

AD_____

Award Number: W81XWH-08-1-0019

TITLE: 2007 Simulation Education Summit

PRINCIPAL INVESTIGATOR: James Gordon, M.D.

CONTRACTING ORGANIZATION: Society for Simulation in Healthcare
Hastings MN 55033

REPORT DATE: March 2008

TYPE OF REPORT: Final Proceedings

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
Distribution Unlimited

The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE 26-03-2008		2. REPORT TYPE FINAL PROCEEDINGS		3. DATES COVERED 26 October 2007 - 26 March 2008	
4. TITLE AND SUBTITLE 2007 Simulation Education Summit				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER W81XWH-08-1-0019	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) James Gordon, M.D. Email: jgordon3@partners.org				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Society for Simulation in Healthcare Hastings MN 55033				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This contract supported the objective of this conference held October 2007 to produce consensus educational and competency standards and guidelines for simulation in healthcare education leading to measurable improvements in patient safety.					
15. SUBJECT TERMS Simulation, healthcare, education, patient safety, technology					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRMC
U	U	U	UU	16	19b. TELEPHONE NUMBER (include area code)

Table of Contents

	<u>Page</u>
Introduction.....	4
Body.....	4
Key Research Accomplishments.....	5
Reportable Outcomes.....	5
Conclusion.....	5
References.....	6
Appendices.....	7-16

Introduction:

The Society for Simulation in Healthcare convened the second Simulation Education Summit meeting in October 2007 in Chicago, Illinois. The purpose of the Summit was to bring together leaders of public, private, and government organizations, associations, and agencies involved in healthcare education for a focused discussion of standards for simulation-based applications. Sixty-eight participants representing 36 organizations discussed in structured small and large groups the criteria needed for various training and assessment applications using simulation. While consensus was reached for many topics, there were also areas that required further thought and dialogue

Body:

Sixty-eight individuals representing 36 organizations participated in the daylong meeting (Appendix A). Many of the invited attendees had also attended the 2006 Summit. Everyone involved had a broad spectrum of simulation education experience and came from organizations with an interest in simulation, including specialty societies, regulatory bodies, and industry. SSH board members were also present.

Dan Raemer, past president of SSH and chair of the Summit planning committee, started the meeting with a few videos about the direction and use of simulation. This was followed by an overview of the meeting objectives and a short simulation taxonomy ice-breaker exercise using an audience response system. Participants responded to the degree of agreement with the provided definition of simulation terms (Appendix B). Those who disagree or strongly disagree were asked to write down their comments.

A professional facilitator (Jay Vogt, Peoplesworth, Concord, MA) led a series of working sessions where different groups addressed the following areas related to simulation:

- Formative and Summative Assessment of Trainees
- Formative and Summative Assessment of Practitioners
- Continuing Medical/Healthcare Education
- Formative and Summative Assessment of New Procedures
- Substitute for Clinical Encounter
- Rehabilitation and Remediation of Healthcare Practitioners
- Credentialing of Practitioners
- Patient Safety

For each topic, participants were asked to discuss acceptable standards regarding the following:

- Simulators – mode/type (e.g. standardized patients, screen-based, task trainers, mannequin-based, virtual reality, etc.), equipment fidelity and validity issues
- Instructors – qualifications, need for formal certification
- Metrics – basic competencies that simulation is expected to measure
- Evaluation – valid and reliable subjective/objective assessment tools
- Ratification – approval process for standards and verification of compliance
- Time – requirements related to duration and frequency of simulation training
- Other elements – differences between standards for technical vs. cognitive or critical thinking skills, training vs. assessment, formative vs. summative; other considerations

Participants were also asked to discuss the specific training and assessment challenges facing their organization, the assessment methods that their organization would most likely accept and the criteria that would be required or recommended for implementation of simulation activities and standards. Participants first worked in small groups of 7-8 at an assigned table. Two tables were given the same topic to discuss. After an hour of discussion, the two tables with the same topic shared their ideas to reach a consensus. A combined report was given to the entire Summit group. These reports were documented by each group and collated by the facilitator (JV) who outlined all the notes on a 34-page report, which this executive summary report was based on. The final summary report was then circulated to all participants of the Summit for feedback.

The Meeting report will be published in Vol 3 Issue 3 of the Society's Journal, Simulation in Healthcare and are also available on-line.

Key Research Accomplishments:

After six hours of brainstorming and discussions, an important consensus was established: more of these collaborative meetings are needed and more time was required to fully tackle the issues at hand. A single day of meeting was insufficient to deliver a comprehensive standards guideline. However, despite the challenging feat, there were some preliminary findings that were established and could serve as the framework for future working meetings.

