The Competencies and Safety

Nathan R. Selden, M.D., Ph.D.

American medicine has evinced a tradition of technological mastery, curative breakthroughs, and unlimited resources. At times, both public opinion and media attention have fostered this perception. From *Marcus Welby, MD* to *ER*, the media has depicted the physician as a highly competent practitioner armed with space age gadgetry and, of course, miraculous cure-producing abilities. Popular culture has treated neurosurgery in much the same manner, often as paradigmatic of the dramatic accomplishments of modern medicine and surgery.[5]

Recently, however, a number of societal trends have disrupted traditional attitudes toward American medicine:

- Dramatic increase in the proportion of the gross national product devoted to healthcare has led to extensive efforts to impose efficiency and cost-containment measures on both public and private healthcare systems.
- Concerns regarding the ethical implications of medical technology have led to independent social, political, and religious movements aimed at restricting the development and/or application of certain medical and reproductive technology as well as extensive debate regarding the ethics of life preservation.
- Concerns regarding consumer and workplace safety have ultimately extended to the healthcare industry.

PATIENT SAFETY

Patient safety concerns, in particular, currently, dominate the public consciousness regarding healthcare. The landmark Institute of Medicine (IOM) report, *To Err is Human: Building a Safer Health System*, published in 1999, famously maintained that "tens of thousands of Americans die each year from medical errors".[12] The conclusions of this IOM report remain controversial.[14] Many experts think that the dangers of American medicine and hospital care were exaggerated and/or presented inaccurately in the press.[7] Nevertheless, the IOM's contention that "reform [of health care] around the margins is inadequate to address system ills" has been broadly adopted by various stakeholders, including the United States Congress, the United States Department of Health and Human Services, third party payors, federal and state regulators, and others.[9]

Ironically, although the IOM has repeatedly expressed its desire to move away from a "culture of blame" in healthcare quality improvement, the media have often suggested that the IOM healthcare reports disclose secretive and salacious failures of the healthcare system, principally regarding safety and error avoidance. On the positive side, the IOM has also made a number of constructive suggestions regarding improvement of healthcare systems, particularly emphasizing the importance of reorganizing complex systems to minimize error generation.[12] In essence, the IOM and other healthcare organizations have begun to advocate for the adoption of techniques that have previously succeeded in other industrial safety settings, particularly the United States airline industry.

For example, commercial airlines have adopted safety practices that encourage efficient emergency resource management and effective crew communication across hierarchies. Using these types of interventions (and many others) airline safety experts have reduced airline fatalities caused by human error by almost 75% since 1979.[15] Although healthcare delivery represents a much more complex and risky environment, it is likely that surgery will benefit significantly from this type of constructive and positive intervention.[8]

MEDICAL EDUCATION AND CERTIFICATION

Healthcare regulators have also made a positive contribution by recognizing that profound changes in healthcare education and training will be required to effectively implement improvements in patient safety.

Many suggested educational improvements revolve around two paradigmatic concepts. First, that regulation of the appropriate curricular content in healthcare education is inadequate and instead, healthcare education should focus on measured and validated outcomes: what the learner knows, how the learner subsequently practices, and, ultimately, whether the educational system results in improved patient outcomes (including safer outcomes). Second, that learning is a lifelong process of mastering competency in various medical scientific and related, nonmedical arenas.

The IOM recommended "implementation of a core set of competencies and targeting a mix of approaches including leveraging oversight organizations, fostering enhanced train-

Copyright © 2007 by The Congress of Neurological Surgeons
0148-703/07/5401-0180

ing environments, and initiating public reporting".[10] Specifically, the IOM identified six aims for healthcare quality improvement: care that is safe, effective, patient-centered, timely, efficient, and equitable. It is evident that these aims address each of the three societal concerns listed above, with an emphasis on safety.

