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Understanding the Nature of Surgical Excellence Using a Competency Modeling Approach

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**UNDERSTANDING THE NATURE OF SURGICAL EXCELLENCE USING
A COMPETENCY MODELING APPROACH**

by

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ABSTRACT

UNDERSTANDING THE NATURE OF SURGICAL EXCELLENCE USING A COMPETENCY MODELING APPROACH

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Currently, a thorough description of the knowledge, skills, abilities, and other personal characteristics (KSAOs) that distinguish an exceptional surgeon does not exist. This knowledge is pertinent to the development of selection, training, and performance assessment methods that can be used to develop high performing surgeons. Expert surgeons from around the country were recruited to participate in an interview to discuss the KSAOs (i.e., the competencies) needed to be exceptional in the field. A smaller number of novice surgeons were also interviewed. The expert interview data were distilled into a competency model that consists of ten competencies and patterns within the data that distinguished between the expert and novice results were examined. Results revealed ten competencies essential for distinguishing between outstanding and typical and surgeons: Dedication to Patient Care, Integrity, Tireless Work Ethic, Preparedness, Intellectual Giftedness and Curiosity, Humility, Compassion, Devotion to Field, Rapid Decision Making, and Passion for Teaching. These results suggest that surgical training would benefit from focusing on the development and enhancement of character-based competencies. Once validated, Industrial-Organizational psychologists can use the present model to assist surgeons in creating instruments that measure and track residents' acquisition of these competencies.

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INTRODUCTION

During the Annual Meeting of the Society of University Surgeons in 2003, Dr. William Silen of Harvard Medical School delivered the keynote address in which he described the current state of surgical education. Silen argued that a major change was needed in surgical residency programs. In this address, he shared the following statement made by a surgical resident from a reputable medical school:

I believe the apprenticeship model, so successful in the mid portion of the 20th century, is now dead and has taken the spirit out of the work of medicine. There are too many sick patients to be cared for by too few people...Time spent practicing, teaching, thinking are considered luxuries, taken with the knowledge that each minute will subtract from time [treating patients] or from time sleeping.
(p. 399)

Others have recently expressed similar attitudes regarding this shift in surgical education. For example, Gawande (2001) stated that residency programs must acknowledge that although the method of learning-by-doing (i.e., on-the-job training) worked for decades, its flaws are increasingly evident. Silen and Gawande represent a growing contingent of educators who are endorsing a major modification to surgical training.

Such remarks also indicate that many surgical programs have reached a crossroads. The Halstedian method, the reigning teaching strategy for the past century, consists of a “see one, do one, teach one” approach to surgical training. In other words, the Halstedian-based system to training surgical residents mirrors a traditional apprenticeship model. This method was a logical approach to surgery when there was no viable alternative to learning directly with patients. The consensus in surgical education

The journal model for this dissertation is *Journal of Applied Psychology*.

is that the Halstedian method is now insufficient given the changing competencies required for surgeons (Fabri, 2003; Hall, 2004; Haluck & Krummel, 2000). The concern over this teaching method is so widespread that formalized training programs of basic surgical skills have been established in many countries, including the United Kingdom and Australia (Davies & Hamdorf, 2003). A good example of such a skills training facility is The Centre for Medical and Surgical Skills (CTEC) in Perth, Western Australia, a state-of-the-art training center consisting of a medical and surgical workshop, a high-fidelity simulated anesthesia mannequin, and a virtual hospital that contains an operating theater, emergency department, and intensive care unit.

Because few surgical programs are equipped with such technically advanced training centers, most education continues to occur in the operating room (OR). From an educational standpoint, the OR is a poor classroom for learning important surgical skills. It is an uncomfortable, stressful, and even hostile environment; thus, learning potential and the ability for a surgeon to concentrate are often compromised (Haluck & Krummel, 2000). Although many residency programs need to improve aspects of their current curricula, it is of even greater importance to determine whether these programs are producing *competent* surgeons. To do so, the surgical community must first reach a consensus regarding the definition of a competent surgeon. Currently, surgical competency is an elusive concept that even the American Board of Surgery is grappling to define (Scott et al., 2000). However, this Board does suggest that multiple assessment instruments be used to evaluate competency. This recommendation implies that surgical competency is multidimensional in nature and therefore, assessing only medical

knowledge or technical skill does not provide a complete picture of a surgeon's proficiency.

Of equal significance to the concept of surgical competency is the role of assessment. It is important to investigate whether educators can adequately assess the levels of competency that surgical residents achieve throughout their training. The identification of poor performers is important because these individuals require additional training or, in extreme cases, dismissal from the surgical program altogether. Unfortunately, existing assessment methods are often criticized as subjective, inconsistent, and too general to discriminate among trainees (Cheung & Yau, 2002; Gibbons, Baker, & Skinner, 1986; Paisley, Baldwin, & Paterson-Brown, 2001).

Assessing Surgical Performance

Little has been written about characteristics that distinguish a typical surgeon from an exceptional one. However, all surgeons, even the exceptional ones, begin their training in medical school. Upon graduating from college, aspiring physicians must first attend medical school, where they acquire a broad education in medicine typically within a four-year program. The first two years are taught largely via classroom lectures, laboratories, and demonstrations. The object of these two years is to provide students with a foundation in medical-related sciences. During the third and fourth years, students complete various medical rotations in some of the main specialties of medicine such as obstetrics/gynecology, family medicine, psychiatry, and general surgery. Once the four years are completed, students receive their medical degrees and are then matched to residency programs within their chosen specialty. These doctors are now referred to as residents. In essence, residency is a time when surgeons are expected to sharpen their

skills and further their medical knowledge. The first year of residency is known as the internship, although the internship can be as long as three years in certain institutions (Ludmerer, 1999). Once residency is concluded, the formal portion of a surgeon's medical education is considered to be complete. But the question remains, how good is a surgeon at what he or she does?

Until recently, surgical performance was defined by the raw number of medical procedures performed and patients examined (Haluck & Krummel, 2000). Due to a recent shift in educational standards and tremendous advances in medical technology (e.g., medical simulators), this approach is becoming obsolete. Rather than defining level of performance by a set number of procedures, many surgical programs are turning to predetermined educational goals and objectives for assessment purposes (Romanchuk, 2004).

The need to operationalize surgical performance is widespread. In fact, there has been extensive public interest and scrutiny in defining levels of surgical performance (Satava, Gallagher, & Pellegrini, 2003). The media, patient groups, governmental agencies, and insurance companies are a few of the many parties involved in this debate (Singh, Smeeton, & O'Brien, 2003). Most medical professionals believe that a surgeon's level of performance can be determined by considering an amalgam of several skills and abilities including, clinical skills, technical ability, academic potential, administrative skills, good judgment, and the ability to maintain strong relationships with patients and other health care professionals (Cuschieri, Francis, Crosby, & Hanna, 2001). Patil, Cheng, and Wong (2003) agree that a high performing surgeon must have strong clinical skills, a compassionate and professional attitude, and effective communication skills, but

they also state that a high performing surgeon must possess the ability to think and work in highly stressful situations.

Hall, Ellis, and Hamdorf (2002) acknowledge that although technical ability is crucial, a high performing surgeon must also be a capable decision maker. It has been estimated that a surgical procedure requires approximately 75 percent cognitive skills and 25 percent technical skills (Satava et al., 2003; Spencer, 1978). Surgical performance, by its very nature, is complex because it requires good manual dexterity, a blend of high stakes decision making, and critical thinking in complex situations often with relatively uncommon procedures (Hall, 2004; Higgins et al., 2004; Spanknebel et al., 2004). There have been many attempts to define surgical competency, each with its own merits and weaknesses.

Historical Attempts to Assess Surgical Performance

Mortality Rates

One fairly straightforward approach to determining the quality of a surgeon's level of performance is simply, the death of a patient (e.g., Margulies et al., 2001; Singh, Smeeton, & O'Brien, 2003). Mortality rates allow hospital administrators and patients to determine the quality of surgical care they are likely to receive. In a recent study aimed at identifying under-performing surgeons, Singh et al. (2003) provided an example of operationalizing surgical performance. They used a mortality rate of four percent over a 30-day period following a radical cystectomy procedure for bladder cancer. Acceptable surgical performance was defined as a mortality rate of four percent and under-performance was defined as a mortality rate of eight percent or greater.

Although mortality rates are clinically relevant and certainly important to patient groups and insurance companies, there are problems inherent with this approach. For instance, very large sample sizes are needed which often create logistical problems in medical research. Furthermore, since surgery is a team effort, a surgeon is rarely the sole person responsible for the death of a patient. If a surgical team fails to communicate or provide proper monitoring and feedback during a procedure, it may not be possible to place blame on any particular individual. As such, defining surgical performance through mortality statistics may be viewed as both a contaminated and deficient measure of performance. It may be contaminated because the surgeon may not necessarily be responsible for problems that arose at the team level. Mortality rates may also be deficient because they do not provide any evaluative information regarding other important characteristics of job performance, such as interpersonal interactions with patients and their family members.

Patient Satisfaction

The quality of a surgeon's performance is not only tied to patient survival, but also the attitudes and reactions held by their patients. Although medical practitioners are evaluated by their superiors, many hospitals and clinics now include their patients in the evaluation process. Over the past 25 years, patients' opinions have become a serious concern in the medical and nursing literature (Sitzia & Wood, 1997). For example, patient satisfaction with physicians' interpersonal skills has been shown to be related to long-term psychological adjustment. Mager and Andrykowski (2002) interviewed 60 women diagnosed with local or regional breast cancer to examine the relationship between breast cancer survivors' experiences during their diagnostic consultation and

their subsequent psychological adjustment. One interesting finding was that the best predictor of long-term patient depression, stress, and anxiety was not perceptions of physician competence, but patients' perceptions of a physician's interpersonal skills. Thus, patients may require more than technical expertise from their physicians; patients typically expect to be treated with sensitivity and respect.

Assuming that patients are well-informed and well-intentioned, the information gathered from patient satisfaction questionnaires can be extremely useful. On the other hand, some physicians are suspicious of patient satisfaction data. They believe that these data may unduly threaten the status and livelihood of medical practitioners, as well as threaten the professional standards of the medical community as a whole (Armstrong, 1991). Although such physicians may assume that many patients are dissatisfied with their medical care, in practice the opposite is usually true (Sitzia & Wood, 1997). Since these fears are likely to be unfounded, patient satisfaction information could be an important and worthwhile component of surgical excellence.

To date, there are many more studies involving patient satisfaction with non-surgical physicians than there are with surgeons. However, at the University of Toronto, MacRae, Cohen, Regehr, Reznick, and Burstein (1997) developed a six-station, three-hour, standardized-patient-based evaluation system. MacRae et al. called this system the Patient Assessment and Management Examination (PAME). They used it to assess 18 senior general surgery residents. Although the sample size was small, their results suggested that the PAME is a reliable and useful tool for assessing the attitudes of surgical patients. However, it must also be acknowledged that most patients have limited insight into an operative procedure. Typically, patients are able to judge only

interpersonal interactions with the surgeon as well as the final outcome of a procedure. While patient input provides an important measure of a surgeon's performance, patients are not capable of providing a complete evaluation of surgical ability.

Suturing Skill

Another approach that has been used to define surgical performance is the assessment of suturing skills. Those who use suturing as a measure of surgical performance seem drawn to its objectivity. In these studies, a standardized battery of knot-tying and suturing stations may be used to assess performance (Bann, Khan, Datta, & Dazi, 2004). Although suturing is not the only skill necessary for technical performance, it is a fundamental aspect of surgery. Seki (1987, 1988) conducted several studies dealing with the suturing techniques among surgeons. His work demonstrated that surgeons may overestimate their accuracy of suturing and cause tissue damage by wavering the needle without realizing it. Furthermore, Seki's research demonstrated that less experienced surgeons benefited more from training than more experienced ones. Khan, Bann, Darzi, and Butler (2003) asked a group of 43 plastic surgeons and 46 general surgeons to suture a wound made in a latex pad using interrupted sutures. They were videotaped performing the procedure while their movements were monitored using an electromagnetic tracking system. All videotapes were assessed via the Objective Structured Assessment of Technical Skills (OSATS), which is an operation-specific checklist that is frequently used to assess surgical skills among residents in teaching hospitals (Faulkner, Regehr, Martin, & Reznick, 1996; Hernandez et al., 2004; Reznick, Regehr, MacRae, Martin, & McCulloch, 1997). This assessment method allows trainees to be scored objectively by their peers or superiors (for further description of the OSATS,

see the following section, “Technical Skill”). Khan et al. found that, when suturing, plastic surgeons were significantly more efficient with their time than general surgeons. They also found that senior surgeons performed better than their juniors, regardless of surgical specialty.

