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14. ABSTRACT Despite the tremendous advantages, the adoption of simulation technology has been at a pace that is slower than might be expected. There are several reasons for a lag in adoption. The largest may be appropriate exposure to the technology. In a study done by Haluck et al several years ago, only 19% of Program Directors in General Surgery had used a simulator in a hands-on fashion. While it is likely that more program directors have seen simulators since then, it is likely that much more exposure to simulation technology and the use of simulation technology is required for widespread adoption.					
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INTRODUCTION

The Medical Modeling and Simulation Section under TATRC and the USAMRMA has been working for several years on the advancement of simulation and related technologies in order to improve training for civilian and military medicine. Simulation technology for training and assessment is very new. The technology hold tremendous promise to revolutionize the ways medical training is delivered.

Despite the tremendous advantages, the adoption of simulation technology has been at a pace that is slower than might be expected. There are several reasons for a lag in adoption. The largest may be appropriate exposure to the technology. In a study done by Haluck et al several years ago, only 19% of Program Directors in General Surgery had used a simulator in a hands-on fashion. While it is likely that more program directors have seen simulators since then, it is likely that much more exposure to simulation technology and the use of simulation technology is required for widespread adoption.

Certainly, advancement of military medical simulation technology will parallel civilian medical simulation technology adoption. Advancement of the fields will go hand-in hand. The purpose of the SAGES / SLS Simulation Hands-On course is not only to expose educators in surgery and nursing to the simulator devices, but to teach the teachers how to use the devices as teaching tools. This will be one of the first courses of this kind and certainly is the first course of its kind to be offered by a major surgical society. We envision repeat courses at SAGES, SLS, and other venues, as well as a ripple effect of this course as the learners carry their expertise to their home institutions.

BODY

SAGES / SLS Hands-On Simulation Course

Title: Establishing a Simulation and Training Center for Surgical Skills:
What to do and How to do it.

Date: April 27, 2006

Time: 8 am to 5 pm

Course Chairs: Randy Haluck, MD & Col. Richard Satava, MD

Description:

The SAGES / SLS Hands-On Simulation Course is designed to inform Surgical and Perioperative Educators on the latest Simulation Technology and it use in the development of a Skills Training Center. Participants will learn how simulators are used as a teaching tool within an educational curriculum. Participants will also learn about current issues and concerns with regard to building a Skills Training Center. Participants will have the opportunity to use a variety of current simulators to teach assigned trainees provided for the Hands-On session. The Hands-On session will be limited to 40 participants.

Target Audiences:

Program Directors in General Surgery, Minimally Invasive Surgery, Urology, Gynecology, Orthopedics, OR Nurses, OR First Assistants. All Surgical Educators and Trainees. Students, residents, and faculty interested in Surgical Education as a Career Path.

Objectives:

Understand, through hands-on use, how simulators are used as a teaching tool.

Understand current and future initiatives and concerns of societies and regulatory agencies.

Understand the background and issues involved in the creation of a skills training center.

Participants will be able to develop a roadmap to facilitate the implementation of a skills training center.

Presenters and Topics for Didactic 8AM – 11 AM

Session 1 Background and rationale for starting a skills training center

730 – 740 Haluck –Intro remarks

740 – 755 Satava – Where we've come, Where we're going - Curricula, criteria, proficiency, and the paradigm shift in surgical education.

755 – 820 Ajit Sachdeva- Update on American College of Surgeons Accredited Education Centers Initiative

Session 2 The activities of a Skills center

820 – 845 Neal Seymour – Development of a curriculum using simulation.

845 – 910 David Wilkes – How to teach with simulators and simulation.

910 – 935 Gerry Fried – Evaluation and Validation of Simulators

Session 3 Implementation of a skills training center

935 – 1000 Lee Sillin – Integration of skills training into the residency program.

1000 – 1020 Carol Lake – How do I pay for a skills lab using simulation technology?

1020 – 1045 Matt Ritter – What to look for in simulators: What is New / Valid / Affordable in Simulation?