DEFINING THE COMPETENCIES

Similar goals have been broadly adopted or co-opted by regulatory authorities, including the institutions responsible for the oversight of neurosurgical education and certification in the United States. The Accreditation Council for Graduate Medical Education (ACGME), which accredits United States residency programs, has explicitly recognized the political forces driving reform in healthcare education: "Availability of educational outcomes-based data is necessary to inform discussions with policymakers and others who have become increasingly focused on issues related to funding for medical education, and, most recently, on patient safety".[3] In response to these pressures, the ACGME has created the Outcome Project, which focuses on evaluating outcomes of the educational process, for both learners and, ultimately, patients. Specifically, healthcare professional trainees are required to achieve competency in six defined areas, chosen to adequately prepare physicians to practice within a rapidly evolving healthcare delivery system:

- Patient care
- Medical knowledge
- Professionalism
- Systems-based practice
- Practice-based learning and improvement
- Interpersonal and communication skills

Regulatory authorities have also realized, however, that improved training will only partly address the problem. First, there are hundreds of thousands of practicing physicians and surgeons in the United States who will never reenter full time education. Second, healthcare practice evolves rapidly, requiring constantly updated knowledge and practice by healthcare workers. Thus, lifelong learning is an important component of the ongoing *practice* of medicine and surgery.

To implement effective, lifelong learning of competency-based material, the American Board of Medical Specialties (ABMS), which regulates the process of professional certification for doctors, has mandated the implementation of Maintenance of Certification (MOC) processes by each of its 24 member boards, including the American Board of Neurological Surgery (ABNS). According to the ABMS, "the MOC program is designed to document that physician specialists maintain the necessary competencies to provide quality patient care".[1] The ABMS also notes that "state legislatures, concerned for patient safety, have begun to explore the possibility of mandating that the process of re-licensure of physicians should require documentation of continuing competence to practice medicine".[1] Thus, at least in some states, the ability to continue practicing medicine or surgery may eventually require successful ongoing participation in an MOC process.

For neurosurgeons, MOC will consist of verification of professional standing, evaluation of practice performance (based in part on a small reviewed case list and patient questionnaires), evidence of cognitive expertise (using a 10-yr-cycle closed book examination similar to recertification exams previously used by other specialties), and participation in approved continuing medical education (CME) programs that demonstrate a commitment to lifelong learning and periodic self-assessment. Relevant content, as in the case of resident education, will include traditional medical as well as complementary, nonmedical content.[2]

For neurosurgeons who have experienced traditional medical school and residency training, the subject matter of "the competencies" may seem obscure. In reality, the competencies are an attempt to formalize, systematize, and improve education in areas that have an impact on the day-to-day lives and practices of most surgeons. A few examples follow from among hundreds of legitimate "competency" topics:

- Surgical site identification
- Billing compliance
- Health Insurance Portability and Accountability Act of 1996 (HIPAA)
- Patient communications: consent
- Medical literature class of evidence
- Clinical study design
- Teamwork
- Analysis of cost effectiveness
- Interdisciplinary intensive care unit (ICU) care protocol design
- Surgical infection control

A PARADIGM FOR ONLINE COMPETENCY AND SAFETY EDUCATION

Modern industry increasingly relies on educational information that is easily accessible (generally online), is modifiable in real-time to keep pace with a rapidly changing technological and regulatory environment, and, whenever possible, is based on evidence demonstrating improved outcomes.

Even the most useful information, however, may fail to alter outcomes if it is presented to learners (airline pilots or neurosurgeons) in an educationally ineffective manner. Modern experts have described the optimal value of educational media that allow self-directed learning, are learner centered, and allow for ongoing self-assessment.[13] Effective educational media alter learner knowledge and behavior in a

© 2007 The Congress of Neurological Surgeons

measurable way. For an airline pilot, reduction in accidental death or injury per passenger mile is an obvious metric. In medicine and surgery, patient safety is the most prominent current goal (although cost reduction is obviously also of great interest to regulators).

Self-assessment tools have a long history in medicine and surgery. The creation in the early 1970s of the Surgical Education and Self-Assessment Program (SESAP) by the American College of Surgeons was followed in 1977 by the introduction of the Self Assessment in Neurological Surgery (SANS) program.[17] From its inception, SANS incorporated many effective and modern educational features. The program allowed the learner to direct their own study in the available question topic areas, provided immediate feedback with an accompanying answer key and expert critiques, which explained both correct and incorrect answers, and provided references to each question to guide further study and learning.

Multiple editions of SANS were issued during the subsequent two decades and included technological updates, such as release on CD-ROM, with accompanying digital media (such as x-rays or operative photographs). Nevertheless, in traditional format, SANS was not interactive, and content was changed only glacially in time, with occasional release of new editions every 3 to 5 years.