Collectively, these studies suggest that suturing skill may be useful as a measure of surgical performance for two reasons. First, suturing assessment may be a sensitive measure because it has been shown to discriminate among surgeons from different specialties and with different levels of experience. Second, suturing may provide an index of one’s overall level of technical competence.

Technical Skill

Psychomotor abilities and technical skills have been an important part of selection and assessment research for the past 80 years (Ackerman, Cianciolo, & Bowen, 1999). Technical skills have played a role in predicting individual differences in various skilled professions. However, the convention in Industrial-Organizational psychology is to lump technical skills into a “noncognitive skills and abilities” category (Schmidt, Ones, & Hunter, 1992). Other terms that fall under the “noncognitive” umbrella are psychomotor and perceptual ability. Although general cognitive ability is considered to be the strongest predictor of job performance across a wide range of jobs, noncognitive abilities may improve the overall predictive validity of cognitive ability measures (e.g., Schmidt & Hunter, 1998, McHenry, Hough, Toquam, Hanson, & Ashworth, 1990).

Approximately twenty years ago, the United States Army began a seven-year research program to improve the selection and classification of entry-level military members. This effort, known as Project A, was one of the few examples of empirical

research in which the role of noncognitive abilities in selection was examined (McHenry, et al., 1990). Results suggested that while cognitive ability was the best predictor of job performance across nine different military occupations, adding specific ability tests increased the validity beyond what was predicted by cognitive ability alone (McHenry et al., 1990). Johnston and Catano (2002) also examined the predictive and incremental validity of noncognitive abilities. They administered tests of manual dexterity, finger dexterity, and motor coordination to 209 Canadian Forces trainees in technical and mechanical occupations. The results indicated that only manual dexterity predicted training performance. Further, although the addition of the three psychomotor tests increased validity beyond using only cognitive measures, only manual dexterity significantly contributed to the regression model.

Logic suggests that technical skill is related to surgical performance. However, until the past decade, the formal assessment of surgeons' technical skills was often accomplished via only a single item on summary achievement indicators, such as in-training reports (Winckel, Reznick, Cohen, & Taylor, 1994). Until the OSATS was introduced into the surgical community, the assessment of technical skills was much less sophisticated than the assessment of clinical skills, cognitive ability, and medical knowledge. The OSATS is comprised of six separate tasks that a trainee must perform within 90 minutes. These tasks include excision of a skin lesion, insertion of a T-tube, abdominal wall closure, control of major bleeding, stapled bowel anastomosis, and sutured bowel anastomosis (Faulkner, Regehr, Martin, & Reznick, 1996). Using a task-specific checklist and a global rating scale, the examiner is able to assess the trainee's performance.

Technical skill may also be assessed more generally using human cadavers, animal models, and living patients. There are obvious ethical constraints to using living patients since safety must always precede training opportunities. These constraints may also hinder the assessment process, particularly when an examiner must step in to assist a trainee if something goes wrong during the procedure. Such external help or guidance would bias the evaluation process. Cadavers therefore alleviate some of the ethical concerns and problems related to assessment. However, since tissue supply is limited in cadavers and tissue properties are different from those of live patients, the use of cadavers also presents problems (Khan, Bann, Darzi, & Butler, 2003). Furthermore, human cadavers may place trainees at risk because it is possible to transfer disease from cadavers to humans.

Recently, surgical educators have taken advantage of computer-enhanced technology to train residents to perform specific procedures, as well as to improve their overall technical skills. Several virtual reality (VR) simulators that address endoscopy and laparoscopy are now available to train instrument manipulation and advanced procedures (Patil, Cheng, & Wong, 2003). As surgery becomes less invasive, the range of skills required to manage surgical issues is increasing. Compared to traditional open procedures, minimally invasive surgery (MIS) involves smaller incisions and less extensive manipulation of the tissues surrounding the target structure (Guyer, Foley, Phillips, & Ball, 2003). Further, patients who undergo minimally invasive procedures typically experience less pain, a smoother recovery, and an improved cosmetic outcome (Cooley, 1998).

Researchers acknowledge that training and assessment of the skills needed for MIS differ somewhat from the skills needed for conventional surgical procedures (e.g., Seymour et al., 2002). The Minimally Invasive Surgical Trainer-Virtual Reality (MIST[®]-VR) has become one of the most popular trainers and assessment systems of the technical skills needed to perform MIS (Jordan, Gallagher, McGuigan, McGlade, & McClure, 2000). This PC-based system, which contains two laparoscopic instruments and a diathermy pedal, has six tasks of increasing difficulty. The tasks use abstract graphics that simulate the manipulations required during laparoscopic cholecystectomy (Grantcharov, Bardram, Funch-Jensen, & Rosenberg, 2001). The MIST[®]-VR system records number of errors, economy of movement for each hand (actual path length/ideal path length), and time information. This scoring system permits measurement of skills relevant to laparoscopic surgery. Moreover, research has shown that individuals trained on the MIST[®]-VR demonstrate significantly better technical performance than those surgeons trained using traditional methods (Seymour et al., 2002).

As with any assessment method, one must consider its advantages and disadvantages. One obvious benefit of defining surgical ability by technical skills is its intuitive appeal. Instrument handling and the ability to demonstrate respect for tissue are necessary prerequisites for any surgical procedure. However, the question then begs, is a surgeon truly exceptional if he or she is technically proficient but has poor interpersonal and communication skills and is lacking in overall professionalism? Although technical skill is important and clearly necessary to perform surgical procedures, it does not provide information about other aspects of surgery that are relevant to patient care. Thus,

for the present study, it is anticipated that technical skill will not emerge as a competency that distinguishes typical from exceptional surgeons.

Critical Thinking

Surgery consists of activities that are highly complex and risky. In fact, much medical decision making is based on insufficient information (Satish et al., 2001). As such, a surgeon often needs to make life or death decisions during specialized, intricate, and sometimes, relatively uncommon procedures (Spanknebel, Shoup, Temple, Coit, Brennan, & Jaques, 2004). The majority of surgical research focuses on thought processes involving major decisions such as deciding whether to operate, determining diagnoses, and deciding the level of risk to which a patient can be exposed by operating (Birkmeyer & Birkmeyer, 1996). With the advent of MIS, surgeons must now make important mid-surgery decisions such as whether to convert from a minimally invasive procedure to an open-incision procedure (Dominguez, 2001).

To be a high performing surgeon, it is likely that one needs to possess a combination of technical skills and higher-order cognitive processes, such as critical thinking and independent thought. Although surgeons must be intellectually prepared to handle a wide array of contingencies, many training programs are not designed to produce surgeons who think critically, learn independently, and generate new ideas (Ludmerer, 1999). Curricula are often typified by rote memorization, lectures, and other rigid processes. In addition, the Halstedian method is essentially a behavioral approach to instruction, as observed behavior rather than internal processes is emphasized (Hall, Ellis, & Hamdorf, 2002). Given that the Halstedian method is becoming obsolete, the role of critical thinking is taking a more prominent role in surgical programs.

Critical thinking is especially necessary when dealing with complex medical cases and individualized treatment plans. Satish et al. (2001) also believe that high performing surgeons require more than strong technical skills. They contend that these surgeons should have the capacity to respond appropriately to multiple, simultaneous symptoms and medical events that can potentially compromise a patient's safety. Educating surgeons about diseases and medication is fairly straightforward information that can be translated through training, lectures, and medical textbooks. However, as Satish et al. (2001) emphasize, it is the *integration* of that information toward individualized treatment plans and the response to unpredictable changes in the patient's status that are much more difficult to convey through traditional skill training. Therefore, these researchers used an alternative assessment method to measure critical thinking, as well as other skills needed for integrative surgical decision making (e.g., flexibility, crisis management). This method, known as the Strategic Management Simulation (SMS), uses different medical scenarios to measure critical thinking and to identify where an individual needs improvement. Satish and his colleagues used the SMS to predict surgical residents' higher cognitive function (e.g., critical thinking). Their SMS results were very similar to ratings provided by surgical faculty who had known the residents for a minimum of two years.

Given how important it is for surgeons to be able to critically assess complex medical cases and procedures, it is anticipated that critically thinking will emerge as a competency in the present study.

The Need for Clear Standards of Surgical Performance

The previous section described the difficulties researchers face when trying to evaluate a surgeon's performance. Nonetheless, it is becoming more important for surgeons to demonstrate that they can perform according to professional standards.

Recertification and Professional Development

Professional organizations commonly endorse certification and recertification/revalidation programs for various surgical specialties. Such bodies prescribe high standards and requirements for both board certification and recertification. For instance, before the American Board of Colon and Rectal Surgery (ABCRS) permits a surgeon to apply for recertification, he or she is required to: submit a practice review of consecutive operative cases for the preceding year and acquire 100 approved hours of postgraduate medical education in surgical or colorectal surgery in the two years prior to application. The purpose of these boards is to ensure that surgeons maintain acceptable qualifications of practice in their surgical specialty, as well as maintain commitment to ongoing education and evaluation of performance in practice (Patil, Cheng, & Wong, 2003).

Although continuous medical education (CME) and recertification appear to be universal endeavors for most surgical specialties, ongoing professional development opportunities for those practicing general surgery is less straightforward. Since general surgery is heterogeneous in nature, it is much more difficult to create surgical competence assessment sections that are broad enough to encompass the spectrum of surgical circumstances (Patil et al., 2003). As such, a major challenge facing the surgical profession is to develop and validate measures that assess a representative sample of

general surgeries. Moreover, the profession needs to create requirements that are broad enough to allow general surgeons to qualify for recertification. Having discussed recertification, the resident work hour mandate is another important issue facing surgeons today.

Resident Work Hour Mandate

Whether a resident chooses general surgery or some surgical specialty, he or she is now subject to limits in working hours and training time. The Accreditation Council for Graduate Medical Education (ACGME), which is the umbrella organization for all residency review committees in medicine, promulgated this decision in 2002. As of July 1, 2003, residents in all specialties are required to adhere to an 80-hour work week (http://www.acgme.org/acWebsite/newsRoom/newsRm_dutyHours.asp). This mandate was due, in large part, to the Institute of Medicine's (IOM) report, *To Err is Human: Building a Safer Health System*, which focused on the relationship between work hours and medical error (Kohn, Corrigan, & Donaldson, 1999). This report revealed that medical error was responsible for 98,000 deaths and over 1 million injuries every year in the United States alone (Chen et al., 2003). Although many individuals outside the medical field have criticized the long hours traditionally required by surgical programs in the past (e.g., Botta, 2003), there are some surgeons who oppose the control that external bodies have recently had over their field. There is a growing fear that the ACGME mandate will result in unprepared surgeons and thus, an overall decline in patient care (Komenaka, 2003). Furthermore, the 80-hour restriction impacts continuity in care since residents may not be able to see the patients on whom they operated the previous day.

Although it is not yet known whether the 80-hour restriction will be beneficial or detrimental to surgeons and their patients, it is clear that this mandate demonstrates the need for clearly articulated standards of surgical performance. The Society of University Surgeons (SUS) released a statement about the resident work hour issue, stating that specific hours for surgery residents cannot be arbitrarily defined. The SUS statement suggests that constrained work hours “do not prepare residents for the real world of surgical practice” (Cole, Bertagnolli, & Nussbaum, 2002). Some surgeons also fear that the mandate will affect the quality of future surgeons. For instance, Komenaka (2003) is concerned that a very different type of medical student will now be attracted to the surgical professional. He argues that students who choose “lifestyle specialties” (e.g., dermatology, emergency medicine, anesthesia, etc.) may now be attracted to surgical programs because time commitments and training obligations are less burdensome under the new mandate. According to Komenaka, individuals who are attracted to lifestyle specialties have a work ethic and value system that are a poor match for surgery. If this is indeed the case, the development of standards of competence is more imperative now than before the introduction of the 80-hour limit. In fact, residency programs may find it necessary to devote more attention to the *selection* of surgical residents, particularly if greater numbers of medical students decide to apply to surgery programs.