To begin, the taxonomy exercise showed that in general, most people tended to agree with the provided definitions (average response 3.6-4.1 for all questions, on a Likert scale with 1=strongly disagree, 5=strongly agree). Only a couple of individuals submitted comments; one noted that "certification" is a process for qualifying individuals and "accreditation" was the more appropriate word for the process for approving simulation programs. Additional definitions, such as standards vs. guidelines vs. template vs. recommendations were desired. Other semantic questions were raised in regards to credentialing vs. competency certification.

During the large group reports, it was clear that there was consensus regarding specific standards that should be considered regardless of the simulation application. The overarching theme was that everything should be driven by the educational objectives. Moreover, a number of other unifying threads cut across all topics discussed.

Reportable Outcomes:

The increasing multidisciplinary membership of Society for Simulation in Healthcare has generated a demand for consistent and validated curricula and assessment tools for the expanding applications using simulation, as evident by the questions posed on the SSH listserv. The mission of SSH is to facilitate excellent multi-specialty healthcare education, practice, and research through simulation. Therefore, to better represent our multidisciplinary simulation society, we need to consolidate the needs and desires of different agencies and healthcare specialties in order to establish and implement a unified set of educational standards for simulation applications.

This second Simulation Education Summit is a testament to the wonders of collaborative efforts. As a result of bringing together the key stakeholders in simulation education, this preliminary outline of considerations for simulation-based training and assessment standards has been drafted. There is no doubt that much more work is needed before a more comprehensive set of standards or a guidelines document can be distributed. However, this report serves as a starting point to address the same questions that every organization faces. The fact that nearly all Summit participants indicated that we should continue to meet in this collaborative forum and not wait a year to reconvene is an indication of the strong desire to work together toward a common goal. At the conclusion of the meeting, the group agreed on an action plan.

Conclusions:

- The Society for Simulation in Healthcare will form a coalition of societies interested in simulation to serve as the "think tank" in resolving simulation-based issues.
- After further discussion and consensus, SSH will convene an ad hoc development group to create the standards documents and guidelines for review and dissemination.
- The next meeting should include definitions of standards and contextual framing to facilitate better discussions.
- SSH should act as a clearinghouse to survey practices within organizations.
- Along with input from specialty societies and accrediting agencies, SSH will continue to lead these efforts in consolidating common simulation needs and issues.

References:

1. Sinz L. 2006 Simulation Summit. *Simul Healthcare* 2007; 2(1):33-39.
2. Swanstrom LL et al. Beta test results of a new system in laparoscopic surgery. *J Am Coll Surg* 2006; 202(1):62-69
3. Fried GM et al. Proving the value of simulation in laparoscopic surgery. *Ann Surg* 2004; 240(3):518-528
4. Gallagher AG et al. Discriminative validity of the Minimally Invasive Surgical Trainer in Virtual Reality (MIST-VR) using criteria levels based on expert performance. *Surg Endosc* 2004;18(4):660-665
5. Seymour NE et al. Virtual reality training improves operating room performance: results of a randomized, double-blinded study. *Ann Surg* 2002; 236 (4):458-464
6. Sedlack RE, Kolars JC. Computer simulator training enhances the competency of gastroenterology fellows at colonoscopy: results of a pilot study. *Am J Gastroenterol.* 2004 Jan;99(1):33-7
7. Ritter EM, McClusky DA 3rd, Lederman AB, Gallagher AG, Smith CD. Objective psychomotor skills assessment of experienced and novice flexible endoscopists with a virtual reality simulator. *J Gastrointest Surg.* 2003 Nov;7(7):871-7; discussion 877-8.
8. Sedlack RE, Kolars JC. Validation of a computer-based colonoscopy simulator. *Gastrointest Endosc.* 2003 Feb;57(2):214-8.
9. Blum MG, Powers TW, Sundaresan S. *Ann Thorac Surg.* Bronchoscopy simulator effectively prepares junior residents to competently perform basic clinical bronchoscopy. 2004 Jul;78(1):287-91; discussion 287-91.
10. Colt HG, Crawford SW, Galbraith O 3rd. Virtual reality bronchoscopy simulation: a revolution in procedural training. *Chest.* 2001 Oct;120(4):1333-9.
11. Mayo PH, Hackney JE, Mueck JT, Ribaud V, Schneider RF. Achieving house staff competence in emergency airway management: results of a teaching program using a computerized patient simulator. *Crit Care Med.* 2004 Dec;32(12):2422-7.
12. Patel AD, Gallagher AG, Nicholson WJ, Cates CU. Learning curves and reliability measures for virtual reality simulation in the performance assessment of carotid angiography. *J Am Coll Cardiol.* 2006 May 2;47(9):1796-802. *JACC* 47:1796-1802, 2006
13. Edmond CV Jr. Impact of the endoscopic sinus surgical simulator on operating room performance. *Laryngoscope.* 2002 Jul;112(7 Pt 1):1148-58. *Laryngoscope* 112:1148-1158, 2002
14. CPM van der Vleuten and David Swanson: Assessment of Clinical Skills with Standardized Patients: State of the Art. *Teach Learn Med* 1990; 2(2):58-76
15. Jerry Colliver and Reed Williams: Technical Issues: Test Application. *Acad Med* 1993; 68:454-460.
16. Fletcher, G., Flin, R., McGeorge, P., Glavin, R., Maran, N., & Patey, R. (2003). Anaesthetists' Non-Technical Skills (ANTS): Evaluation of a behavioural marker system. *British Journal of Anaesthesia*, 90 (5), 580 - 588. Also see <http://www.abdn.ac.uk/iprc/ants> for more information.