1045 – 1100 Discussion / Wrap up / Intro to Afternoon – Haluck / Satava

Afternoon session: Hands on with the simulatorsLab Stations 2PM – 5:30PM:CompanyParticipants for Hands-on:

METI

Haptica

Immersion

MISTELS

Simbionix

Surgical Science

RealSim Systems

Verefi Technologies

STEP / HPS

ProMIS

Laparoscopic Simulation Workstation

Fundamentals of Laparoscopic Surgery

Lap Mentor , GI Mentor, UroMentor

LapSim

LTS 2000

EndoTower / RapidFire

KEY RESEARCH ACCOMPLISHMENTS

The morning didactic session was delivered to an audience of almost 80 participants from academic surgery and industry. Presenters are leaders in their respective fields with regard to the implementation of simulation technology and building skills centers. The session lasted for approximately 3 hours. The audience participated in four audience response system questions.

The afternoon Hands-on workshop was attended by nine companies demonstrating 12 different simulators to 40 participants. For this session, the course directors developed a tool (under reportable outcomes). Approximately twelve faculty served as Hands-On course instructors. Many of these faculty were from the SAGES technology committee and again are leaders in the field of simulation and other surgical technologies.

All participants received a syllabus of the morning didactic session and received a copy of the curriculum development tool (included in reportable outcomes). This tool may be used at the participants' home institution in order to develop a training curriculum for procedural skills using computer-based simulation.

REPORTABLE OUTCOMES

1. At the time of this report, feedback from course participants is being collected and collated by SAGES.
2. Final tabulation of responses from the Audience Response System (ARS) is underway
3. Curriculum Development tool for Participants / Educators

SAGES Simulation Hands-On Course Information for participants Randy S. Haluck, M.D.

The course is designed to 1) provide useful information to directors and centers that plan to establish a skills training center using simulation technology and 2) educate participants on how to use simulators as an educational tool.

This is a “train the trainers” course. We are not trying to provide instruction on how to perform laparoscopic surgery. Some participants may not be surgeons. The course is designed to help organize a teaching effort using a powerful new technology: simulation. The educational objectives involve:

1. Use of a Simulator as a Teaching Tool
2. Use of a Simulator in Conjunction with Didactic Teaching
3. Development of a Curriculum around use of a Simulator
4. Identification of Procedural Errors that may be identified and corrected through simulation instruction.
5. Interpretation of Metrics that are provided by a Simulator
6. Understanding of how simulators are useful for Assessment, Feedback, Reinforcement, and Remediation

The Hands-On portion will run from 2PM to 5:30PM. A few minutes will be spent gathering everybody after lunch break, providing final instructions, and start shortly after 2P. We will do a ½ hour wrap-up / de-brief as well around 5PM giving participants time to complete written evaluations and also for a Q+A / feedback session with faculty.

The following is a list of the Simulator devices that will be available for the HO course, the manufacturer of the trainer, and a one line description.

- ___ Human Patient Simulator (HPS mannequin) (METI)
Full mannequin for critical care and trauma training.
- ___ SurgicalSim Laparoscopic trainer (METI)
Basic laparoscopic skills trainer
- ___ ProMIS Laparoscopic trainer (Haptica)
Hybrid VR / physical trainer for laparoscopic skill including colon
- ___ Laparoscopic Workstation (Immersion)
Basic laparoscopic skill including haptics feedback
- ___ Fundamentals of Laparoscopic Surgery (SAGES)
Physical trainer / assessment station developed by SAGES
- ___ Lap Mentor Laparoscopic Trainer (Simbionix)
Trainer for laparoscopic skill includes haptics and cholecystectomy

___LapSim Laparoscopic trainer (Surgical Science)
Trainer for basic laparoscopic skills

___LTS 2000 (RealSim Systems)
Physical trainer and assessment station

___EndoTower (Verefi Technologies)
Laparoscopic camera navigation trainer

___RapidFire (Verefi Technologies)
Basic laparoscopic skills trainer with intelligent tutoring system.

We have a 40 participants and 16 stations with 9 different simulators. This will allow us to have groups of 2-3 at each station. Groups will spend 55 minutes at each of 3 stations which should provide adequate time to accomplish educational objectives.