Selection instruments should be able to exclude applicants who lack not only the potential to master the important technical and interpersonal skills needed in surgery, but also identify those applicants lacking the personal characteristics and values that many senior surgeons want their successors to possess. To rely on these methods for important

selection and promotion decisions, it is essential that they are subjected to well-established principles of validation.

This work hour mandate places considerable demands on surgical residency programs. Program directors are forced to work within the constraints of an 80-hour week and still produce high performing surgeons. In addition, educators must ensure their residents have the skills required to perform the latest surgical techniques.

New Technologies and Skill Sets

As with the introduction of any new technology, the adoption of MIS required new training procedures. By the late 1990s, many authors had discussed the need for objective assessment and feedback parameters in MIS (Sokollik, Gross, & Buess, 2004). Although MIS was a revolutionary advancement within the surgical community, the training it requires has been a burden for most surgical programs. Specifically, MIS requires many new skills that are less relevant to conventional open procedures including keen psychomotor skills, interpreting the three-dimensional operating field from a two-dimensional monitor, and adapting to reduced tactile/haptic feedback (Hanna et al., 1996). Furthermore, performing advanced MIS procedures typically requires surgeons to undergo an additional one to two years of postresidency training (Gallagher, Ritter, & Satava, 2003). Since MIS is the gold standard for an increasing number of surgeries today (e.g., cholecystectomy, antireflux surgery), most expert practitioners agree that education and training should be intensified to ensure optimal quality of treatment (Grantcharov, Bardram, Funch-Jensen, & Rosenberg, 2003).

Surgical educators typically acknowledge that the complexity associated with MIS must be handled cautiously. The acquisition of these new skills poses a serious

challenge to conventional systems of surgical training. Accordingly, the establishment of clear standards of surgical performance in MIS will not be easy. However, since MIS is associated with significantly higher complication rates (Deziel et al., 1993), particularly during a surgeon's early use of these procedures (Moore & Bennett, 1995), it is imperative that education and training in laparoscopic skills play an important role in surgical programs. Similarly, expert surgeons need to be able to clearly define what makes a surgeon skilled in MIS. Once surgeons agree upon such a definition, assessment and feedback should become a regular component of their training in laparoscopic skills.

The section described above illustrates some of the difficulties researchers face in trying to define and assess a surgeon's level of performance. It is anticipated that the expert participants in the present study will mention these themes when discussing the qualities that impact surgical excellence.

Competency Modeling: A New Approach to Determining Levels of Surgical Performance

What are Competencies?

During the past twenty years, economic, demographic, and technological changes have had a powerful influence on modern organizations. These changes have posed a major challenge for organizations to remain competitive within local and global markets. Due to heavy competition, many organizations have focused on developing and maximizing the talent of their human resources. Previously, the success of many organizations was defined by monetary capital and hard assets (McLagan, 1997). Today, employees' knowledge, skills, abilities, and other personal characteristics (KSAOs) are considered to be an important yardstick for measuring an organization's success.

In order to become a high performing organization, it is imperative that high performing people are identified, selected, and ultimately retained (Rodriguez, Patel, Bright, Gregory, & Gowing, 2002). Over the past three decades, many human resource specialists have begun to rely on competency models to select high performers. Although there have been many attempts to describe competency, one widely accepted definition is “an underlying characteristic of a person which results in effective and/or superior performance on the job” (Klemp, 1980, p. 21). As such, competencies are also referred to as “superior-performer differentiators” (McLagan, 1997) or “success factors” (Mirabile, 1997). Unlike a list of tasks found in a typical job description, a competency model describes the talents and skills a person must have to be successful in an organization (Rodriguez, Patel, Bright, Gregory, & Gowing, 2002).

Competency modeling is a systematic process of determining the combination of KSAOs needed to perform at a high level in an organization (Harris, 1998; Lucia & Lepsinger, 1999). Therefore, a competency model is a general description of the qualities that top-level employees possess. Competency models may differ in format (e.g., verbal or graphical) as a function of the data collection method and customer requirements. Competency models can be used for selection, training and development, performance evaluation, promotion decisions, leadership development, and succession planning (Lucia & Lepsinger, 1999). Moreover, competencies help to ensure that employees and managers alike share a common view of what it takes to be successful in an organization.

The development of a competency model is a complicated procedure, particularly if a job involves higher-level cognitive processes, such as problem-solving and strategic thinking. Those KSAOs that are concrete are much easier to identify, describe, and

measure than those that are abstract. For example, although it may be straightforward to develop a typing test that measures psychomotor ability, it is much more complicated to measure hypothetical constructs such as creativity. Further, characteristics such as aptitudes and personality traits are typically more difficult to measure than knowledge, skills, and abilities because there is less agreement on definitions of these terms, which in turn, complicates efforts at validation. Competency modeling can be helpful for identifying and defining these abstract personal characteristics. It can also be used to classify personal characteristics that are more trainable and those that are innate.

There are several reasons why competency models are becoming increasingly popular. For instance, competency models improve the ability of selection committees to identify applicants who possess critical KSAOs. Competency models can be used to improve the interview process by ensuring that all persons involved in making selection decisions are using the same criteria. In addition, competency models provide an alternative to strong reliance on “gut instincts” or initial impressions gained from employment interviews, which have historically proven to be a weak predictor of job success (Latham & Wexley, 1981). They also increase the likelihood that individuals selected for a job will succeed. Furthermore, competency models can minimize investment in employees who fail to reach certain levels of performance (Lucia & Lepsinger, 1999). Because it can be extremely costly to recruit, hire, and train an employee such as a surgical resident, competency models can help to optimize the process of selecting the best candidates.

The ACGME Competencies

Over the past decade, medical schools and residency programs have undergone many changes. For instance, the Balanced Budget Act of 1997 mandated that medical schools revise their curricula (Langdale, Schaad, Wipf, Marshall, & Scott, 2003). In 1999, the same year that the IOM released its report, *To Err is Human* (Kohn, Corrigan, & Donaldson, 1999), the ACGME took radical steps to define competencies in resident education. By July 1, 2001, the ACGME mandated that all U.S. residency programs implement a curriculum and evaluation program based on the six core competencies. The ACGME gave residency programs a ten-year timeline to implement the new competencies into their curriculum and use them to guide educational goals, objectives, and evaluation instruments (<http://www.acgme.org/outcome/>). The American Board of Surgery also adopted the same six competencies for ongoing assessment of surgeons (Dunnington & Williams, 2003). The six ACGME core competency requirements are shown in Table 1 along with their definitions and behavioral examples.

Table 1

ACGME Competencies and Definitions

Competency	Definition
Patient Care	<p>Patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Able to develop and execute patient care plans appropriate for the resident's level • Performs procedures safely and proficiently • Demonstrates proficiency of sterile technique
Medical Knowledge	<p>Medical knowledge about established and evolved biomedical, clinical, and cognate (e.g., epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Critically evaluates and demonstrates knowledge of pertinent scientific information • Uses clinical data in operative decision-making and patient management • Demonstrates appropriate basic and clinical science knowledge (specifically relating to anatomy, pathophysiology, fluids and electrolytes, and pharmacology)
Practice-Based Learning and Improvement	<p>Practice-based learning and improvement that involves investigation and evaluation of their own patient care, appraisal, and assimilation of scientific evidence, and improvement of patient care.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Critiques personal practice outcomes • Integrates scientific evidence when diagnosing and developing treatment plans • Effectively uses information technology to manage information

Table 1- Continued

Competency	Definition
Interpersonal and Communication Skills	<p>Interpersonal and communication skills that result in effective information exchange and collaboration with patients, their families, and other healthcare professionals.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Communicates effectively with other healthcare professionals • Counsels and educates patients and families • Demonstrates caring behavior toward patients and families
Professionalism	<p>Professionalism as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse population.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Demonstrates a commitment to continuity of patient care • Demonstrates sensitivity to age, gender, and culture of patients and other health care professionals • Integrates constructive feedback
System-Based Learning	<p>System-based practice as manifested by actions that demonstrate an awareness of and response to the larger context and system of health care and effectively call on system resources to provide optimal care.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Practices high quality, cost-effective patient care • Demonstrates an understanding of the role of different specialties and other health care professionals in overall patient management • Able to access and mobilize outside resources

Assessing Competencies in Medicine and Surgery

The term “competency” is defined differently in psychology than in most other fields. In medicine, competency is typically synonymous with the terms, “ability” or “skill.” Langdale and his colleagues (2003) defined competency in medicine as “having sufficient experience to allow the independent completion of the task with minimal or no supervision” (p. 40). Further, in medicine, competency is generally measured through volume performance and patient outcome, while surgery may also use performance measures such as decision time and reaction time (Trunkey & Botney, 2001).

Psychologists, in contrast, define competencies as KSAOs that distinguish exceptional from average performers (Lucia & Lepsinger, 1999; McClelland, 1973, Schippmann, et al., 2000; Spencer, McClelland, & Spencer, 1994). In the context of surgery, a competency based on the psychological definition would be a skill or attribute that differentiates an exceptional surgeon from a typical surgeon. Although the medical and psychological definitions of competency differ slightly, it is a difference worth noting. In medicine, all residents are expected to acquire minimum standards of performance in each of the six ACGME designated competencies throughout their training. Competencies, as described in I-O psychology, are the KSAOs that are largely associated with outstanding performers. Thus, they describe characteristics that are beyond the basic minimum standards expected of residents by the end of their training. In fact, these qualities may not begin to manifest until a surgeon is already established in his or her career. Therefore, there may be some overlap between the results of the present study and the ACGME competencies, but it is likely that additional KSAOs will be identified that are unique to only exceptional surgeons.

Leadership

Although no one denies that the ACGME core competencies are a fundamental part of surgical education and training, several surgical educators have also begun to express the need to incorporate basic leadership training in both the undergraduate and graduate educational curricula (Craven, 2002; Itani, Liscum, & Brunicardi, 2004; Schwartz, 1998). According to Muller (1984), leadership training has historically occurred on an informal basis during random opportunities or via observation during surgical training. Today, a greater number of surgical programs are changing their curricula to bolster the development of leadership skills to a more prominent level (Bowen, 1998; Sims & Darcy, 1997).

This curricular modification is imperative because many surgical residents do not feel confident or competent in their leadership skills. Itani et al. (2004) administered a survey to 43 general surgery residents and asked them to rank 18 leadership characteristics in terms of importance and then rate their own levels of confidence and competency in the same leadership areas. Although nearly all (92%) of the residents rated the leadership characteristics as either “somewhat” or “very important” to their careers, more than half of the respondents rated themselves as either “minimally” or “not competent” in 10 of the 18 leadership areas. Over 75% of the residents indicated that they were least competent in conflict resolution, practice management, and leadership theory.

The type of leadership required in surgery may be different from that of many other disciplines. In teaching hospitals, in particular, a strict formal division of labor exists with the attending surgeon at the top of the hierarchy, followed by a chief resident,

surgical interns, senior medical students, and finally, junior medical students. Since the attending surgeon is ultimately responsible for everything that occurs in his or her surgical service, he or she is viewed as a leader. The rank of an attending surgeon grants almost total power and authority to address issues that arise within his or her service. Furthermore, an attending also holds the power to make or break careers (Bosk, 2003).

Despite the strict hierarchy that exists in surgery, particularly in teaching hospitals, actual surgical procedures require teamwork. Because the practice of surgery is team-oriented, some surgical programs are introducing collaborative leadership training (e.g., Awad, Hayley, Fagan, Berger, & Brunicardi, 2004). The outcome of any surgical procedure is contingent on the entire medical team; therefore, it is imperative that surgeons not only know how to collaborate with others, but also how to *lead* a surgical team (Gawande, 2001). According to Awad and his colleagues, collaborative leadership training should focus on teaching effective communication, alignment of the team toward providing good patient care, and integrity. If a team leader has integrity, he or she will hold the entire team to high personal and professional standards. Integrity will also help to create an atmosphere of trust among team members.

