Collaborating with the College of Engineering: Initial Strategies and Early Outcomes

Rosalyn P. Scott, MD, MSHA
Professor of Surgery, BSOM
Professor of Biomedical, Industrial and Human Factors Engineering (Joint Appointment), College of Engineering
Collaboration Across Disciplines

- Applies human factors engineering principles to the design of complex systems

Courses
- Engineering Health Systems
- Human Factors in Virtual Environments

Jennie J. Gallimore, PhD
Professor of Industrial and Human Factors Engineering
Overview

- Current Projects
  - First Case FI X Initiative
  - Surgical Unit Layout Analysis
  - Modeling of Telemedicine System
  - Development of Virtual Patients

- Grant Proposals
  - Integration of Simulation and Virtual Patient Experiences for Surgical Education
  - Developing IT Communication Models in Perioperative Cancer Care
First Case FIX Initiative

Objectives

- To identify and analyze sources of delays in first surgical cases
- To enhance the capabilities of the surgical services department in order to launch a greater percentage of first cases on time
- To start the first case of the day at 7:30am instead of 7:45am
First Case FIX Initiative

- **Methods**
  - Process flow analysis: Observation, interviews, analyzing existing VA data on delays
  - Analyze preparations taking place with patients in clinics that have low number of delays
    - Orthopedic Surgery identified as a best practice
    - Reviewing computer support systems
    - Improve screens for antibiotic ordering and other tasks
    - Reminders sent to physicians to complete medication orders, consents
First Case FIX Initiative

- Changes Implemented
  - Additional surgery tech (total = 2) support morning nurse
  - Patient arrives in Pre-op area by 7:00 AM
  - Shaving takes place in Same Day before sending to Pre-Op
1st Case Delays in 16 of 30 Cases
Surgical Unit Layout Analysis

- Class project of WSU Engineering Graduate students

**Objectives**

- Analyze current storage solutions
- Analyze current unit layout
- Propose changes based on analysis
  - Improve the efficiency of the workplace
  - Identify areas for further evaluation
Methods

- Observe daily situations
- Interview staff
- Create list of recommendations
  - Short term: i.e. Reallocation of current space
  - Long term: i.e. Renovation of unit and implementation of electronic storage systems
Example of Project Focus: Storage

- **Current:**
  - Inadequate space for equipment
  - Supply storage not centralized

- **Proposed:**
  - Reallocation of space to allow for large equipment
  - Centralized supply locations
  - Implement electronic storage system for inventory and ordering
Development of Virtual Patient

- **Objectives**
  - To develop a computer-based *interactive* virtual patient for teaching clinical care and communication skills to learners
  - To evaluate effectiveness of interactive computer-based virtual patient compared to static (non-interactive) and human standardized patients

- **Submitted Major Collaboration Grant to WSU.**
  - Integration of Virtual Patients into High Fidelity Simulation Strategies for Medical Training and Competency Assessment
Development of Virtual Patient

- Methods
  - Literature Review
  - Interviews with experts in teaching communication to medical students and/or using virtual patients
  - Observation of training and interactions with standardized patients
  - Applying existing models of communication
WSU SOM Grant

- WSU SOM Medical Education Grant Proposal, submitted March, 2009
- Title: Integration of Task Training and Human Patient Simulation Strategies into Virtual Patient Experiences for Surgical Education of Medical Students and Residents
Objectives:

- Develop interactive avatar-rich virtual patients with surgical disease in Second Life
- Demonstrate the feasibility of integrating virtual patient scenarios into high fidelity simulation for the student and resident in surgery
- Create a learning environment that allows testing of both cognitive and task oriented skills
WSU SOM Grant

**Methods**

- Clinical cases developed around colon cancer, cholelithiasis and lung cancer
- Cases include diagnosis, preoperative care, surgery and postoperative care
- Patient scenarios programmed into Second Life
- Each scenario contains at least one task-simulation and possible high-stakes event to be managed on human patient simulator at Dayton VAMC
- Medical student and resident versions
Telemedicine

FY 2007 Consultation Requests from Outside Dayton VAMC
## Travel to Dayton VAMC

<table>
<thead>
<tr>
<th></th>
<th>Miles from Dayton VAMC</th>
<th>Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chillicothe</td>
<td>81</td>
<td>1:22</td>
</tr>
<tr>
<td>Columbus</td>
<td>79</td>
<td>1:20</td>
</tr>
<tr>
<td><strong>CBOC's</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lima</td>
<td>76</td>
<td>1:15</td>
</tr>
<tr>
<td>Richmond, IN</td>
<td>38</td>
<td>0:48</td>
</tr>
<tr>
<td>Springfield</td>
<td>36</td>
<td>0:43</td>
</tr>
<tr>
<td>Middletown</td>
<td>19</td>
<td>0:32</td>
</tr>
</tbody>
</table>
Modeling of Telemedicine System

- Student Computer Simulation Project
  - Model levels of telemedicine utilization and patient wait times.

- Input variables
  - Referral rates (Columbus and Chillicothe)
  - Shared resource
  - Length of in-person consultations
  - Length of telemedicine consultations
  - Percentages of appointments that went directly to consult vs. those that had some extended delay to wait on tests
  - Frequency of physicians needing to cancel appt’s
Modeling of Telemedicine System

- Results based on theoretical system indicated that factors that must be considered are:
  - Mismatch between referral and specialty availability leads to long patient times.
  - However, patients are waiting near their homes rather than traveling long distances so time may be equal.

- Additional factors to add to the model
  - Change in resource utilization compared to face to face
  - Difference in time spent with patient
  - Patient satisfaction
NIH Grant

- Invited to resubmit March, 2009
- Title: Developing Best Practice IT Communication Models in Perioperative Cancer Care
- Objective: To enhance cancer patient care through the development of models for incorporating IT to improve communication and teamwork among providers and between providers and patients
NIH Grant

Phase I Aims:

- Establish benchmarks of current system
- Evaluate patient and provider needs and expectations
- Evaluate current teleconsultation model
- Develop IT use model for pre- and post-surgical care
NIH Grant

Phase II Aims:

- Set up IT systems based on model
- Measure system effectiveness and compare to benchmarks
- Update model and re-evaluate
Expanded Collaboration and Student Involvement

- April Barnes, PhD Candidate in College of Engineering, will work with human factors in development of virtual patients as her dissertation.
- Offer MPH Student Culminating Experience and Practice Placement Opportunities associated with our work.