In 2001, the Congress of Neurological Surgeons performed an educational needs analysis indicating a role for online, competency based, self-assessment learning. Original software was designed to recreate SANS as an online self-assessment tool accessible from any web browser-enabled computer in the world. The online environment allowed a number of educational improvements to SANS, which was released as "*SANSwired*" in 2003[16]:

- Learners received automatic feedback on accuracy immediately after answering each question, as well as category-specific and global feedback at any time regarding their performance across the examination as a whole.
- Digital media were expanded to include video (for example, of a surgical procedure or a patient undergoing neurological examination).
- Individual user accounts kept virtual records of question answer attempts, performance accuracy, etc., that could be analyzed to evaluate educational efficacy.
- Immediate statistical analysis of the validity and discriminative accuracy of each question became possible (using the same algorithm used by the ABNS and the National Board of Medical Examiners for their official written examinations).
- References were made available as instant hyperlinks, taking learners to web-based resources including peer-reviewed PubMed abstracts, governmental and nongovernmental regulatory websites, and quality, peer-reviewed public media.
- Learners were able to subscribe to, access, and receive CME credit for SANS online at any time, dramatically improving convenience and accessibility.

The current online edition of SANS, *SANS: Lifelong Learning* (2006) is designed to incorporate nonmedical competency information along with traditional clinical neurosurgical topics. The program also incorporates fluid, ongoing replacement of question content and topics, reflecting the evolution of medical and regulatory information of relevance to neurosurgeons and supporting the interest of neurosurgeons who maintain an ongoing subscription.[17]

SANS is particularly valuable in disseminating rapidly evolving information and regulatory requirements relevant to patient safety, such as the 100,000 Lives Campaign of the Institute for Healthcare Improvement or the National Patient Safety Initiatives of the Joint Commission on the Accreditation of Health Care Organizations (JCAHO). The online format, with housing of the exam at a central web server, allows the creation of new, topical content in days to weeks, rather than years.

An example of a SANS question that teaches about JCAHO patient safety guidelines can be seen in *Figure 28.1*. Note that the question is accompanied by a brief critique, available to the learner after they have submitted their answer. The peer-reviewed critique explains both correct and incorrect answer choices. Finally, hyperlinked learning references lead instantly to further learning resources available on the web, in this case, including the full JCAHO national patient safety goal listings, themselves:

The Joint Commission on the Accreditation of Health Care Organizations (JCAHO) has issued a set of National Patient Safety Goals to be implemented by all hospitals and hospital based practitioners by January 1st, 2005. One of JCAHO's 2005 national patient safety goals is:

a. Assure that the full range of manufactured drug concentrations and intravenous solutions are readily available within the hospital.

b. For verbal telephone orders, verify the order by having the person receiving the order read back the key portions.

c. Implement a process to mark the surgical site involving nurses and OR technicians.

d. Standardize a list of abbreviations, acronyms and symbols that are not to be used throughout the organization.

e. Include the use of the patient room as a patient identifier whenever administering medications or performing procedures.

Critique

JCAHO requires that, as of January 1st, 2005, all hospitals standardize a list of abbreviations, acronyms and