Some fields of medicine, including cardiac surgery and anesthesia, have adopted a specific type of team training known as, crew resource management (CRM), to enhance both communication and patient safety (Helmreich & Davies, 1997; Howard, Gaba, Fish, Yang, & Sarnquist, 1992). Crew resource management was originally developed in the aviation community to increase safety practices and reduce errors and accidents among cockpit teams (Salas, Burke, Bowers, & Wilson, 2001). One conclusion of the IOM report (1999), *To Err is Human*, was that CRM had the potential to improve patient

safety and reduce medical errors. Thus, medical educators were urged to translate and apply the concepts of CRM within their domain.

Although leadership and teamwork skills are not explicitly listed in the ACGME core competencies, an increasing number of surgical educators realize that they want to produce surgeons who are knowledgeable, able to communicate effectively, and demonstrate integrity and professionalism. These qualities are strongly related to being an excellent leader in a high performing team (Larson & LaFasto, 1989).

Intelligence

Although most, if not all of the ACGME competencies require a surgeon to be intelligent, we do not know if exceptional surgeons are more intelligent than the typical surgeon. In other words, would a competency model of an exceptional surgeon deem intelligence to be a factor that distinguishes different levels of surgical performance?

The study of intelligence has played an important role in psychology for over a century. The first article on intelligence, “‘General Intelligence,’ Objectively Determined and Measured” was written by Spearman in 1904. Since the appearance of this article, several major theories of intelligence have emerged, some more controversial than others. For example, Jensen (1979) maintained the existence of a single, general factor in human intelligence. This factor was called *g*, or general mental ability. Jensen believed that *g* was identified through the factor analysis of correlations among several different intelligence tests. Gardner (1983), on the other hand, argued that there are seven different types of intelligences: interpersonal, intrapersonal, linguistic, logical-mathematical, musical, spatial, and bodily-kinesthetic. In an effort to incorporate several existing theories of intelligence, Sternberg (1985) developed the triarchic theory of

human intelligence. According to Sternberg (1988), intelligence can be thought of as “the purposive adaptation to, selection of, and shaping of real-world environments relevant to one’s life and abilities” (1988, p. 65). Sternberg argues that traditional conceptions of intelligence are too narrow and that an expanded view of the construct is necessary. Accordingly, Sternberg developed a theory that divides intelligence into three different, yet interrelated parts.

Analytical Intelligence

Analytical intelligence was the first module described by Sternberg and arguably the most thoroughly developed (Tigner & Tigner, 2000). It is often measured through academic problem solving, analogies, and reading comprehension exercises. Sternberg (1985) believes that analytical intelligence is based on a combination of metacomponents, performance components, and knowledge acquisition components of intelligence. Metacomponents include planning, monitoring, and evaluating skills that aid in problem solving. Sternberg considers metacomponents to be the higher-order executive processes of human intelligence. Metacomponents are viewed as the foundation of mental self-management. They allow an individual to decide what cognitive action to take and which components are necessary to perform. Performance components are the basic operations required to execute any cognitive action. It would be nearly impossible to list and describe all performance components (Sternberg, 1988). However, some examples include encoding and maintaining information in short-term memory, discovering relationships between objects or events, performing mental calculations, applying knowledge to real world problems, and critiquing ideas and products. Finally, knowledge

acquisition components are processes used to gain and store new knowledge (e.g., the way in which individuals learn new words and concepts).

An individual with high analytical intelligence typically performs well in traditional educational settings (Tigner & Tigner, 2000). Since standard intelligence tests (e.g., the Scholastic Aptitude Test or SAT) were specifically developed to predict academic performance, it is logical that analytical intelligence is most similar to the type of intelligence measured in academic settings. Individuals with high analytical intelligence are likely to be good academic test-takers and thus, viewed as “smart.” They also tend to be good critical thinkers.

Creative Intelligence

Sternberg (e.g., 1985, 1988) also noted that although many individuals appear to be gifted in traditional analytical and memory skills, they are not necessarily adept at creating their own ideas. Likewise, there are many individuals who excel at developing new and imaginative ideas, but do not score well on standard intelligence tests. It would therefore seem that creativity extends beyond traditional intelligence. Thus, the second facet of intelligence is creative intelligence or the experiential facet of intelligence. According to Sternberg (1985), creativity involves insight, synthesis, and the ability to react to novel situations and stimuli. Creative behavior is demonstrated when a person must deal with a relatively novel task or situation, or when a task becomes automatized. The triarchic theory dictates that performance on novel tasks is an excellent measure of intelligence because it assesses an individual's ability to apply existing knowledge to new problems. For instance, when individuals first arrive in a foreign country, they must rely on their intelligence to adjust to the demands of a new culture. However, the less

attention required to process novel conditions, the more that remains to automatize actions. Likewise, the more efficiently an individual can automatize performance, the more attention he or she will have for dealing with novel situations and tasks (Sternberg, 1988). Sternberg provides an excellent example of the relationship between coping with novelty and automatization of information processing. Returning to the example of traveling to a foreign country, the less attention an individual devotes to adjusting to the new currency, the more attention he or she will have to enjoy shopping.

Individuals high in creative intelligence excel at discovering, creating, and inventing ideas and products (Sternberg, Castejón, Prieto, Hautamäki, & Grigorenko, 2001). One must note that creativity is context-specific; thus, what is creative in one context may not be creative in another (Sternberg & Lubart, 1995). Sternberg believes that it is essential to view creativity as a property of an individual as he or she interacts with one or more systems (Sternberg, 2001). For instance, in the 1950s, certain New York abstract expressionist artists such as Jackson Pollock or Willem de Kooning were the first to produce drip style paintings. At the time, this style was considered to be innovative because it represented a major change in the art world. By contrast, if someone were to produce a drip painting today, it would not be considered creative because this style is no longer original. In essence, Sternberg believes that highly creative behavior is “crowd defying.” In other words, creative individuals are often underappreciated or even attacked for their way of thinking. If the public eventually decides to accept these novel ideas, crowd-defying creativity actually may propel a field in an entirely new direction (Sternberg & Lubart, 1995).

Practical Intelligence

Sternberg (1985) was not the first author to discuss practical intelligence. Neisser (1976) distinguished academic intelligence from intelligent performance in natural settings. The former term is comparable to Sternberg's analytical intelligence while the latter is equivalent to his concept of practical intelligence. For both Sternberg and Neisser, traditional intelligence is insufficient for successful performance in real-world situations because it does not address the ability to learn information and then *apply* it correctly. Practical intelligence or the contextual aspect of intelligence, also refers to the ability to grasp, understand, and deal with everyday tasks, particularly in regard to one's short-term and long-term goals (Sternberg, 1988). More commonly, practical intelligence is conceived of as "street smarts" or intelligence that functions in the real world. Traditional, academic intelligence is only a subset of the abilities needed to determine how a person performs in real-life contexts.

Unlike the other two aspects of intelligence, practical intelligence includes attitudes and emotions that may be associated with real-world intelligence. For example, although the decision to purchase a house is partly an intellectual decision, this decision also has a strong emotional component for most people. Another novel aspect of practical intelligence is that it is very individualistic, particularly in comparison to analytical intelligence. Practical intelligence allows people to take the knowledge they have gained throughout their many life experiences and generalize that knowledge to other contexts they encounter. It is also distinctive in that what is relevant and useful for one person's life may be totally irrelevant for another individual (Tigner & Tigner, 2000). Consequently, practical intelligence is difficult to assess through traditional intelligence

tests and shows little or no correlation with analytical or creative intelligence (Sternberg, 1988).

A Competency Model for Exceptional Surgeons

The ACGME core competencies have served to either enhance or develop new curricula for surgical programs (Dunnington & Williams, 2003). Generally, these competencies have not been used to create new selection systems or evaluation plans. In fact, there is no standardized approach to selecting prospective surgeons. Rather, residency directors use a variety of criteria in their selection decisions. According to Berner, Brooks, and Erdmann (1993), the majority of surgical residency programs rely on face-to-face, unstructured interviews, academic transcripts, and scores on the National Board of Medical Examiners (NBME) Part I and Part II examinations. Although most selection committees are currently interested in academic indicators and interview performance, it is important to note that interviews have a long and tainted history from the I-O psychology perspective. Interviews suffer from low reliability (Judge, Higgins, & Cable, 2000). Interviews are also time and labor intensive (Cascio, 1998), prone to interview bias (e.g., Cash, Gillen, & Burns, 1977; Beehr & Gilmore, 1982), and require extensive training with active practice and feedback (Latham & Wexley, 1981). Individuals who conduct interviews should not only be aware of the potential problems inherent in the interview process, but also the best methods for enhancing validity and legal defensibility.

In many organizations outside of medicine, standardized psychological tests have been used for decades to improve their selection systems. In surgery programs within the U.S., the use of psychometrics to enhance the selection process is just beginning to gain

popularity. International surgical programs, however, appear to be slightly ahead of the U.S. in using this approach. For instance, in 1983, the Association of Surgeons in The Netherlands integrated psychometric testing in their training process. The Royal College of Surgeons is also considering a similar approach (Gilligan, Treasure, & Watts, 1996). However, the main problem of identifying the competencies of an excellent surgeon remains and until this problem is resolved, the selection of outstanding surgeons will be greatly hindered (Wanzel, Ward, & Reznick, 2002).

A competency model for surgeons could be used by selection committees to more effectively screen for surgical acumen. Further, the competency model would also be useful in identifying those candidates who are ill-suited for surgical residency. In addition, a competency model can be used to improve training. In other words, the same set of competencies that are used for selecting high-quality candidates can also be used to guide surgical training and education. The use of a competency model as the foundation for a training program can ensure that training is based on the main KSAOs that constitute exceptional performance rather than passing fads that training practitioners choose to adopt (Lucia & Lepsinger, 1999). Additionally, competency models can serve to make training comprehensive, standardized, and directly linked to performance evaluations.

Finally, the use of a competency model in surgery can help to develop leadership programs. Few surgical residents are equipped with the skills and the know-how to become strong leaders. A competency model can be used to develop the content for leadership training, which would set expectations for residents in their roles as leaders and help them identify their own developmental goals (Lucia & Lepsinger, 1999).

Objectives of the Present Study

The primary goal of the present study was to develop an understanding of the nature of surgical excellence by means of the competency modeling approach. In the first part of the procedure, outstanding surgeons representing various specialties were interviewed to determine the specific competencies needed to be considered exceptional. In addition to outstanding surgeons, residents from various surgical specialties were interviewed. When developing a competency model, it is common practice to compare the interview results of exceptional performers to those of more typical performers. Since it would be difficult to identify surgeons who would identify themselves as “average,” an alternative approach was used targeting less experienced surgeons. Furthermore, most competency assessment practitioners interview a greater number of exceptional performers than average performers. McClelland (1998), one of the earliest developers of competency modeling, recommends interviewing exceptional and average performers in a ratio of 3:2. He believes that there are more ways to be exceptional than there are to be typical. This ratio was also used in the present study.

The purpose of collecting data from the surgical residents was to determine how less experienced surgeons describe successful job performance. Therefore, another goal of the present study was to identify patterns within the data that distinguish between exceptional and novice surgeons. It was anticipated that although some degree of overlap would be found among the competencies provided by each group of surgeons, on the whole they would look quite different. Since the exceptional group of surgeons would have many more professional experiences to draw upon, they were expected to have a better grasp of those KSAOs needed to become truly exceptional in any field of surgery.

Predictions of the Present Study

ACGME Competencies

It was also anticipated that the exceptional surgeons would mention the importance of ACGME core competencies in surgical training; however, not all six were expected to be included in the final competency model. Since all surgical residents are expected to meet the minimum standards of performance described by the ACGME core competencies, it is unlikely they would differentiate between typical surgeons and those who are truly exceptional.