Appendix

2007 Simulation Education Summit Report

2007 Simulation Education Summit

Yue Ming Huang, EdD, MHS, Jose F. Pliego, MD, Bernadette Henrichs, PhD, CRNA, CCRN, Mark Bowyer, MD, Viva Siddall, MS, MS, RRT, William McGaghie, PhD, Dan Raemer, PhD
In collaboration with the 2007 Summit Consortium

Affiliations: David Geffen School of Medicine at UCLA, Texas A&M University System HSC College of Medicine, Washington University and Barnes-Jewish College of Nursing, Uniformed Services University, American College of Chest Physicians, Northwestern Feinberg School of Medicine, Center for Medical Simulation

Abstract:

The Society for Simulation in Healthcare convened the second Simulation Education Summit meeting in October 2007 in Chicago, Illinois. The purpose of the Summit was to bring together leaders of public, private, and government organizations, associations, and agencies involved in healthcare education for a focused discussion of standards for simulation-based applications. Sixty-eight participants representing 36 organizations discussed in structured small and large groups the criteria needed for various training and assessment applications using simulation. While consensus was reached for many topics, there were also areas that required further thought and dialogue. This paper is a summary of the results of these discussions along with a preliminary draft of a guideline for simulation-based education.

Introduction:

The Society for Simulation in Healthcare (SSH) organized its second Simulation Education Summit meeting on October 26, 2007 in Chicago, Illinois. The 2007 Summit was initiated in response to the first Simulation Summit held at the same site in November 2006,¹ which resulted in a consensus call for SSH to serve as the consolidator for simulation activities. The goal of the first Summit was to advance simulation into mainstream healthcare education and as a product of the meeting, a list of important topics and priorities for future meetings was generated. The primary goal for the 2007 Summit meeting was to create a working draft of standards for various kinds of learning and assessment when simulation is used as a substantial part of the process.

Simulation standards and guidelines were chosen for the 2007 focus because they were among the first tier topics discussed at the 2006 Summit. Along with establishing standards, competency metrics and assessment were also on the agenda. The desired meeting outcomes included building consensus for important simulation terms, determining the levels of assessment and acceptable methods for assessment using simulation and developing an action plan for next steps.

Method:

Sixty-eight individuals representing 36 organizations participated in the daylong meeting (Appendix A). Many of the invited attendees had also attended the 2006 Summit. Everyone involved had a broad spectrum of simulation education experience and came from organizations with an interest in simulation, including specialty societies, regulatory bodies, and industry. SSH board members were also present.

Dan Raemer, past president of SSH and chair of the Summit planning committee, started the meeting with a few videos about the direction and use of simulation. This was followed by an overview of the meeting objectives and a short simulation taxonomy ice-breaker exercise using an audience response system. Participants responded to the degree of agreement with the provided definition of simulation terms (Appendix B). Those who disagree or strongly disagree were asked to write down their comments.

