APPLICATIONS OF SIMULATION-BASED TRAINING IN THE MEDICAL FIELD

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Overview of talk

- Existing approaches
  - Level of integration
  - Costs and benefits
- New approaches
  - What's coming down the pike
  - Defining the direction of simulation (what does simulation look like in 5 years?)
- Goals:
  - Identifying what you can do right now
  - Identifying your part in shaping the future

Current approaches have difficulty providing:

- Sufficient opportunities for practice
- Exposure to infrequent – yet critical – scenarios
- Tailoring for each student
- Standardization
- Patient variability
- Team-based learning
- Cultural competency
- Feedback

Simulation *could* be the answer!

- Sufficient opportunities
- Exposure to infrequent
- Tailoring for each stude
- Standardization
- Patient variability
- Team-based learning
- Cultural competency
- Feedback
- Instructors control experience (patient, parameters)

Current Simulation Efforts

- Humans
  - Standardized patients – "gold standard"
  - Role-playing
  - Lecture
- Pros
  - Empathy
  - Emotion

Current Simulation Efforts

- Computer-based learning
  - Case studies
    - Passive – multimedia presentation of information
      - https://research.bidmc.harvard.edu/vptutorials/cases/mental.htm
    - "Choose your own adventure"
      - http://www.virtualpatients.eu/referatory/
  - Standards and consortiums - MedBiquitous

Image from Harvard Medical School

Current Simulation Efforts

- Physical Simulators
  - Realistic devices
  - Procedural simulation
- Pros:
  - Satava – safe place to make mistakes

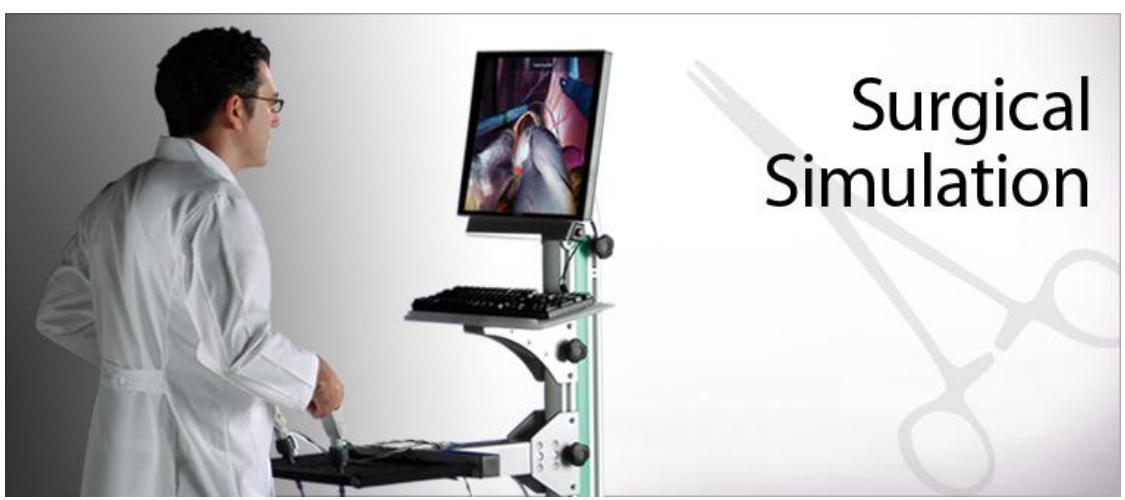


Image from METI


Human Patient Simulator – image from Samsun Lampotang

Current state of usage

- Standardized patients and Mannequin simulations are integrated into many medical schools
  - Teaching, training, and evaluation
  - Significant infrastructure (upkeep, educators, logistics)
- [Huang 2007] studied virtual patients
  - Ad-hoc (26 of 108 schools building cases)
  - Still images and video (83% of virtual patients)
  - Expensive (each case $10,000-$50,000, 1-2 years to develop)

Image from UF Simulation in Healthcare

Current state

- Simulation wings
  - Medical schools are building simulation wings
    - Example: UF-Jacksonville has dedicated 24,000 sq. ft.
  - Buying simulators
    - UF-Jackonsville 55 sims
  - Minimal understanding of integration into curriculums
- Known of education potential
  - Provides additional experiences
  - Compliments classrooms
  - Unknown learning, retention
  - Face validity