Leadership Skills

Although leadership skills are not explicitly listed in the ACGME core competencies, an increasing number of surgical educators recognize the importance of producing surgeons who are knowledgeable, able to communicate effectively, and demonstrate integrity and professionalism. As stated earlier, an increasing number of surgical programs are changing their curricula to address leadership skills (Bowen, 1998; Sims & Darcy, 1997). Therefore, it was anticipated that leadership skills would be a factor that distinguishes an exceptional surgeon from an average one.

Intelligence

Intuitively, one might surmise that an exceptional surgeon would also be highly intelligent. Although it is possible that the experts would view intelligence as an important factor for average and exceptional surgeons alike, it was anticipated that their descriptions of an outstanding surgeon would include all three forms of intelligence as described by Sternberg (1985).

Critical Thinking Skills and Decision Making Ability

Given that an important part of a surgeon's job is to make complicated, real-time decisions, exceptional surgeons must be able to rapidly evaluate multiple course of treatment. They must be able to quickly integrate information regarding medication, diseases, and changes in a patient's status. Therefore, it was anticipated that critical thinking and decision making ability would be included in the competency model of an exceptional surgeon.

Technical Skill

Historically, technical skill has been closely linked to surgical excellence. With the advent of MIS procedures, technical skill may become a more critical component of success in the field. Accordingly, it was predicted that the experts would include technical skill in the competency model.

Interpersonal Skills

Finally, patients' opinions have become a concern for the medical professional. As stated earlier, patient satisfaction questionnaires are becoming more common in the assessment of medical practitioners. It was therefore anticipated that the experts in the present study would indicate that surgeons' attitudes and sensitivity toward their patients, as well as the quality of their interpersonal skills, would be directly related to surgical excellence.

METHOD

Participants

The participants were forty surgeons from different geographical regions in the United States. Participants were divided into two separate groups. The first group consisted of exceptional surgeons. These surgeons were well-known and well-respected in their fields. All were board-certified and fellows of the American College of Surgeons (ACS). Since it is difficult to determine a list of objective criteria for surgical excellence, subject matter experts identified surgeons to be recruited for the present study. An experienced trauma surgeon and three of his colleagues developed a list that included a cross section of surgeons representing different surgical specialties. The second group of participants consisted of surgical residents from various specialties. Since these surgeons were in the initial stages of their career, they were considered novices. Due to their lack of experience, the second group was neither board-certified nor fellows of the ACS.

Expert participants included one female and 25 males with 13 to 44 years ($M = 29.0$) of surgical experience. The expert sample represented seven surgical subspecialties: cardiac/thoracic ($N = 5$), critical care ($N = 3$), gastro-intestinal ($N = 2$), general surgery ($N = 8$), head and neck ($N = 1$), surgical oncology ($N = 5$), and urology ($N = 2$). Novice participants included seven males and seven females with one to five years of surgical experience: PGY-1 ($N = 2$), PGY-2 ($N = 2$), PGY-3 ($N = 2$), PGY-4 ($N = 4$), PGY-5 ($N = 4$). The novice sample included five surgical subspecialties: general surgery ($N = 10$), orthopedic ($N = 1$), otolaryngology ($N = 1$), gynecological oncology ($N = 1$), and urology ($N = 1$).

Procedure

Once participants in both groups were identified, they were sent a formal letter via e-mail that explained the study and requested their participation (See Appendix A). Participants who agreed to be interviewed were sent the questions several days before the interview was scheduled so they could start thinking about their responses. A structured, one-on-one interview was used with all participants. Interviews were approximately forty minutes in length, or longer if the surgeon's schedule permitted. All participants granted permission to have the interview session tape recorded. Since the terminology surrounding a surgeon's job is highly technical, the interviews were tape recorded to ensure the accuracy and completeness of their comments (Lucia & Lepsinger, 1999). Detailed hand-written notes were taken throughout each interview as well.

All participants were told that their responses would be kept confidential and anonymous. They were instructed to refrain from mentioning other surgeons or healthcare professionals by name during the interview. Participants were assured that their names would not be linked to any comments included in the written report from the present study. The present study received approval from the Institutional Review Boards of Eastern Virginia Medical School and Old Dominion University.

Instruments

A structured interview was developed for the current study in consultation with IO psychologists who have extensive experience developing competency models, as well as existing literature. The interview began with a brief introductory session explaining the purpose of the project and its potential impact. Participants were told why they were selected to participate and the expected duration of the interview. They were then given

an opportunity to ask questions. All individuals were thanked for their participation both at the start and conclusion of the interview. Participants in both groups received the same structured interview. The actual interview consisted of seven main questions. The list of questions in the order presented were as follows:

1. Think of some of the finest surgeons you have ever known. What personality traits do you believe contributed to this person's success?
2. Once again, think of a surgeon that you respect and admire. What values or attitudes contributed to this person's success as a surgeon?
3. Think of the finest surgeon you have ever known. Now describe in detail one incident that reflects the personality, values, or skills that contribute to their excellence.
4. Think of a surgeon with whom you would never want to work. Now describe in detail one incident that reflects the personality, values, or lack of skills that contributed to their poor performance as a surgeon.
5. Think of some of the finest surgeons that you know. What characteristics or attributes do you share with these surgeons? What characteristics or attributes, if any, set you apart from these exceptional surgeons?
6. Describe a critical or significant experience that represents what you do well as a surgeon (i.e., an experience that made you proud). What about this experience makes you feel particularly effective?
7. Finally, please describe the job of a surgeon in the future (e.g., in the year 2015). What knowledge, skills, or other attributes will a surgeon in the future need to be exceptional?

For each question, participants were probed for additional information. Depending on the situation, probes included:

- What was the first thing you (or the surgeon in question) did?
- What were you (or the surgeon in question) trying to accomplish?
- What were you (or the surgeon in question) thinking at that point?
- Tell me more about that.
- Can you think of a specific example of that?
- Is there anything else you would like to add about what you (or the surgeon in question) did in that situation?

All interviews were transcribed. The transcriptions allowed for careful analysis of interview content for patterns within the data.

Analyses

The data for the exceptional surgeons and the surgical residents were handled differently. The analysis of the exceptional surgeons' data is described first. A common approach for analyzing the comments derived from competency interviews is known as the critical incident technique (CIT; Flanagan, 1954). Although this technique was developed half a century ago, it continues to be used in both practical and research settings today (Aamodt, Keller, Crawford, & Kimbrough, 1981; Stitt-Gohdes, Lambrecht, & Redmann, 2000). Bailey and Merritt (1995) argue that this method is optimal for rendering holistic and professionally-oriented descriptions of a job. Analyses were performed using an approach based on the critical incident technique (CIT). On the basis of a thorough literature review, previous medical research, and the analysis of the

transcripts, the responses to each question were reduced to behavioral or critical incidents. Flanagan (1954) referred to this phase as incident segmentation.

In the second phase, the critical incidents obtained from the exceptional surgeons were sorted into categories (i.e., competencies). For each competency, definitions based on the critical events were developed. After the definitions were considered complete, they were submitted to a group of five experienced surgeons to be confirmed or modified. These surgeons were also well-known and well-respected in their respective specialties. This group of subject matter experts was responsible only for revising the competency definitions.

Next, a second I-O psychologist with experience in competency modeling and qualitative analysis sorted the critical incidents into their appropriate categories. His results were compared to the categories formed in Phase two. In the final phase, the importance of each category was estimated. Using the process described by Aamodt and his colleagues (1981), the number of critical incidents in each category retained after the final phase was summed. The number of critical incidents in each category was provided in an effort to establish relative importance of each competency.

In addition to describing the characteristics of outstanding surgeons, the interview data were also used to describe the characteristics of poor surgeons, as well as requirements for exceptional surgeons in the future. The same process of analysis used for the expert comments was applied to these categories of comments.

Interview Data from the Surgical Resident Group

A second goal of the present study was to identify patterns within the data that distinguish exceptional from novice surgeons. Once again, the critical incidents obtained

from the residents were independently sorted into categories (i.e., competencies). Additionally, relative importance ratings were determined by summing the critical incidents within each competency. Once the categories were considered complete, they were not presented to another group of experienced surgeons for further consideration. The objective of analyzing the surgical resident data was to compare and contrast the resultant model with the one derived from the exceptional surgeons. Therefore, the interview content from the residents did not impact the final competency model of an exceptional surgeon. Rather, similarities and discrepancies between both groups of surgeons are described and explored below.

RESULTS

Main Analysis

Two sets of interviews were performed: the main analysis centered on the expert comments and the secondary analysis addressed the resident comments. The results of the main analysis will be described first. The expert comment analysis is divided into three sections. The first section consists of the characteristics of an exceptional surgeon (i.e., the competencies). The second section consists of the characteristics of a poor surgeon and the final section consists of the characteristics of the exceptional surgeon of the future.

Characteristics of an Exceptional Surgeon

The comment analysis of the characteristics of an exceptional surgeon consisted of 298 individual comments made by 26 expert surgeons. Each comment was placed into 17 themes. However, an *a priori* decision was made to include only themes that contained comments from a minimum of eight participants. Any theme containing comments from fewer than eight participants was not considered to be characteristic of the participant pool since it represented less than one-third of the total number of participants (See Appendix B for the residual comments). This criterion yielded ten competencies based on 237 comments. The most frequently noted competency had 39 comments and the least frequently noted competency had 15 comments.

Inter-rater Agreement

Two I-O psychologists with experience in competency modeling and qualitative analysis independently sorted the 237 comments into the ten competencies. Cohen's kappa (Cohen, 1960) was used to provide a measure of inter-rater agreement between the

two judges. The value of kappa for this data set was 0.85, with a standard error of .03. Many researchers, including Landis and Koch (1977), believe that a kappa value of .61-.80 indicates “substantial agreement” and a value of .81-1.00 indicates “almost perfect agreement.” Therefore, in the present study, it can be said with confidence that the two raters had extremely high agreement on their sortings.

The Ten Competencies

The following section contains a description of the ten competencies, along with the total number of individual comments comprising each competency. Definitions were created for each competency and these are shown in Table 2. Immediately following the table, a more thorough description of each competency is provided.

Table 2

Ten Competencies of an Exceptional Surgeon

Competency	# of Comments	Definition
Dedication to Patient Care	39	Consistently and passionately regarding the patient as the most important part of any professional transaction. Maintaining the patient as the primary focus while simultaneously holding one's personal needs, ego, and obligations as secondary. Answering all of a patient's questions and concerns while always communicating that everything possible will be done to ensure a positive outcome.
Integrity	33	Honestly recognizing one's strengths and weaknesses as a surgeon. Admitting when one is wrong and publicly accepting responsibility for mistakes. Agreeing to perform operations only after the complete consideration of a patient's full medical profile.

Table 2- Continued

Competency	# of Comments	Definition
Tireless Work Ethic	29	Displaying a high level of energy and drive when dealing with patients, residents, and other healthcare professionals. Willing and eager to work long hours to ensure excellence in one's career.
Preparedness	27	Delivering patient care in a thoughtful, precise, and deliberate manner. Consistently anticipating complications before entering the OR and having multiple contingencies covered. Conducting every operation in a structured and orderly way as to not confuse team members.
Intellectual Giftedness and Curiosity	23	Displaying an ability to process an enormous amount of medical information and grasp new concepts very quickly. Maintaining an insatiable curiosity about the field through the conduct of research and the development of new and improved surgical methods and procedures. Tackling medical issues in an innovative and creative manner.
Humility	21	Displaying respect for others regardless of their rank within the hospital setting. Maintaining a modest demeanor when interacting with patients and other healthcare professionals.
Compassion	19	Adopting a humanistic approach to treating patients, responding in a caring and empathetic manner to their suffering. Maintaining a gentle and patient attitude with co-workers and other healthcare professional, including nurses, residents and medical students.
Devotion to Field	16	Demonstrating an intense devotion to the field of surgery disproportionate to other surgeons. Viewing surgery not as a job but as a calling.

Table 2- Continued

Competency	# of Comments	Definition
Rapid Decision Making	15	Demonstrating the capacity to quickly analyze the risks and benefits of multiple courses of treatment and to choose the most appropriate and expeditious path to a positive patient outcome. Making swift yet informed decisions under intense pressure and with less than optimum data available.
Passion for Teaching	15	Maintaining the utmost dedication to the education of patients, the community or other health professionals, as well residents, both in and out of the classroom. Disregarding any time limit when training others. Demonstrating an intense responsibility and passion for creating the next generation of highly qualified surgeons.