A professional facilitator (Jay Vogt, Peoplesworth, Concord, MA) led a series of working sessions where different groups addressed the following areas related to simulation:

- Formative and Summative Assessment of Trainees
- Formative and Summative Assessment of Practitioners
- Continuing Medical/Healthcare Education
- Formative and Summative Assessment of New Procedures

- Substitute for Clinical Encounter
- Rehabilitation and Remediation of Healthcare Practitioners
- Credentialing of Practitioners
- Patient Safety

For each topic, participants were asked to discuss acceptable standards regarding the following:

- Simulators – mode/type (e.g. standardized patients, screen-based, task trainers, mannequin-based, virtual reality, etc.), equipment fidelity and validity issues
- Instructors – qualifications, need for formal certification
- Metrics – basic competencies that simulation is expected to measure
- Evaluation – valid and reliable subjective/objective assessment tools
- Ratification – approval process for standards and verification of compliance
- Time – requirements related to duration and frequency of simulation training
- Other elements – differences between standards for technical vs. cognitive or critical thinking skills, training vs. assessment, formative vs. summative; other considerations

Participants were also asked to discuss the specific training and assessment challenges facing their organization, the assessment methods that their organization would most likely accept and the criteria that would be required or recommended for implementation of simulation activities and standards. Participants first worked in small groups of 7-8 at an assigned table. Two tables were given the same topic to discuss. After an hour of discussion, the two tables with the same topic shared their ideas to reach a consensus. A combined report was given to the entire Summit group. These reports were documented by each group and collated by the facilitator (JV) who outlined all the notes on a 34-page report, which this executive summary report was based on. The final summary report was then circulated to all participants of the Summit for feedback.

Results

After six hours of brainstorming and discussions, an important consensus was established: more of these collaborative meetings are needed and more time was required to fully tackle the issues at hand. A single day of meeting was insufficient to deliver a comprehensive standards guideline. However, despite the challenging feat, there were some preliminary findings that were established and could serve as the framework for future working meetings.

To begin, the taxonomy exercise showed that in general, most people tended to agree with the provided definitions (average response 3.6-4.1 for all questions, on a Likert scale with 1=strongly disagree, 5=strongly agree). Only a couple of individuals submitted comments; one noted that “certification” is a process for qualifying individuals and “accreditation” was the more appropriate word for the process for approving simulation programs. Additional definitions, such as standards vs. guidelines vs. template vs. recommendations were desired. Other semantic questions were raised in regards to credentialing vs. competency certification.

Unifying Themes

During the large group reports, it was clear that there was consensus regarding specific standards that should be considered regardless of the simulation application. The overarching theme was that everything should be driven by the educational objectives. Moreover, a number of other unifying threads cut across all topics discussed.

Simulators

All conceded that if an organization is using clinical simulation activity, it must specify specific learning objectives and identify appropriate simulation activity to match the objectives. The simulator(s) or simulation exercise should have at minimum construct validity (i.e. the simulator equipment does what it is supposed to do). A combination of various types of simulations were encouraged. Simulations used for formative evaluation should be the same as those used for summative assessment for validation purposes, although for the purpose of practice, lower-end models may suffice. High stakes activities will require higher standards (e.g. validated simulators) and a greater degree of standardization.

Instructors

It was uniformly agreed upon that instructors must have appropriate simulation training and be able to demonstrate basic competency with the simulation system being used. Also, they must have validated

content knowledge as specified by the educational objectives. What constitutes “appropriate” simulation training was not fully discussed. Participants also did not reach an agreement regarding whether or not instructors will need to be formally trained via a recognized simulation training program, or what would qualify as an adequate training center to certify instructors. Analogies were made to successful programs such as ACLS and ATLS where instructors must be certified and their certifications renewed every few years.

Metrics & Evaluation

It was generally agreed that metrics and evaluation tools should be addressed together. Metrics are standards of measurement and evaluation tools are the specific means of determining whether the metrics are met. The metrics should be competency-based and driven by the learning objectives and the learner needs. The metrics should include cognitive, psychomotor, and affective aspects of learning. These could be broken down into specific knowledge, skills, attitudes and behavioral competencies. A number of evaluation modalities were endorsed including checklists, 360-degree feedback, video, standardized patient review/feedback, self-review/feedback, test scores, simulator feedback, expert review/feedback, and demonstrations of transfer of knowledge to patients or peers. It is important to note that simulation is recognized as only one of many tools within an individual's performance portfolio. Validated evaluation tools are clearly desirable and should be a goal but may not be available for all metrics at this time.

Ratification

Most participants felt that it is currently too soon to set a process for approving these simulation standards. However, in some areas certain considerations were proposed. Input from accrediting agencies is clearly needed.

Time

There was general consensus that an organization must specify the appropriate duration and frequency of any simulation activity needed to achieve their learning objectives. More time in practice is desired.

Other Elements

Issues such as who should certify instructors or approve simulation standards, cost considerations, and legal challenges were discussed but no consensus was reached at this time.

Formative and Summative Assessment of Trainees

Trainees are defined as residents, medical students, nursing students, dental students, allied health students, hospital service students, “family” students, preparaprofessionals or teams of students.