© 2007 The Congress of Neurological Surgeons

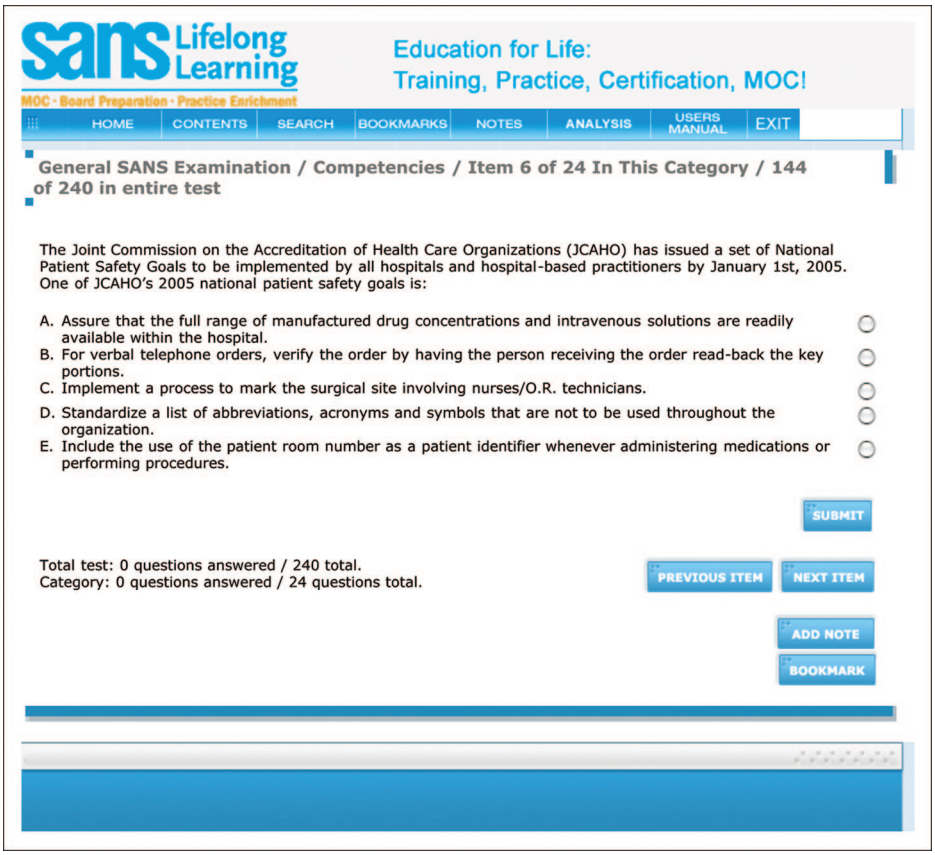

FIGURE 28.1. Appearance of a question and answer options in *SANS: Lifelong Learning*. SANS contains content relevant to the nonmedical competencies, including patient safety.

symbols that are not to be used throughout the organization. This includes abbreviations such as "MSO4" for morphine sulfate (which can be confused with magnesium sulfate) and "qod" for every other day (which can be confused with qD for daily).

JCAHO also instructs hospitals to stock only a limited, necessary supply of drug concentrations, to reduce the risk of accidental overdose, and to remove highly concentrated intravenous solutions from patient care areas.

Beginning in 2005, JCAHO requires that verbal orders be read back to the ordering physician in full, before acceptance.

JCAHO requires that operating rooms implement a system to pre-operatively mark the surgical site that involves the patient in site marking.

JCAHO also mandates use of at least two patient identifiers before medication administration or invasive procedures. These identifiers may NOT include the patient room number, use of which is a common cause of patient misidentification.[4,11]

The online learning format may also be used to evaluate and teach knowledge of more abstract nonmedical content, such as professionalism or communications skills:

Steep gradients in authority can negatively impact patient safety when:

a. A nurse unable to reach a resident does not call an attending.

b. Overcrowded operating rooms create delays in scheduling.

c. An incomplete medical record results in a missed drug allergy.

d. Fear of litigation results in physician migration out of a community.

e. Surgical instruments are incorrectly counted at the beginning of a case.

Critique

Steep gradients in authority were initially recognized in aviation safety, when pilots and co-pilots with a significant discrepancy in experience, rank or authority did not communicate effectively during emergency situations. Excellent outcomes from the work of complex teams, by contrast, depend on the free and efficient flow of accurate information. Command training by United States commercial airlines now routinely involves key decisions during emergencies, regardless of the particular make-up of an individual team. By analogy, patient care during an operative procedure may

© 2007 The Congress of Neurological Surgeons

suffer if nurses and surgical trainees are too intimidated to point out information to an authoritative attending surgeon.

Overcrowding is an example of systems failure. Incomplete medical records represent an information systems and communication failure. Fear of litigation and physician availability is related to health care and medical-legal policy. Incorrect instrument counts may be related to procedural inadequacies, system errors in the operating room, or inadequate training of operating room personnel.[6,18]

SANS represents a single example of what must necessarily be an extraordinarily complex and distributed effort to teach and evaluate knowledge in the competencies, including safety, among trainees and practicing surgeons. A broad network of learning opportunities should be created to accomplish the goals stated by the IOM, ABMS, JCAHO, and others. The most effective efforts, however, will likely be characterized by ease of access, evidence-based content, learner centered format, self-assessment design, and modifiability in real-time.

CONCLUSION

Neurosurgery is characterized by extreme personal dedication to optimal patient outcomes. I think that no one besides family members advocates more effectively for an individual patient's interest than his or her attending neurosurgeon. Nevertheless, if a neurosurgeon operates within a flawed medical system that predisposes to error and lapses in safety, the neurosurgeon will ultimately fail to effect optimal patient outcomes. Neurosurgical care is increasingly delivered in extremely complex, interdisciplinary environments that demand a more sophisticated understanding and implementation of safety, teamwork, and communications protocols. Success requires ongoing education and, although unpalatable to traditionally independent-minded surgeons, a degree of regulatory oversight.