Competency #1: Dedication to Patient Care

Twenty-two expert participants defined the exceptional surgeon as one who is totally dedicated to patient care. In fact, 39 comments related to the dedication to patient care were provided by the participants. An essential aspect of this competency is the ability and willingness to treat the patient with the utmost importance and urgency. Consequently, the needs of a surgeon, including any personal obligations, are viewed as secondary to those of the patient. One particularly relevant example given by a participant was that of an accomplished surgeon who was called into a hospital to operate on a patient who required emergency surgery. This surgeon performed a successful surgery which ultimately saved the patient's life. The poignant part of the story is that the surgeon's father had just died, although no one in the hospital knew about the tragedy

at the time. Even after receiving horrendous personal news, the surgeon refused to abandon his patient.

Several participants also commented that their dedication to patient care helped them work through the fatigue of lengthy operations. A sense of duty to patients often compels a surgeon to spend ample time with a patient and family members prior to surgery to ensure that all questions and concerns regarding the disease and procedure are addressed. Postoperatively, this same sense of duty brings a surgeon to a patient's bedside and drives him or her to follow the recovery meticulously. Furthermore, dedication to patient care often compels a surgeon to be willing to hold the hand of a patient who is very upset. In fact, a few participants admitted to crying with several of their patients during these highly emotional times.

Another experience that several experts seemed to share was a long-standing relationship with a few of their patients who had extremely critical diseases or injuries. Some participants revealed that they still receive Christmas cards from patients that they operated on five, ten, or even fifteen years ago. Many of these patients acknowledge that they would not be alive if it were not for the valiant efforts of their surgeons. Moreover, surgeons felt honored that they continued to remain in their patients' thoughts and prayers so many years later. A handful of participants admitted becoming attached to patients and that these patients continued to be a part of their lives years after the surgery. One participant recently wrote a letter of recommendation for a former patient who decided to apply to law school. Another participant shared a story of a surgeon who developed such a strong rapport with a patient that he found employment for his former patient in the hospital in which he worked. These stories exemplify the unique bond that

sometimes exists between an exceptional surgeon devoted to patient care and his or her patient.

Dedication to patient care extends from the initial meeting with the patient through the surgery and post-operative visits, and in certain cases, it may last for years into the future via annual cards or visits. Although it is impossible to expect a surgeon to maintain a close relationship with all patients, the exceptional surgeon consistently provides comfort when delivering bad news and sits down with a patient and his or her family to answer all of their questions and quell their fears. It is this type of surgeon who does everything in his or her power to ensure the well-being of a patient.

It was also frequently noted that the exceptional surgeon is forced to make many personal sacrifices, including missing important family events. However, none of the expert participants lamented the fact that they sometimes miss these occasions. There appeared to be an unspoken understanding that personal sacrifices are a natural consequence of being in such a demanding, patient-driven profession. In fact, nearly every participant spoke about the profession with passion and enthusiasm.

Competency #2: Integrity

Nineteen expert participants indicated that integrity was an essential characteristic of the exceptional surgeon. A total of 33 comments were offered concerning the importance of integrity for surgery. Specifically, integrity involves the recognition of one's strengths and weaknesses as a surgeon. It also includes the willingness to admit when one is wrong and the public acceptance of responsibility for mistakes made either in or out of the OR. In addition, integrity helps guide a surgeon's decision making when

considering whether to operate on a patient. Clearly, if a surgeon performs an operation that is not needed, his or her integrity would be called into question.

Not every surgeon has the ability or the inclination to communicate honestly and directly. According to the experts, an exceptional surgeon communicates with everyone in an honest and straightforward manner, including patients, family members, colleagues, residents, and students. A surgeon with integrity can be trusted to inform patients of his or her limitations and not provide them with false hope or misinformation about their prognosis. Likewise, if a surgeon has limited experience with a particular procedure, it is expected that he or she will provide the patient with an honest representation of his or her skills and experience. A surgeon with integrity will be candid with the patient about whether he or she can help.

Exceptional surgeons have a clear understanding of right and wrong and a set of ethical principles that guide them in their practice. Many of the expert participants believed strongly that a surgeon should not perform a surgery unless the patient's full medical profile had been carefully considered. Certain patients are not good candidates for surgery. Therefore, if a procedure will put a patient at considerable risk, a surgeon may have to refuse to perform it. One participant commented that he must occasionally refuse older patients because he feels it is not in their best interest to have surgery. He offers them alternatives to surgery instead.

Additionally, a surgeon with integrity will be straightforward with patients and their family members, as well as colleagues when mistakes are made. Several participants described similar accounts of surgeons who accepted the blame for mistakes that occurred in the OR, even when other surgeons were directly responsible. For

example, one participant recalled a time in his training when an attending surgeon assumed full responsibility for a complication caused by his resident. Furthermore, surgeons with integrity do not allow mistakes to be minimized or ignored. Rather, they take responsibility for them and candidly explain the nature of the mistake or complication to patients, family members, and to colleagues at morbidity and mortality meetings.

Competency #3: Tireless Work Ethic

Sixteen participants indicated that an exceptional surgeon has a tireless work ethic. In fact, 29 comments were offered regarding this competency. For a surgeon, a tireless work ethic includes limitless energy when dealing with patients, family members, residents, and colleagues. Underlying this competency is a passion for surgery that drives an individual to work through the exhaustion inherent in a surgeon's schedule. Exceptional surgeons will persist and push through procedure after procedure due to their passion for hard work and excellence.

Several experts argued that a tireless work ethic is not limited to the early years of practice. Rather, it is a goal-oriented behavior pattern that continues throughout a surgeon's career. Surgeons with a tireless work ethic are self-motivated and have an intense desire to succeed. However, success is not necessarily a byproduct of hard work but a *process* of achievement. Exceptional surgeons derive enormous satisfaction in the process of performing surgery. They also find excitement in rising to a challenge, such as successfully completing a complicated or life-threatening surgery. Moreover, the exceptional surgeon is one who successfully engenders the same enthusiasm and drive for hard work in others, including residents and colleagues.

Finally, a strong work ethic paired with high energy often results in a tenacious, persistent surgeon. Five participants remarked that surgeons with a tireless work ethic are often difficult to pull off task. These individuals rarely let themselves give up when dealing with a problem. They will devote extremely long hours to find solutions to problems. Several participants also indicated that an unresolved problem will keep them up at night. These surgeons are committed to working any time of day to tackle a problem.

Competency #4: Preparedness

Fourteen participants viewed preparedness as a central competency for surgeons. Twenty-seven participant comments indicated that preparedness distinguishes the exceptional from the typical surgeon. In the context of surgery, preparedness refers to how a surgeon approaches his or her cases. The prepared surgeon acts thoughtfully and precisely so that complications are anticipated prior to surgery and contingencies have been considered should any complication arise.

Furthermore, a prepared surgeon conducts every operation in a structured manner so that residents and other team members can easily anticipate and assist with each step of the procedure. An organized and structured style of work also decreases the chances that a surgeon will panic or lose focus should unexpected problems arise. Although complications do occur even with the most prepared surgeons, several participants commented that truly prepared surgeons rarely find themselves in major trouble and they tend to have the best outcomes with their patients.

In addition to performing well-planned and well-executed surgeries, the prepared surgeon also pays great attention to detail. The ability to attend to small details enables a

surgeon to identify minor problems and prevent them from quickly spiraling into major problems or complications. Moreover, prepared surgeons are often viewed by others as compulsive, thorough, and orderly. One expert participant even described himself as a “control freak.” Although individuals who are compulsive and controlling may be viewed somewhat negatively in other professions, these characteristics appear to be strongly linked to success in surgery.

Competency #5: Intellectual Giftedness and Curiosity

Ten participants indicated that a combination of intellectual giftedness and intellectual curiosity distinguishes expert from average surgeons. Twenty-three comments addressed intellectual giftedness and curiosity. Surgeons with this competency have the ability to process an enormous amount of medical information and grasp new concepts very quickly. They are also extremely active in research and often in the development of improved surgical procedures. Involvement in these activities demonstrates curiosity and an ability to advance the field through innovative thinking.

Not only do exceptional surgeons have an extensive medical knowledge base, they can process the information that they need very quickly. They also know where to find the information they need in a pinch. When new concepts or surgical methods arise, these surgeons are likely to master them rapidly. One reason why they may grasp new concepts quickly is that their intellectual giftedness and curiosity compels them to participate in research. Several participants indicated that it is in the exceptional surgeon’s nature to ask questions about the field and to strive toward moving the field forward through the development of innovative procedures. Finally, while some surgeons may be reluctant to tackle critical medical issues, exceptional surgeons tend to

derive enormous satisfaction from handling a crisis. Rather than be held back by fear of failure, an intellectually gifted/curious surgeon welcomes a challenge.

Competency #6: Humility

The next highest-ranking competency was humility, which was endorsed by eight participants. A total of 21 comments related to humility were provided by the participants. Humility reflects how surgeons relate to other professionals who are lower in rank (e.g., nurses, residents), as well as how they interact with patients and their family members. Humility is a characteristic often lacking in the stereotypical version of a surgeon. Nonetheless, a surgeon with humility allows patients to feel comfortable enough to ask questions and voice concerns. It also enables healthcare professionals who work alongside the surgeon to feel respected and valued for their contribution to patient care.

Surgeons with humility demonstrate modesty when dealing with patients and colleagues yet they retain their self-confidence. Remaining humble is often easier said than done for surgeons given that they are the team leaders in the OR. Although surgeons are generally revered by the public, exceptional surgeons do not act as if they are above others. The exceptional surgeon is humble rather than arrogant and confident rather than cocky.

Another aspect of humility concerns the display of respect for other healthcare professionals, regardless of their rank in the hospital or academic institution. In other words, surgeons with humility do not talk down to nurses or technicians, nor do they patronize those who are beginning their training. Several participants stressed that exceptional surgeons are respectful in all of their professional encounters. When

surgeons fail to treat others with respect, they are essentially devaluing their contributions to patient care. An exceptional surgeon acknowledges the teamwork inherent in surgery and the value in each part played by every team member.

Competency #7: Compassion

Eleven participants indicated that compassion also distinguishes expert from average surgeons. Nineteen expert comments addressed this competency. Compassionate surgeons display a caring attitude toward co-workers and residents. These surgeons are genuinely sympathetic toward patients who are suffering. They also display empathy with residents who may be struggling to perform a procedure. Compassionate surgeons avoid turning surgery into a purely technical feat. Rather, they interact with their patients, residents, and colleagues with kindness and patience.

Surgeons with compassion give other individuals, including patients and residents, sufficient time to talk. Compassionate surgeons never rush patients out of their office, particularly when they have to deliver bad news. They take the time to listen to their patients' problems. Occasionally, these surgeons form bonds with their patients, especially those with chronic conditions. One participant noted that he has actually attended several of his patients' funeral services. Another participant spoke of his mentor who was extremely compassionate. Not only was he kind toward his patients, but he was described as a father figure with the residents. His residents knew they could call him at any time. In fact, he even responded to a late night phone call to bail a resident out of a jail. Not every surgeon has the personality to be overtly compassionate, but exceptional surgeons tend to exhibit a uniquely sympathetic attitude toward others.

Competency #8: Devotion to the Field

Eight expert participants indicated that a strong devotion to the field was an important component of an exceptional surgeon. A total of 16 comments comprised this competency. In describing exceptional surgeons, some of the words the participants used were “passionate, “single-minded”, and “fanatical.” These descriptions suggest that many exceptional surgeons display an intense dedication to their field above and beyond that of other surgeons. Colleagues and co-workers of exceptional surgeons recognize the passion they hold for surgery. It is something they typically wear on their sleeves.