In addition to the common unifying themes, simulation use at the trainee level should also consider the issues of integration of simulation into the existing curricula. A participant's exposure to simulation is driven by simulator availability, cost, learner needs, learning objectives, and encounter history. The time spent in training is driven by availability of time off from clinical duties, technology, task complexity and student capabilities.

Formative and Summative Assessment of Practitioners

Practitioners include any licensed professional who provides healthcare directly to patients. The environment they practice is any place where there is direct patient care, whether at academic sites, private/non-academic areas, clinics, or community health centers.

The overall opinion was that simulator use must be standardized for formative and summative assessment of practitioners. The extent of standardization remains nebulous. Different modalities may be used including standardized patients, unannounced simulated patients, virtual reality, low and high fidelity simulators, etc. Homemade simulators that cannot be validated or standardized should not be used for assessment. The simulator mode and characteristics should be flexible and a multi-modal approach should be considered. Simulators, instructors, metrics, evaluation and exposure should support the objectives: objectives → simulator → evaluation → objectives.

A formally certified evaluator who has documented content expertise in the specialty area and demonstrated simulation/educational skills is needed to perform high stakes summative assessment. Clinical relevance confers credibility; so at least one instructor/assessor needs to be in the specialty.

Metrics need to be specialty-specific but based on core competencies prescribed by the profession. Performance level of proficiency needs to be defined and used as a goal for both formative and summative evaluations. Evaluation tools need to be tested and validated to an accepted standard by the specialty group. Validation should be evidence based, scientifically defensible in a legal challenge, and should be published in a peer-reviewed journal. Examples of validated tools are shown in Table 1.

Time is limited for practitioners to train with simulation, so the recommended interval should be 3-5 years and may be determined by the specialty. However, formative assessments should be conducted annually, and may not necessarily involve simulation. Certification and competency validation should be defined. In accordance with board certification requirements, certification with simulation training should be every ten years.

In regards to ratification, standards for use of simulation for formative and summative assessment of practitioners should be reviewed and approved by a committee comprised of members of the profession as well as educators and experts from outside the profession who may be affected by the standards. An ongoing process for feedback along with continuous research is desired.

Continuing Medical/Healthcare Education (CME/CE)

In general, continuing medical/healthcare education is about learning, not testing. Thus, CME/CE must not be mistaken for certification and should be seen as a mechanism for skills/knowledge training rather than formative assessments or summative assessments, as these standards are different. The mode of simulation should include all modes appropriate for the CME/CE population and tailored to the goals and objectives of the CME/CE curriculum. Validation may be needed for the transfer of knowledge/skills for obtaining the achievable outcomes, or for defensibility in court.

In regards to metrics, both intracourse (CME/CE activity) versus extracourse metrics (implementation, change in practice or patient outcome) should be considered. Evaluation tools should specifically define what is correct and incorrect to provide feedback for improvement. Duration and frequency of simulation activity will depend on skills taught and should be proficiency based. High stakes, low frequency events need more frequent training than common skills. The qualification of the instructors should follow the same principles described in the standards for formative and summative assessment of practitioners.

CME providers and accrediting agencies will be responsible for ensuring that these standards, once approved through boards of relevant societies, are enforced by the various institutions that provide simulation-based CME. Examples are stamps of approval from national organizations, such as the American Society of Anesthesiologists simulation endorsement program and the American College of Surgeons accreditation program for those centers that meet that specialty's CME criteria.

Formative and Summative Assessment of New Procedures

The mode and the type of simulation should support the objectives and the specific step-wise tasks involved in the procedures. Differentiation of manual procedures (individual-based) vs. hospital procedures (team-based) should be specified. Any simulation mode could be used including combination types. The standards would be different for formative vs. summative assessment and for technical vs. cognitive skills. High-risk procedures will require more than one level of simulation. Validation is essential, particularly for summative assessment and to determine whether simulators that act as their own instructors are realistic, valid and reliable. However, for formative purposes, validation needs to be balanced against cost and availability.

The instructors, metrics, evaluation and exposure should be dictated by the objectives and the complexity of the procedure. Instructors should be formally certified unless the simulator has built in metrics. For simulators with built in metrics, the role of the instructor may be to evaluate whether or not someone is cognitively ready to learn the new skill or to teach the cognitive and behavioral aspects to those who have mastered the manual skills. Successful completion of simulation training should be followed by a graded observation of a real case performance. A Masters in Simulation degree program was proposed.

Metrics for new procedures include simple and complex tasks, psychomotor and cognitive skills competencies. Examples include: ability to adapt to non-standard situations, efficiency completing simulation (time, accuracy, success rates), adverse events and managing complications (rate and techniques for managing complications), decision making pathway, success in performing basic tasks, correct technique and correct procedures, perception of performance, attitudes towards

device/procedure, communication, dexterity and flexibility in tissue handling, judgment and timing of events.