For one of the three sessions, all participants will spend time at the METI HPS mannequin going through learning of a teaching exercise. This module of instruction is well-developed and has been delivered to many instructors in surgery.

Participants will receive pre-course materials and should know what is expected of them. For the remaining 2 of the 3 55 minute stations, participants will interact with Hands-On station faculty and develop an education program (what we will call a curriculum - a mini-curriculum for laparoscopic skill) that includes the use of simulation technology.

Faculty will help to guide participants through the development of a curriculum. Participants should use the form included in the course materials to assist with the process. If participants do a little thinking beforehand, make a few notes during the course, and fill-in with information while fresh in their minds, they should have a "shell" of a curriculum that could be used at home institutions for skills education. Obviously the idea is to provide a start on how to do this on your own. Some may already know this process much better than most faculty but know less about simulators. We hope to help participants understand how the technology fits.

Plan for the hands-on stations and sessions.

Note: It is less important to focus on the skills a particular simulator teaches. The goals of this course are generic across any number of skills.

Note: The goals of the course are not to see how participants perform on the trainers or learn features of the simulators. It may be very useful for one participant to do a simulator trial as a "student" while another participant acts as "teacher" and interprets metrics – with emphasis on the teacher – not the student. If for some reason a participant (or faculty member for that matter) is struggling with a simulated task, then good! That will provide an opportunity for learning about using the simulator.

Pre-Simulator

1. First things first. It is valuable to first understand that we are going about this a bit backwards, that is building a curriculum around a simulator when in real life, simulation technology should be used when it effectively fulfills educational needs. Other components may also be out of logical sequence as we go along, but for the purposes of this course, we're starting with the simulators in mind.
2. Here is what the simulator does generically. Except for HPS, all of the simulators we have serve to train, allow for practice, and provide an assessment for fundamental skills related to laparoscopic surgery.
3. What are the procedures where these skills are needed or essential? Write down a few examples.
4. Who are the target learners for these skills? Write down a few examples.
5. What is the key relevant knowledge related to the procedure and related skills? This may be best taught by didactic instruction and would include anatomy, indications, contraindications, and complications. Obviously, basic laparoscopic skills are applicable to a wide variety of operations. It may be useful to pick a single operation such as Lap Nissen and list a couple of key relevant

knowledge items.

6. What are the key steps and techniques of the procedure that may be taught by didactic instruction? This is a very important piece to a skills learning curriculum. Even if a simulator provides instruction in this area, it is helpful to provide didactic instruction in the steps of an operation before learning the skills.
7. What are the errors related to the techniques and performance of the procedure? Learning of errors goes hand-in-hand with learning of the key steps of the procedure. It must be emphasized that this is a critical component to the teaching of procedural skill. Errors must be clearly defined, ideally demonstrated, and reliably detected and reported. This, of course, is one of the most powerful components of simulation technology.
8. Testing of all relative knowledge based on instruction. If learners cannot demonstrate the cognitive knowledge, it is arguable that they should not proceed to “motor skill” learning of the procedure.

Simulator

1. Learn what the simulator does. Faculty may make one or two initial runs through tasks for demonstration purposes or continue as the “student.”
2. Learn about the behaviors that the simulator is designed to shape or improve. “Careful tool-tissue interaction” “Learning of fulcrum effect” “Avoid burning non-target tissue” “Follow the curve of the needle” and so on.
3. Understand the importance of setting training criteria or end-points. How do we know when students have trained enough? Some argue that students should train in a distributed fashion until levels established by experts or expert performance criteria (EPC) are reached.
4. Make some runs on tasks on the simulator.
5. Observe the recorded metrics and how errors are reported to the user (if not clear already) and scored. This is critical. Of course, in order to improve scores, reduce errors, or eliminate error messages, behavior must change. Learn of the importance of feedback to the student.
6. Learn about the metrics in detail and how to sort them out. It should be noted that a score is often a composite of several metrics. Some instructors may wish to examine the raw data. Understand, for example, that there is a difference between a user with a low “time to task completion” and high errors versus a user with a longer “time to task completion” and few errors.
7. Learn need and importance of de-briefing at appropriate stages of learning. Why does the student keep making the same errors? Why can't the student progress?
8. Describe a plan for long-term training and assessment. Repetition, reinforcement, long-term performance and tracking, outcomes.