One participant described this extreme form of commitment as “living and breathing surgery.” Another participant stated that this type of surgeon “gives his life and soul to the field.” These individuals tend to put in more time on the job than other surgeons. In fact, to these select few, surgery is much more than a job, it is a calling. Surgeons who are truly devoted to the field are not in the profession for money. Rather, they are in it for the love of helping and healing others. These surgeons never watch the clock or espouse a work shift mentality. In this vein, one participant compared himself to an artist because, as he stated, “an artist never watches the clock; he leaves the studio only when he feels he is finished.” Likewise, devoted surgeons remain on the job until they feel confident that their work is truly completed.

Competency #9: Rapid Decision Making

Although rapid decision making received only 15 comments from experts, ten participants felt compelled to describe it as an important characteristic that distinguishes the exceptional surgeon. There are two important aspects of this competency. First, the exceptional surgeon often possesses the ability to swiftly analyze the risks and benefits of

multiple courses of treatment and choose the most appropriate and expeditious path to a positive outcome. Second, these surgeons are frequently able to make informed decisions under highly stressful situations with incomplete data.

Rapid decision making reflects the ability to improvise and think quickly on one's feet. Several participants indicated that surgeons with rapid decision making ability can very quickly size up a disease and the potential complications associated with it. These individuals rarely hesitate or second-guess themselves. They are able to remain calm so they can concentrate fully on the proper course of action. One particular participant described rapid decision making as the ability to "maneuver through mine fields." These exceptional surgeons know best how to handle the most dangerous and complicated of situations.

Competency # 10: Passion for Teaching

The final competency gleaned from the expert comments was a passion for teaching. Twelve participants offered 15 comments indicating that a passion for teaching distinguishes expert from average surgeons. Exceptional surgeons display a profound love for education and a tremendous dedication to their medical students and residents both in and out of the classroom and the OR. One participant recalled a former teacher who would hold discussions about cases with his residents for hours, even late in the evening, despite the fact that his family was waiting for him at home. Another surgeon also reminisced fondly about a former teacher, who had an incredibly hectic schedule, but still spent hours talking to him about cases. This special type of surgeon takes surgical education very seriously.

Several participants noted that surgeons with a passion for teaching are also devoted to the development of their mentees. They enjoy helping residents, fellows, and even junior faculty members in their professional development. In fact, they often do whatever is in their power to facilitate the success of others. For this type of surgeon, there is a thrill in motivating someone else to achieve. The passionate educator often maintains a sense of responsibility, and certainly an enthusiasm, for creating the next generation of highly qualified surgeons.

Characteristics of a Poor Surgeon

The comment analysis of the characteristics of a poor surgeon consisted of 62 individual comments made by the expert surgeons. Each comment was placed into five overall themes. However, the fifth theme consisted of only five comments; therefore, it was not considered to be representative of the participant pool. The following section describes the four predominant characteristics of a poor surgeon. The most frequently noted characteristic consisted of 18 comments and the least frequently noted characteristic consisted of 10 comments. Furthermore, there were five comments that did not relate to any of the established themes and thus were not included in the analysis (See Appendix B).

Characteristic #1: Dishonesty

A total of 18 comments revealed that dishonesty was the primary characteristic of a poor surgeon. Dishonesty can manifest itself in several ways. Individuals may falsify records or data, submit dual publications, or perform surgeries that are ethically questionable. A dishonest surgeon may also fail to take ownership of his or her mistakes. Seven participants commented that dishonest surgeons often refuse to take responsibility

for poor patient outcomes. One participant discussed an incident involving a technically weak surgeon who had a poor patient outcome. This surgeon blamed the nurses for the outcome and responded very poorly to the suggestion that the patient should go back into the OR. Dishonest surgeons tend to lie about their patients' complications and display an unwillingness to accept responsibility for their errors.

In an academic setting, a dishonest surgeon may falsify data or alter the results of a research study. One participant recalled a junior surgeon in his lab who misrepresented the data he collected. As a result, the participant could never trust the junior surgeon again. Another participant discussed the case of an academic surgeon who submitted the same abstract to two different conferences. In both of these cases, the surgeons' dishonest actions seriously damaged their reputations.

Five participants described dishonest surgeons as those who either perform procedures on patients who do not need them, or perform procedures for which they are unqualified. The participants offered several reasons why a surgeon might perform an unnecessary surgery. Some surgeons are driven by greed and may perform unnecessary surgeries for their own financial gain. Other surgeons attempt to establish themselves as experts by conducting surgeries that are extremely complicated but may not be in the best interest of the patients. These surgeons may become fanatical about performing as many surgeries as possible so that they will receive additional referrals from other physicians. For example, one participant described a surgeon with whom she worked. This surgeon was gifted technically, but almost amoral in practice and became consumed with doing as many cases as he could and getting as many referrals as possible. Furthermore, he demonstrated minimal concern for his patients once they were out of surgery. This

surgeon exemplifies the prototypical dishonest surgeon whose need for recognition, success, or money overshadows his dedication to patient care.

Characteristic #2: Apathy Toward Patient Care

Thirteen individual comments indicated that apathy toward patient care is characteristic of a poor surgeon. Surgeons with this characteristic exhibit a lack of caring and commitment toward their patients. Two participants stated that these surgeons also display little enthusiasm and energy when dealing with patients and their family members.

Several participants shared stories of surgeons who fit this mold. One extreme example involved a cardiac surgeon who delegated too much responsibility to the nurses and junior surgeons. The surgeon actually left in the middle of a procedure, instructing the junior surgeon to handle it. Tragically, the patient died during the procedure. When the junior surgeon called the senior surgeon to inform him that the family was inquiring about what went wrong, he refused to return to the hospital to talk to the family. This surgeon demonstrated complete apathy toward his patients.

Another participant provided a more typical example of a surgeon who scheduled patients around his golf games. He also had very limited office hours and refused to extend them for any reason. His schedule, whether it involved golf or other personal matters, consistently took priority over his professional commitments. Both of these examples describe surgeons who are not committed to their patients and do not have their patients' best interests in mind.

Characteristic #3: Aggressive Behavior

Twelve comments indicated that poor surgeons often bully other people and behave aggressively, particularly in the OR. The recipients are typically residents and nurses, but they can be anyone working alongside surgeons in the OR. All 12 comments described intimidating surgeons who often resorted to yelling, using profanity, and publicly berating or demeaning co-workers. One participant recalled an episode in which a surgeon actually became violent in the OR. When this individual was training a junior surgeon, he punched his subordinate for making a mistake during the procedure. Not only did the senior surgeon overreact, but he behaved in an inappropriate and abusive manner.

Two participants discussed former teachers who commonly used public humiliation as a teaching strategy. One of these teachers would frequently mock residents who were beginning their training, particularly if he thought they had talent. Rather than encourage the residents to succeed, this surgeon would try to undermine their confidence by ridiculing them as they worked on cases. As the participant stated, this surgeon was “trying to keep the residents in their place.”

Characteristic #4: Lack of Preparation and Focus

The final characteristic of a poor surgeon is a lack of preparation and focus, particularly in the OR. Ten comments indicated that a disorganized OR is a sure sign of an unprepared and unfocused surgeon. Although such surgeons may feel prepared to perform a particular surgery because they have done many similar procedures in the past, they often overlook how much prep work is involved. They rarely read relevant articles

or books that would help them better prepare for major surgeries or deal with unanticipated complications.

Two participants remarked that unprepared surgeons are often hesitant and self-doubting. They are indecisive when important decisions need to be made (e.g., “Should I replace or repair the valve?”). According to the participants, unprepared surgeons are frequently “treading water” in that they waste valuable time debating their next move. Their operations tend to take longer than those of surgeons who are prepared. Moreover, these surgeons never seem to salvage a marginal patient. Although they may do well on cases without complications and patients who are relatively healthy, their outcomes tend to be less favorable with more vulnerable patients.

Finally, surgeons who lack preparation and focus may not attend to smaller, technical details, such as blood loss. They may have to rely on their team members to keep them abreast of subtle changes. These surgeons may also omit important tests that should be run prior to sending a patient for surgery. In addition, they may not consider the full array of risk factors that are involved in each individual case. When a surgeon overlooks important factors prior to surgery, disastrous outcomes may result. For instance, one participant described a surgeon who had a young patient bleed to death immediately following a splenectomy procedure (i.e., removal of the spleen) because the surgeon did not realize she was on a blood thinner. This tragedy could have been avoided if the surgeon had reviewed his patient’s medication record prior to performing surgery.

Characteristics of an Exceptional Surgeon of the Future

The analysis for an exceptional surgeon of the future consisted of 101 comments. Participants were asked to discuss the “knowledge, skills, and other characteristics” necessary for a surgeon to be exceptional in the year 2015. Four themes emerged. The most frequently noted theme included 30 comments and the least frequently noted theme included 8 comments. Six other themes will not be discussed because they consisted of five or fewer comments. Further, there were seven comments that did not relate to any of the established themes and thus were not included in the analysis (See Appendix B).

Theme #1: Willingness to Adopt New Technologies and Skill Sets

Nearly every generation of surgeons is faced with the task of mastering new technology. For instance, during World War II, surgeons were forced to learn new technologies to deal with the vast number of casualties including the use of prosthetics, bone fusion, and the use of antibiotics. In the coming decade, surgeons will also need to embrace new forms of technology. It is likely that skills and expertise not traditionally associated with surgery, such as radiology, ultrasound, and cathlabs, will become an important part of the surgeon’s arsenal.

Thirty expert comments revealed that surgeons of the future will need to adopt various technologies and learn new skill sets to be considered exceptional. Ten participants stated that future surgeons will need to embrace MIS procedures and five experts indicated that robotics and computer-assisted surgeries will play a significant role throughout the next decade. Regardless of the specific type of technology, it will be important for surgeons to develop skills that they might not have learned during residency. In fact, it is possible that surgeons will need to train themselves on new

technology several times throughout their careers. They must also be able to discern which technologies are most beneficial to their patients. In addition, exceptional surgeons in the future will need to be able to use new technology that can reduce the complexity of procedures. For example, surgeons may need to master technology that provides more accurate prognoses and staging of various types of cancer.

Surgery has become less “hands-on” as lasers, robot assistants, and laparoscopic instruments reduce or eliminate direct contact with patients. Such new technologies will allow for improved treatment, diagnostic, and screening processes. Experts believe that this “non-touch” trend will continue over the next ten years. One participant speculated that future surgeons will be able to assess many patients without having to leave their homes. For instance, they will be able to access and read X-rays from their home e-mail accounts. Indeed, many technological challenges lie ahead for future surgeons.

Theme #2: Primary Qualities Remain Unchanged

Seventeen individual comments conveyed the notion that the primary characteristics of an exceptional surgeon in the future will remain the same as they are today. The participants did not expect the overall profile of an exceptional surgeon to be dramatically different because they believe that a surgeon’s main responsibility will still be dedication to patient care. Although the field is expected to undergo technological changes, thirteen participants indicated that those changes should not impact the qualities of an exceptional surgeon.

The participants who believed that the characteristics of outstanding surgeons will be the same in the future as they are today, were also the same surgeons who held dedication to patient care as the most important competency. These surgeons seemed to

believe that the interpersonal relationships surgeons have with their patients and the caring nature with which they treat patients are the defining characteristics of an excellent surgeon and these should not change over time.

Theme #3: Adjustment to the 80-Hour Work Week

The issue of the 80-hour work week restriction for residents is currently a hot topic and according to 11 participants, it will continue to remain a challenge for future surgeons. The participants believe that a cultural shift is starting to take place among younger surgeons and will persist throughout the next decade. Specifically, they are concerned that young surgeons are adopting a work shift mentality. One participant referred to this new breed of surgeons as “clock-watchers.” Many participants were disturbed by this new mindset because surgeons have traditionally taken pride in their work schedules which are not dictated by set time frames. One participant noted that many residents now view surgery as a job instead of a calling and have come to expect limited hours and more personal freedom than older surgeons.

According to the participants, the adjustment to the 80-hour work week is also creating surgeons who adopt different values. There is a danger in the near future that surgeons will no longer feel the same sense of responsibility to patients as their predecessors. They will become accustomed to handing patients off to whomever is working the next shift. Three different surgeons may take care of a patient in the future as opposed to the traditional paradigm in which a single surgeon closely monitors a patient’s entire stay in the hospital. As one participant commented, such disruption to the continuity of care may ultimately be detrimental to patients if a surgeon does not fully describe a patient’s condition and status to the subsequent physicians in charge.