Evaluations should be both objective (checklist of tasks, time, sequence of events, diagnostic accuracy, correlation to clinical experiences) and subjective (judgment, perceptions). Training time requirements are based on time to proficiency (depends on learner level) with a required minimum number of practice sessions.

Ratification may be through institution for compliance with standards, FDA for device qualifications, or other state/federal or payor agencies with responsibilities and authorities in content area. An interdisciplinary consensus process should be established to approve these standards.

Other issues considered for new procedures: Do learners need to have a priori knowledge of using a simulator? When should training/assessment start? Formative standards would be different from summative (higher standards) and technical vs. cognitive skills.

Substitute for Clinical Encounter

Simulators should possess the appropriate level of fidelity to mimic real life patient encounters or experiences and events. Organizations using clinical simulation must specify the specific learning objectives (and what can be substituted) and identify the appropriate simulation activity to fulfill those objectives. A strong rationale or evidence for substituting or supplementing clinical activities is needed. The instructors, metrics, evaluation and the time should be determined based on the objectives. Standards are the same for technical versus cognitive skills training/assessment.

Rehabilitation and Remediation of Healthcare Practitioners

The first issue at hand is to identify practitioners who are in need of remediation. Current remediation programs are geared toward private substance abuse rehabilitation or ethical conduct remediation programs. Working in conjunction with state boards or other accreditation bodies may be helpful in addition to using simulation to assess competency level. Simulation can also be used as a diagnostic tool for remediation before credentialing. The simulation training should be specific to the deficiency. An educational specialist is needed to identify learning deficiencies and to help design an individualized educational program (IEP). Human feedback is required even if the simulator has built in performance indicators.

A sample curricular template might be:

Diagnosis of need for rehabilitation/remediation (through simulation and/or from state boards) → design IEP → define objectives (knowledge, skills or behavioral goals) → determine appropriate simulation → pre-intervention assessment → simulation training → post-intervention evaluation of performance → pass or further diagnosis.

A probationary period for remediated individuals was suggested, i.e. these individuals would be evaluated more frequently than mainstream practitioners. However legal implications should be considered. Ratification should be from credentialing boards. Private agencies or academic institutions may be called upon to support the remediation programs.

Credentialing of Practitioners

High validity and standardization are mandatory when simulation is used for credentialing. Standards should be driven by specialty boards rather than external societies. There was debate in regards to "credentialing" since it implies not only high-stakes assessment of adequate skill and knowledge but also behavioral characteristics such as professionalism, and therefore has medicolegal implications. The debate continued in regards to how relevant and physical is simulation-based assessment for credentialing. Credentialing may even apply to learner levels if simulation is to be used for high-stakes performance assessment, e.g. advancement of medical students and residents to the next year of training.

The instructors, metrics, evaluation and time required for credentialing will need to be determined by the objective and standards for the specialty. Instructors need to be expert judges at the identified deficiency and must be required to take specialized training. The standards should be set by national organizations for clinical issues. Validation should link simulation performance to patient outcomes. As there are few validated tools at this point, simulation should be used along with other tools for credentialing, not by itself. Multiple tries should be allowed to pass simulation credentialing. Ratification may be accomplished

through Joint Commission, payers, insurers, Pay for Performance, or 3rd party organizations, but it is still a premature concept at this time.

Some issues were raised about the implications of credentialing on macroeconomics, e.g. a higher credentialing bar may cause clinicians to charge more money or be less likely to go into specific fields, therefore creating the risk of miscategorizing good people. Moreover, credentialing may be irrelevant to certain groups, as local oversight of nursing and allied health professional skills assessments are not considered credentialing. Finally, there is the issue of simulator availability for practice.

Patient Safety

Practitioner competency is essential for patient safety. All modes of simulation are appropriate; again, they must be linked to the objectives. Most appropriate applications include: high-risk tasks and events, low-frequency adverse events, teamwork and communication, judgment and critical thinking, and procedural skills. The instructors, metrics, evaluation and time spent on the activity should be in accordance with the objectives, policies and procedures. Instructors could be content experts or simulation experts. Evaluation tools could measure errors during simulated situations, change in organizational cultures, patient satisfaction and perception of safety, decrease in clinical errors, team performance (through mock codes, mock patients) and individual attitudes and skills.