Post –Simulator - Faculty will ask you to think about:

1. What did the simulator teach, allow for practice, assess?
2. What didn't the simulator teach, allow for practice, assess?
3. For target learners, when would simulator training be most effective? How would you distribute training? How often to re-train or re-assess?
4. What other modalities are needed to most effectively train for the desired skills and procedures?
5. What is needed for careful introduction into “live patient” training?
6. Good-bye and thank you.

CONCLUSIONS

In summary, this was a landmark event with regard to the adoption of simulation technology. While there have been demonstrations of computer-based simulation at other national surgical meetings, this was the first time that simulation had been central to a formal educational course. This was the first time that a curriculum development tool has been distributed as part of a course that is specifically designed for the use of computer simulation technology.

This course was exceptionally timely as the American College of Surgeons has announced its process for accreditation of education centers. This has generated a new and broad-based interest in simulation technology. The course was a major step forward in disseminating information regarding the technology which will ultimately be of great benefit for the understanding of simulation technology for civilian and military medicine.

REFERENCES

A publication describing the course, the didactic sessions, the goals of the Hands-On portion, and the curriculum development tool is planned.

APPENDICES FROM THE SAGES BROCHURE

HANDS-ON COURSES

THURSDAY, APRIL 27, 2006

SAGES/SLS HANDS-ON COURSE

ESTABLISHING A SIMULATION AND TRAINING CENTER FOR SURGICAL SKILLS: WHAT TO DO AND HOW TO DO IT.

7:30 AM - 11:00 AM, 2:00 PM - 5:30 PM Course Chairs: Randy Haluck, MD & Richard Satava, MD

DESCRIPTION:

The SAGES/SLS Hands-On Simulation Course is designed to inform Surgical and Perioperative Educators on the latest Simulation Technology and its use in the development of a Skills Training Center. Participants will learn how simulators are used as a teaching tool within an educational curriculum. Participants will also learn about current issues and concerns with regard to building a Skills Training Center. Participants will have the opportunity to use a variety of current simulators to teach assigned trainees provided for the Hands-On session. The Hands-On session will be limited to 40 participants.

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- All Surgical Educators and Trainees.
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- Understand current and future initiatives and concerns of societies and regulatory agencies.
- Understand the background and issues involved in the creation of a skills training center.
- Participants will be able to develop a roadmap to facilitate the implementation of a skills training center.

PROGRAM:

Session 1: Background and rationale for starting a skills training center

7:30 AM	Introductory remarks	Randy Haluck, MD
7:40 AM	Where We've Come, Where We're Going - Curricula, Criteria, Proficiency, and the Paradigm Shift in Surgical Education	Richard Satava, MD
7:55 AM	Update on American College of Surgeons Accredited Education Centers Initiative	Ajit Sachdeva, MD

Session 2: The activities of a skills center

8:20 AM	Development of a Curriculum Using Simulation	Neal Seymour, MD
8:45 AM	How to Teach With Simulators and Simulation	David Wilkes, MD
9:10 AM	Evaluation and Validation of Simulators	Gerald Fried, MD

Session 3: Implementation of a skills training center

9:35 AM	Integration of Skills Training Into the Residency Program	TBA
10:00 AM	How Do I Pay For a Skills Lab Using Simulation Technology?	Carol Lake, MD
10:20 AM	What to Look for in Simulators: What is New / Valid / Affordable in Simulation?	Matt Ritter, MD
10:45 - 11:00 AM	Discussion	
2:00 - 5:30 PM	Lab Session	



SAGES 2006