Image from UF College of Medicine - Jacksonville

Simulation future – focus on Virtual Humans

- Technologies
  - Rapid development
  - Deployment
  - Complex scenarios
- Application
  - Understanding technology
  - Integration into training
  - Integration into care

Image of psychiatric virtual patient
From the University of Southern California, Institute of Creative Technologies

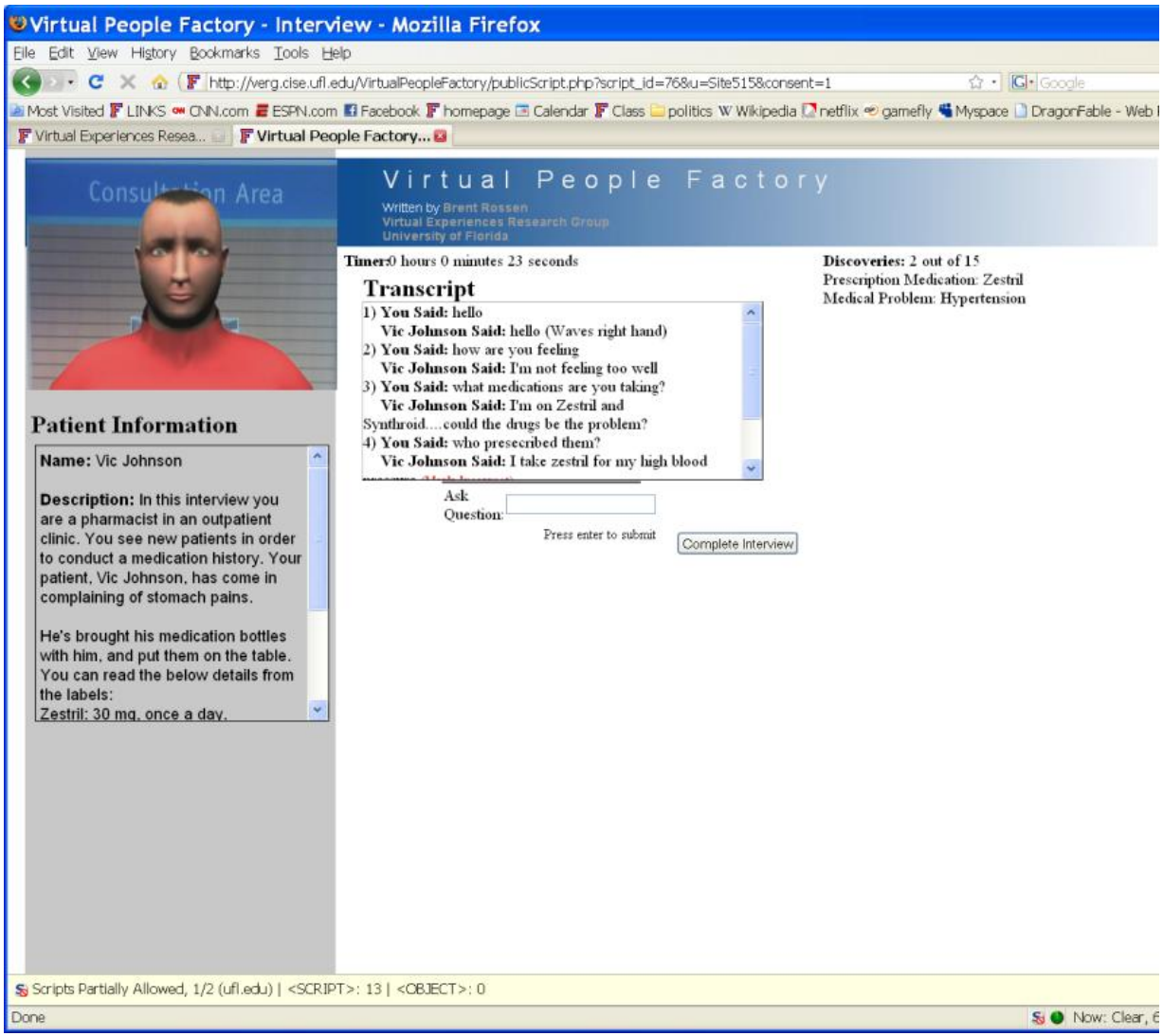
Interactive Virtual Patients

- Students practice communication + diagnostic skills
- Used *in conjunction* with standardized patients
- For different level of learners, different benefits
  - Initially, practice and feedback
  - Later, exposure
  - Eventually, continuing medical education