A consensus among leaders of specialty groups is needed to develop a process for assessment as well as the assessment tools. Ratification may be done through mandated enforcement by state regulations or Joint Commission. Simulation experts should be part of the institutional reviews. It is also important to recognize that simulation is only one area that could impact patient safety. There are many other systems factors and human factors involved, including organizational structure and policies, and society guidelines and standards. Continuous quality improvement measurements are needed to identify and assess areas of patient safety competency. Because of the large scope of what patient safety entails, a suggestion was proposed that non-simulation experts, e.g. economists with human factors engineering experience, perform the assessment of simulation usage for patient safety.

Conclusions

The increasing multidisciplinary membership of Society for Simulation in Healthcare has generated a demand for consistent and validated curricula and assessment tools for the expanding applications using simulation, as evident by the questions posed on the SSH listserv. The mission of SSH is to facilitate excellent multi-specialty healthcare education, practice, and research through simulation. Therefore, to better represent our multidisciplinary simulation society, we need to consolidate the needs and desires of different agencies and healthcare specialties in order to establish and implement a unified set of educational standards for simulation applications.

This second Simulation Education Summit is a testament to the wonders of collaborative efforts. As a result of bringing together the key stakeholders in simulation education, this preliminary outline of considerations for simulation-based training and assessment standards has been drafted. There is no doubt that much more work is needed before a more comprehensive set of standards or a guidelines document can be distributed. However, this report serves as a starting point to address the same questions that every organization faces. The fact that nearly all Summit participants indicated that we should continue to meet in this collaborative forum and not wait a year to reconvene is an indication of the strong desire to work together toward a common goal. At the conclusion of the meeting, the group agreed on an action plan.

Action Plan and Recommendations

- The Society for Simulation in Healthcare will form a coalition of societies interested in simulation to serve as the “think tank” in resolving simulation-based issues.
- After further discussion and consensus, SSH will convene an ad hoc development group to create the standards documents and guidelines for review and dissemination.
- The next meeting should include definitions of standards and contextual framing to facilitate better discussions.
- SSH should act as a clearinghouse to survey practices within organizations.
- Along with input from specialty societies and accrediting agencies, SSH will continue to lead these efforts in consolidating common simulation needs and issues.

Acknowledgements

The authors acknowledge that this paper is a compilation of ideas from the Summit participants and therefore credit is given to all who participated. We thank Beverlee Anderson for her organization and leadership, Sandra Davis, RN, PhD for her review of the paper, William Dunn, MD for his references on validated simulation instruments, and Jay Vogt for his time in planning, preparations, and collation of the meeting notes.

References

17. Sinz L. 2006 Simulation Summit. *Simul Healthcare* 2007; 2(1):33-39.
18. Swannstrom LL et al. Beta test results of a new system in laparoscopic surgery. *J Am Coll Surg* 2006; 202(1):62-69
19. Fried GM et al. Proving the value of simulation in laparoscopic surgery. *Ann Surg* 2004; 240(3):518-528
20. Gallagher AG et al. Discriminative validity of the Minimally Invasive Surgical Trainer in Virtual Reality (MIST-VR) using criteria levels based on expert performance. *Surg Endosc* 2004;18(4):660-665
21. Seymour NE et al. Virtual reality training improves operating room performance: results of a randomized, double-blinded study. *Ann Surg* 2002; 236 (4):458-464
22. Sedlack RE, Kolars JC. Computer simulator training enhances the competency of gastroenterology fellows at colonoscopy: results of a pilot study. *Am J Gastroenterol.* 2004 Jan;99(1):33-7
23. Ritter EM, McClusky DA 3rd, Lederman AB, Gallagher AG, Smith CD. Objective psychomotor skills assessment of experienced and novice flexible endoscopists with a virtual reality simulator. *J Gastrointest Surg.* 2003 Nov;7(7):871-7; discussion 877-8.
24. Sedlack RE, Kolars JC. Validation of a computer-based colonoscopy simulator. *Gastrointest Endosc.* 2003 Feb;57(2):214-8.
25. Blum MG, Powers TW, Sundaresan S. *Ann Thorac Surg.* Bronchoscopy simulator effectively prepares junior residents to competently perform basic clinical bronchoscopy. 2004 Jul;78(1):287-91; discussion 287-91.
26. Colt HG, Crawford SW, Galbraith O 3rd. Virtual reality bronchoscopy simulation: a revolution in procedural training. *Chest.* 2001 Oct;120(4):1333-9.
27. Mayo PH, Hackney JE, Mueck JT, Ribaud V, Schneider RF. Achieving house staff competence in emergency airway management: results of a teaching program using a computerized patient simulator. *Crit Care Med.* 2004 Dec;32(12):2422-7.
28. Patel AD, Gallagher AG, Nicholson WJ, Cates CU. Learning curves and reliability measures for virtual reality simulation in the performance assessment of carotid angiography. *J Am Coll Cardiol.* 2006 May 2;47(9):1796-802. *JACC* 47:1796-1802, 2006
29. Edmond CV Jr. Impact of the endoscopic sinus surgical simulator on operating room performance. *Laryngoscope.* 2002 Jul;112(7 Pt 1):1148-58. *Laryngoscope* 112:1148-1158, 2002
30. CPM van der Vleuten and David Swanson: Assessment of Clinical Skills with Standardized Patients: State of the Art. *Teach Learn Med* 1990; 2(2):58-76
31. Jerry Collier and Reed Williams: Technical Issues: Test Application. *Acad Med* 1993; 68:454-460.
32. Fletcher, G., Flin, R., McGeorge, P., Glavin, R., Maran, N., & Patey, R. (2003). Anaesthetists' Non-Technical Skills (ANTS): Evaluation of a behavioural marker system. *British Journal of Anaesthesia*, 90 (5), 580 - 588. Also see <http://www.abdn.ac.uk/iprc/ants> for more information.

