Training and Education – field medicine
- PTSD
- Rehabilitation
- Pain management
- Behavioral health



# VR IN MEDICAL EDUCATION



Iserson, K. (2018). Cambridge Quarterly of Healthcare Ethics, 27(2), 326-332.

## VR ADVANTAGES

- Low cost and easy set up .
- Faculty need not be present
- In-folded feedback at the end
- Learners make mistakes without risk of harm to patients.
- No specific location or clinical area needed.
- Fun and psychologically safe learning environment.
- Convenient, learners can use during down time or breaks.
- Relatively easy to imbed standardized policies and latest evidence-based practice.
- Relatively easy to monitor learner performance and generate data..
- Addresses larger group without major time and space commitment

## HOW DOES VR WORK?

Select different AED features for each exercise.

# OPPORTUNITIES

- Better team based care
- Process improvement
- Core clinical and technical proficiencies





## SPECIAL THANKS TO MY TEAM

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- Amanda Rowe – ACNP Neurocritical Care
- Bradley Douglas – ACNP Neurocritical Care
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- Pharmacy : Dr. Christine Ahrens , Pharmacist , Neurocritical Care
- Michelle Feliciano and Danielle Harris – Simulation Center



QUESTIONS?

**A PINT OF  
SWEAT, SAVES A  
GALLON OF  
BLOOD.**