Image from www.virtualpatientsgroup.com

Rapid Development of Simulations

- Virtual People Factory
  - Web-based interface
  - End-user creation of content
  - Pharmacy patient
- In two years
  - Over 4700 interactions
  - 24 end-user created scenarios
- UCF integrated into curriculum

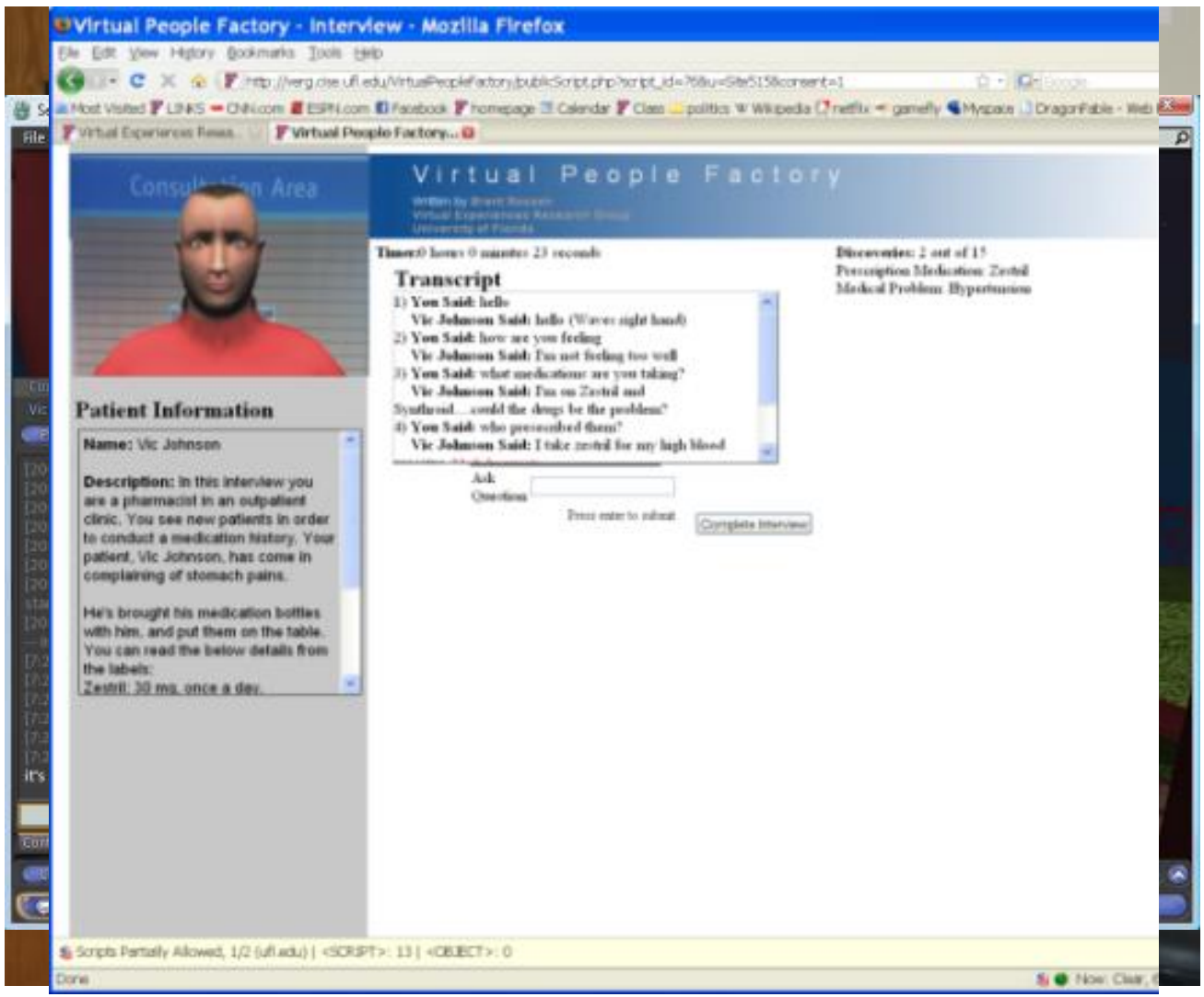


www.virtualpeoplefactory.com

Deployment - Continuum of Experiences

Immersion

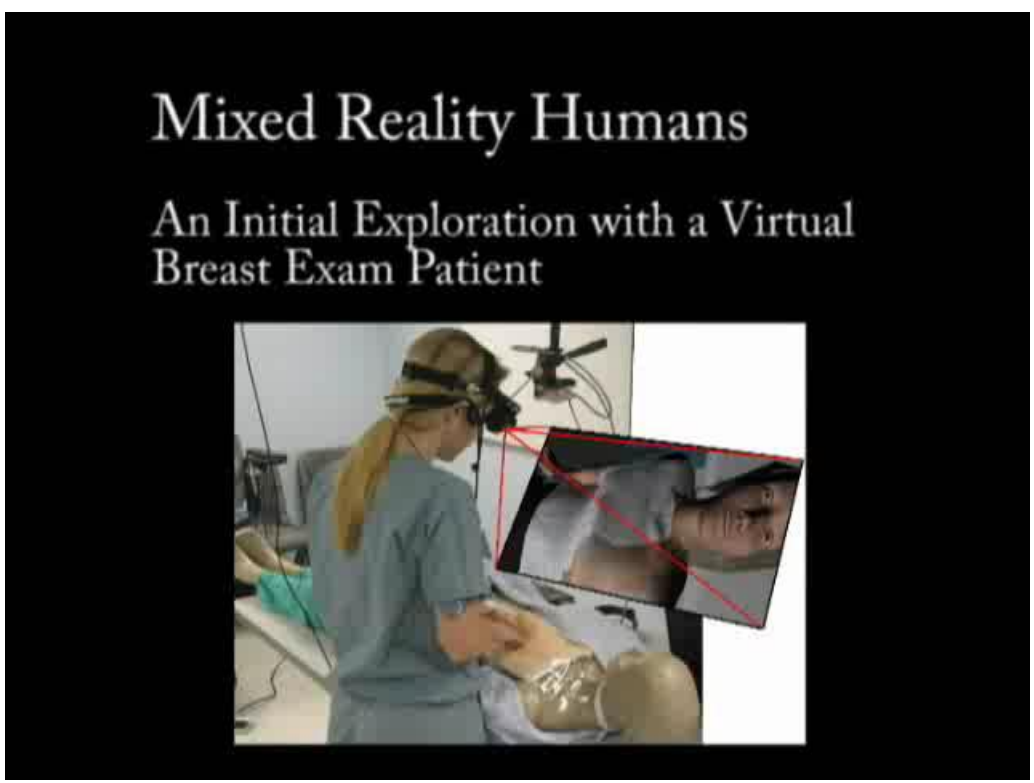
- Immersive Interaction
- Virtual Worlds
- Video Conference Chat
- Mobile Deployment
- Web Browser Instant Message