Appendix A: List of Organizations Represented at the 2007 Summit

1. Association of American Medical Colleges
2. American Academy of Ophthalmology
3. American Academy of Orthopedic Surgeons
4. American Association for Clinical Anatomists
5. American Association of Nurse Anesthetists
6. American Board of Medical Specialties
7. American Board of Surgery
8. American College of Cardiology
9. American College of Chest Physicians
10. American College of Surgeons
11. American Dental Society of Anesthesiology
12. American Heart Association
13. American Heart Association, National Center
14. American Hospital Association
15. American Academy of Pediatric Dentistry
16. American Association of Oral & Maxillofacial Surgeons
17. American Medical Foundation for Peer Review and Education
18. American Society for Health Risk Management AHA
19. American Society of Anesthesiologists

20. Anesthesia Patient Safety Foundation
21. Association of Standardized Patient Educators
22. California Institute of Nursing & Education
23. Canadian Patient Safety Institute
24. Infusion Nurses Certification Corporation
25. Institute of Medicine of the National Academies
26. International Association of Medical Science Educators
27. International Nursing Association for Clinical Simulation & Learning
28. Joint Commission Accreditation of Hospital Organizations
29. National Board of Osteopathic Medical Examiners
30. National Council of State Boards of Nursing
31. National League of Nursing
32. National Nursing Staff Development Organization
33. Society of Neurological Surgeons
34. Society for Academic Emergency Medicine
35. Society for Simulation in Healthcare
36. Telemedicine and Advanced Technologies Research Center (TATRC)

Appendix B: Simulation Taxonomy

- **Simulation:** A technique that uses a situation or environment created to allow persons to experience a representation of a real event for the purpose of practice, learning, evaluation, testing, or to gain understanding of systems or human actions.
- **Simulation program:** A formal workshop, course, class, or other activity that uses a substantial component of simulation as a technique.
- **Simulation fidelity:** The physical, contextual, and emotional realism that allows persons to experience a simulation as if they were operating in an actual healthcare activity.
- **Formative evaluation:** A process for determining the competence of a person engaged in a healthcare activity for the purpose of providing constructive feedback for that person to improve.
- **Summative evaluation:** A process for determining the competence of a person engaged in a healthcare activity for the purpose of certifying with reasonable certainty that they are able to perform that activity in practice.
- **Simulation validity:** The quality of a simulation or simulation program that demonstrates that the relationship between the process and its intended purpose is specific, sensitive, reliable, and reproducible.
- **Simulation guideline:** A recommendation of the qualities for simulation fidelity, simulation validity, simulation program, or for formative or summative evaluation.
- **Simulation standard:** A statement of the minimum requirements for simulation fidelity, simulation validity, simulation program, or for formative or summative evaluation.
- **Certification of simulation:** The process of approving that a simulation or simulation program meets certain published standards.

Table 1. A Preliminary List of Validated Simulators and Evaluation Tools

Simulation/ evaluation tool	Reference #
Laparoscopic trainer/ virtual cholecystectomy	2-5
Gastrointestinal endoscopy	6-7
Bronchoscopy	9-10
Emergency airway management	11
Carotid angiography	12
Endoscopic sinus surgery	13
Standardized patients	14-15
Anesthesia Non-technical Skills (ANTS)	16

Note: Simulation is one technique of training and assessment in a person's portfolio. It is assumed that a range of different educational techniques (didactic, apprentice, workshop, etc.) and measurement tools (e.g. written test, oral exams, case logs, subjective clinical evaluations, etc.) will be needed.