Oversight is increasingly a part of the future of all practicing neurosurgeons. As neurosurgeons, we understand better than outside parties the nature of the challenge, the tremendous stakes for patients with nervous system pathology, and the critical importance of safety for patient outcomes. Rather than accept formulaic safety and regulatory interventions, often designed for higher-volume medical or general surgical settings, neurosurgeons should educate themselves in the vocabulary and methodology of medical safety science, should make novel contributions to safety within the profession, and should assume leadership for neurosurgical safety rather than abdicating this leadership in the future to nonneurosurgeon administrative "experts."

Similarly, although the language and practice of safety and communications science may seem foreign to many practicing neurosurgeons, we should each recognize the importance of this material and make a personal commitment to master its implementation within our own practices and hospitals. Diverse practices, including academic, community, governmental, and group settings, will encounter unique safety and communication challenges. Innovation and leadership, therefore, should be pursued in all practice settings and by neurosurgeons with or without traditional academic roles. If applied with vigor to the problem of competencies education and safety, the traditional dedication of neurosurgeons to patients, ingenuity, and leadership will ultimately raise public confidence in the neurosurgical profession, allow us to control our own destiny, and assure the best outcomes for patients.

ACKNOWLEDGMENTS

Dr. Selden thanks Shirley McCartney, Ph.D. for editorial assistance.

DISCLOSURE

Dr. Selden serves as Editor of *SANS: Lifelong Learning* (Self-Assessment in Neurological Surgery) and is Chair of the Congress of Neurological Surgeons SANS Committee.

REFERENCES

1. American Board of Medical Specialties 2006: http://www.abms.org.
2. American Board of Neurological Surgery Newsletter: 23: 2005: http://www.abns.org/content/newsletter info 23.asp.
3. Accreditation Council for Graduate Medical Education 2006: http://www.acgme.org/Outcome/.
4. Agency for Healthcare Research and Quality (AHRQ): Medical Errors & Patient Safety: 2005: http://www.ahrq.gov/qual/errorsix.htm#h1.
5. Bliss M: *Harvey Cushing: A Life in Surgery.* Oxford University Press, 2005.
6. Cosby KS, Croskerry P: Profiles in patient safety: Authority gradients in medical error. **Acad Emerg Med** 11:1341–1345, 2004.
7. Dentzer S: Media mistakes in coverage of the Institute of Medicine's error report. **Eff Clin Pract** 3:305–308, 2000.
8. Helmreich R, Schaefer H: Team performance in the operating room, in Bogner M, ed: *Human Error in Medicine.* Hillside, NJ, Lawrence Erlbaum, 1998.
9. Institute of Medicine Crossing the Quality Chasm: A New Health System for the 21st Century 2001: http://www.iom.edu.
10. Institute of Medicine Reforming Health Professions Education: 2003: http://www.iom.edu.
11. JCAHO Disease-Specific Care National Patient Safety Goals: 2006: http://www.jointcommission.org/CertificationPrograms/Disease-SpecificCare/DSC NPSG/.
12. Kohn L, Corrigan J, Donaldson M, eds: *To Err Is Human: Building a Safer Health System.* Washington, DC, National Academy Press, 1999.
13. Ludmerer KM: Learner-centered medical education. **N Engl J Med** 351:1163–1164, 2004.
14. McDonald CJ, Weiner M, Hui SL: Deaths due to medical errors are exaggerated in Institute of Medicine report [see comment]. **JAMA** 284:93–95, 2000.
15. Pizzi L, Goldfarb NI, Nash DB: Chapter 44. Crew resource management and its applications in medicine, in Shojania KG, Duncan BW, McDonald KM, Wachter RM, Markowitz AJ, eds: *Making Health Care Safer: A Critical Analysis Of Patient Safety Practices.* 2001.
16. Ragel BT, Asher AL, Selden N, MacDonald JD: Self-assessment in neurological surgery: The SANS wired white paper. **Neurosurgery** 59:759–765, 2006.
17. SANS Education for Life: Training, Practice, Certification, MOC: 2006: http://www.sanswired.com/.
18. Sexton JB, Thomas EJ, Helmreich RL: Error, stress, and teamwork in medicine and aviation: Cross sectional surveys. **BMJ** 320:745–749, 2000.

 © 2007 The Congress of Neurological Surgeons