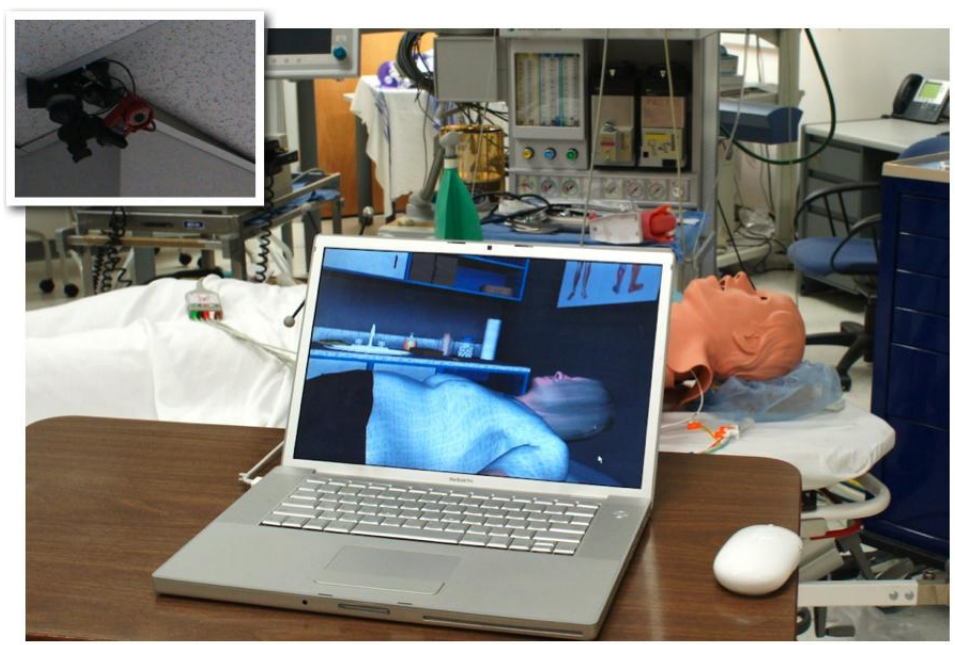


Images from www.virtualpatientsgroup.com

Merging physical and social simulations

- Combine physical simulators and social simulators
- More similar to clinical experiences





Images and videos from www.virtualpatientsgroup.com

Serious Games

- Interactive training exercises
- Using computer game engines and the Internet
- http://www.breakawaygames.com/serious-games/solutions/healthcare/pulse.html

Image from Breakaway Ltd.

Virtual Worlds

- Virtual worlds –
  - Computer generated environments
  - Often with many users (teachers, students)
  - Users can create their own content
- Training
  - UNC Pharmacy using Second Life to prepare students to visit other sites
  - University College London virtual patients in Second Life
  - Encompasses more of the clinical experience (including navigating building, tools, etc.)
  - http://www.youtube.com/watch?v=WnPYhSbSABA&feature=related

Image from University College London

Mobile Distribution of Simulation

- Deploy simulations via mobile platforms
- Students are often provided tablets and smartphones
- Desire to do mobile learning
  - Android app, released December 2010, over 3000 downloads
    - http://verg.cise.ufl.edu/AndroidApp/vpf_android.html
    - In Market, search for "Virtual Patient"
  - iPhone/iPad app, just released
- http://www.youtube.com/watch?v=PPNp5zmSoXo

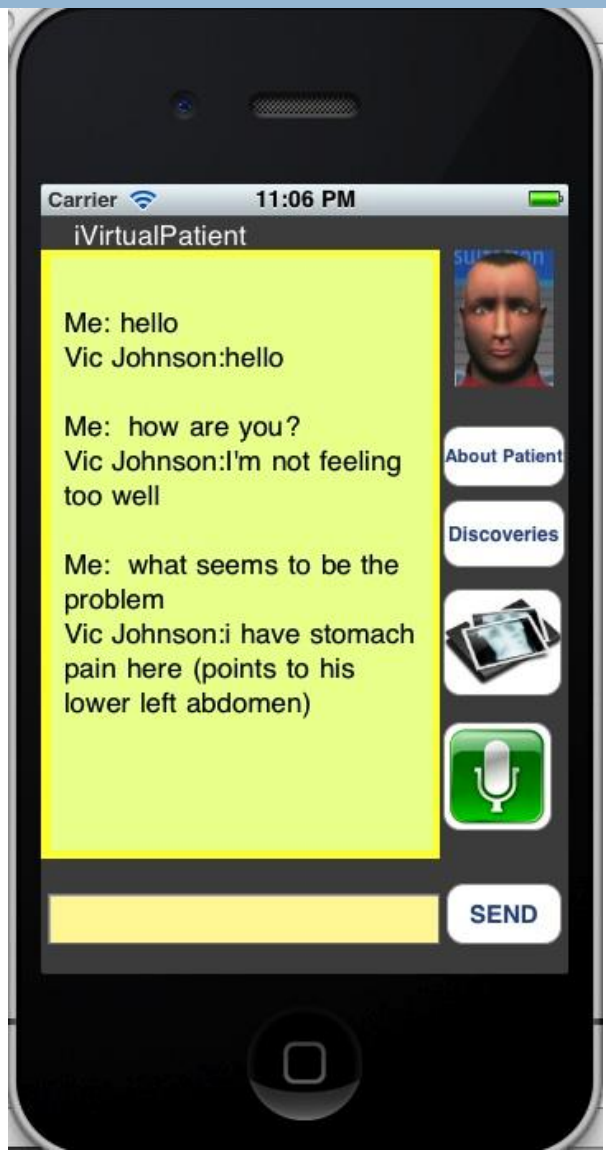


Image from www.virtualpatientsgroup.com

Simulating Complex Scenarios

- Team training
- Bedside Manner
- Rapport
- Empathy

Video from www.virtualpatientsgroup.com

Understanding Technology

- Need longitudinal studies to understand:
  - Retention
  - Learning
  - Efficient implementation
  - Change
- Modality
  - Self-directed? Group?
  - Infrastructure

Image from www.virtualpatientsgroup.com

Integrating Technology

- Learn from the flight simulation industry
  - Complementing existing approaches
  - Abnormal findings
  - Infrequent exposures – intimate exams
  - After-action review

- Example: Opiod patient
- 7 rules for prescribing opiods
  - http://www.virtualpeoplefactory.com/VirtualPeopleFactory/publicConsentForm.php?script_id=616

- Where else can we use virtual human training and simulation?

Image from Link Flight Simulator ($87.7 million dollar contract)

Image from www.virtualpatientsgroup.com

Virtual Patient Advocates

- Engineeredcare.com
- RED Educator
- Virtual patient advocate discusses discharge with patient
- Touch screen
- Pros:
  - Standardization
  - Tailoring (based on medical history)
  - Testing of patient knowledge

Image from Engineeredcare.com

Quality of care research

- NIH-funded collaboration with Michael Robinson
- Video vignettes of virtual patients expressing low or high levels of pain
- Virtual patients varied in gender, age, and ethnicities
- Doctors, nurses, and dentists evaluate perceived levels of pain
- Virtual patients enable controlled stimuli

Videos from www.virtualpatientsgroup.com

Virtualpatientsgroup.com

Research support: National Science Foundation and National Institutes of Health

Virtualpatientsgroup.com

- 5 Universities, 35 researchers, 7 years of VP research
- Create and evaluate technologies to:
  - Create virtual patients
  - Deploy virtual patients
- Enable
  - Curricular building and integration of training scenarios
  - Teaching and training with
    - Variety of scenarios
    - Variety of patients
    - After-action review systems
- Currently in research stage, though commercialization underway (startup)

Scripts (24) at VPF General

http://vpf.cise.ufl.edu/wiki/index.php/VPF_Script_Tracking

- Anesthesia
  - Pre-op OSA (UF)
  - Conscious sedation (UF)
- Cancer
  - Abnormal mammogram (UF)
  - BRCA Pedigree (UCF)
  - Clinical breast exam (UF/MCG)
  - Melanoma (MCG)
- Pain
  - Abdominal Pain (UF)
  - Chest pain (UF)
  - Gallstones (UCF)
  - Lower back pain (UF)
  - Lower back pain (PCOM)
- Psychiatry
  - Failure to thrive (UF)
  - Depression (MCG)
  - Bi-polar (MCG)
- General
  - Breaking bad news (MCG)
  - Cranial Nerve (UF)
  - Dyspepsia – Pharmacy (UF)
  - Gastro-Band (UF)
  - GI Hemorrhage (UF)
  - Meningitis (PCOM)
  - Patient-Centered Counseling (USF)
  - Post Operative Hemorrhage (UF)
  - Sexually Transmitted Diseases (UF)
  - Contraceptive Counseling (UF)