Furthermore, poor continuity of care may result in poorer communication between surgeons and patients. The future surgeon will need to have strong communication skills with patients, physicians, and other healthcare professionals to offset the challenges posed by the new 80-hour work week.

Theme #4: Surgeons Will Become Highly Specialized

Eight expert comments revealed that there will be fewer general and community surgeons and many more specialized surgeons over the next ten years. These participants indicated that surgeons will begin gravitating toward more specific specialties. One participant commented that every surgeon will need to make a decision about performing a combination of traditional and minimally invasive procedures or severely limiting their practice and becoming proceduralists. These experts believed that most surgeons will choose the latter option. In other words, future surgeons will become highly skilled at performing a smaller number of related surgeries rather than compiling a broad repertoire of different procedures. Unfortunately, patients will be the ones to suffer in the end, particularly those who live far from a city. Over the next decade or so, it is likely that patients will need to travel considerable distances for surgery.

Three participants also indicated that many future surgeons are likely to go to great lengths to minimize the stress associated with their practice. They will work to maintain more control over their lifestyles. Once surgeons become accustomed to working only 80 hours per week during their residency, they will also come to expect more free time for their families and personal obligations during their practice. The experts speculated that future surgeons will lean more toward surgical specialties that afford the opportunity to limit their work hours while maximizing their earning potential.

The exceptional surgeons of the future will resist the urge to pursue careers of convenience. Rather, they will maintain professional integrity by keeping the best interests of their patients in mind while working as many hours as necessary to ensure optimal patient care.

Secondary Analysis

A second set of interviews was performed with novice surgeons (i.e., surgical residents). The novice comment analysis is divided into the same three sections used for the experts. The first section consists of the characteristics of an exceptional surgeon (i.e., the competencies). The second section consists of the characteristics of a poor surgeon and the final section consists of the characteristics of the exceptional surgeon of the future.

Characteristics of an Exceptional Surgeon

The second comment analysis consisted of 150 individual comments made by 14 novice surgeons. Each comment was placed into nine overall themes. However, an *a priori* decision was made to include only themes that contained comments from a minimum of five participants. Any theme containing fewer than five comments was not considered to be characteristic of the participant pool because it represented less than one-third of the total number of participants (See Appendix C for the residual comments). This guideline yielded nine competencies of an exceptional surgeon based on 98 comments. The most frequently noted competency had 19 comments and the least frequently noted competency had 8 comments.

Inter-rater Agreement

The same raters who independently sorted the expert comments also sorted the novice comments. The Cohen's (1960) kappa value for this data set was 0.85 with a standard error of .04 and was the same kappa coefficient found for the expert comments. Again, this is a very high level of inter-rater agreement.

Table 3

Nine Competencies of an Exceptional Surgeon from the Novice Surgeon's Perspective

Competency	# of Comments	Definition
Ability to Communicate in Nontechnical Terminology	19	Demonstrating the ability to express complex medical information into simple and straightforward language that patients can understand. Avoiding medical jargon when educating patients about diseases or when discussing treatment plans.
Excellent Bedside Manner	17	Maintaining an attitude of sincere concern and support of a patient's psychological state. Demonstrating regard for the patient-physician interaction by taking the time to address a patient's concerns and questions and treating them with compassion and respect.
Tireless Work Ethic	10	Displaying a high level of energy and drive when dealing with patients, residents, and other healthcare professionals. Willing and eager to work long hours to ensure excellence in one's career.
Preparedness	10	Delivering patient care in a thoughtful, precise, and deliberate manner. Consistently anticipating complications before entering the OR and having multiple contingencies covered. Conducting every operation in a structured and orderly way as not to confuse team members.

Table 3- Continued

Competency	# of Comments	Definition
Rapid Decision Making	9	Demonstrating the capacity to quickly analyze the risks and benefits of multiple courses of treatment and to choose the most appropriate and expeditious path to a positive patient outcome. Making swift yet informed decisions under intense pressure and with less than optimal data available.
Positive Interactions with Staff	9	Displaying the ability to develop a strong rapport with all staff members. Demonstrating respect and gratitude for their contribution to patient care.
Sociability	8	Demonstrating a pleasant disposition and a good sense of humor when interacting with patients and hospital employees. Interacting with others in a friendly and outgoing manner.
Maintaining Composure	8	Remaining calm and focused under highly stressful situations. Displaying the ability to restore order in the OR during moments of chaos or confusion.
Putting Patients First	8	Displaying total commitment to patient care. Consistently willing to place the needs of patients above personal needs and family obligations.

Three competencies emerged on the list for both experts and novices: Tireless Work Ethic, Preparedness and Rapid Decision Making. It was decided to use the same definitions for both sets of competencies since the actual comments from the expert and novice participants were very similar in content.

Competency #1: Ability to Communicate in Nontechnical Terminology

Nine novice participants defined the exceptional surgeon as one who has the ability to communicate with patients in nontechnical terminology. Nineteen comments reflected the importance of a surgeon's ability to distill complicated medical concepts into language that can be understood by a layperson. This competency also describes a surgeon's ability to consider a patient's education and socioeconomic status when communicating so that he or she neither confuses nor belittles the patient. In general, the residents believed that exceptional surgeons are adept at avoiding medical jargon and minimizing the use of overly technical language when talking to patients and family members about courses of treatment or when educating them about their illnesses. Exceptional surgeons are effective communicators who can easily adjust their style of communication to match the level of their audience.

Competency #2: Excellent Bedside Manner

Ten novice participants indicated that exceptional surgeons, by definition, have an excellent bedside manner. Seventeen comments echoed the notion that exceptional surgeons are genuinely concerned about the effects of illness and surgery on a patient's psychological well-being. These surgeons have been described as caring, compassionate, and empathetic individuals who are always willing to take the time needed to address their patients' questions and concerns. One resident discussed an exceptional surgeon who had an amazing presence and ability to make genuine connections with his patients and put them at ease. According to these novices, exceptional surgeons are committed to supporting both the physical and psychological health of their patients.

Competency #3: Tireless Work Ethic

Seven novices indicated that a tireless work ethic was an essential component of an exceptional surgeon. Ten comments indicated that exceptional surgeons are hard-working professionals with an untiring dedication to the job and their patients. According to the residents, these surgeons make themselves available to patients, residents, and other healthcare professionals at any time. They possess the physical stamina and energy necessary to sustain both their dedication to the job and their indefatigable work schedule over the course of their careers.

Competency #4: Preparedness

Six residents stated that preparedness was a distinguishing characteristic of exceptional surgeons. Ten comments reflected the idea that exceptional surgeons practice medicine in a very precise and deliberate manner, anticipating potential complications before they enter the OR and leaving little to chance. They perform surgeries in a structured way so that residents and other surgical team members can anticipate each step and do not become confused. Exceptional, prepared surgeons also maintain the ability to focus in critical situations. As one resident remarked that highly prepared surgeons can disconnect from their emotions when serious complications arise in the OR and get their patients out of trouble.

Competency #5: Rapid Decision Making

Five novice surgeons offered nine comments regarding the ability of exceptional surgeons to make rapid decisions. An outstanding surgeon can analyze the risks and benefits of multiple courses of treatment in a swift fashion. Additionally, they can quickly choose the best path to a positive outcome even under highly stressful conditions.

Exceptional surgeons are decisive and adaptive individuals who are able to make effective decisions, often with less than optimal data.

Competency #6: Positive Interactions with Staff

Seven novices suggested that exceptional surgeons treat staff members well. Nine comments reflected the notion that exceptional surgeons have respect for and demonstrate general goodwill to the other healthcare professionals with whom they work, including residents, nurses, and technicians. Rather than demean or overlook their contribution to patient care, exceptional surgeons often display gratitude for the efforts of all healthcare workers. Consequently, these surgeons tend to develop a good rapport with most of the staff members they encounter.

Competency #7: Sociability

Six novice surgeons believed that sociability was an important characteristic of an exceptional surgeon. Eight comments indicated that exceptional surgeons are often sociable individuals who maintain a pleasant disposition when interacting with co-workers, patients, and family members. These participants viewed an exceptional surgeon as having a friendly and outgoing personality, as well as a great sense of humor. Such surgeons are charismatic individuals who get along very well with most people.

Competency #8: Maintaining Composure

Five novice surgeons provided eight comments on the ability of exceptional surgeons to maintain composure under highly stressful circumstances. Moreover, these participants noted that such surgeons can be relied on to restore order during stressful or chaotic times, such as when a patient's bleeding needs to be controlled. Three of the five novices used the word "levelheaded" to describe composed surgeons. Further, a

composed surgeon appears unflustered and maintains his or her position as the revered team leader, even when other people in the OR are in a state of panic.

Competency #9: Putting Patients First

Five novices stated that exceptional surgeons consistently put their patients before all other obligations. Eight comments indicated that exceptional surgeons are willing to place the needs of their patients before their own personal needs or even those of their family. These participants described exceptional surgeons as selfless and completely focused on the patients. As a result, such surgeons may miss important personal events, such as an anniversary dinner or their child's soccer match. Thus, exceptional surgeons accept and acknowledge that their patients' well-being must take precedence over everything else.

Characteristics of a Poor Surgeon

The analysis for a poor surgeon consisted of 28 comments made by 14 novice surgeons. Each comment was placed into six overall themes. However, three of these themes were endorsed by only two novices; therefore, they were not considered to be representative of the participant pool and they were excluded from the analysis. The most frequently noted characteristic consisted of seven comments and the least frequently noted characteristic consisted of four comments. Moreover, there were six comments that did not relate to any of the established themes and thus were not included in the analysis (See Appendix C).

Characteristic #1: Lack of Concern for Others' Feelings

Seven comments made by four novice participants indicated that poor surgeons show a lack of concern for their patients' feelings, as well as the feelings of other people

with whom they work. These surgeons convey little appreciation for their patients' suffering. Consequently, patients often view them as rude and disrespectful. One novice described an incident in which a surgeon made a patient cry after telling him that his kidneys were going to lose their ability to function because he was "fat." He then informed the patient that he was "going to die." The surgeon immediately left the room, leaving the patient alone to cry. He appeared to have no concern over how his statement affected his patient or the manner in which he delivered the bad news. Surgeons who share this characteristic may also disparage other healthcare professionals by speaking to them with sarcasm or disrespect. Still other surgeons behave unprofessionally by voicing contempt for the opinions or ideas of other physicians. In each case, these were considered to be examples of poor surgeons who did not display the ability to treat patients and co-workers with dignity and consideration.

Characteristic #2: Apathy toward Patient Care

Five comments made by five different novice participants indicated that apathy toward patient care is another characteristic of poor surgeons. For instance, these surgeons often refuse to return to the hospital to assist a patient once they are home. They are unwilling to shift their schedules to accommodate their patients or if they do, they are often resentful of patients impeding on their personal time. If a patient develops sudden complications, these surgeons are more likely to delay surgery until the following day when they are on schedule. Furthermore, two of the five participants believed that surgeons who are apathetic toward patients may make decisions to operate without considering their patients' level of comfort or prospect for survival. Particularly with older patients, poor surgeons may perform surgeries that are not in the best interest of

their patients and rob them of dying with dignity. The novices believe it is important to inform patients when the risks of surgery outweigh the likelihood of a good recovery. Thus, poor surgeons make decisions to operate without weighing the risks of surgery against the benefits.

Characteristic #3: Aggressive Behavior

Four comments offered by four residents indicated that they believe poor surgeons tend to exhibit aggressive behavior. Such surgeons are known to yell at nurses, technicians, and other staff members, particularly in the OR. They may also throw instruments and other objects when they become frustrated during surgery. In essence, these surgeons are quick to lose their temper and displace their aggression onto other personnel who may be doing their best to assist them. Accordingly, surgeons who demonstrate aggressive behavior often have very tense ORs, exacerbating the levels of stress among other team members worried about making mistakes. The other team members realize how easy it is to trigger surgeons who are prone to aggression, especially during challenging procedures or when complications suddenly arise.

Characteristics of an Exceptional Surgeon of the Future

The analysis of characteristics of an exceptional surgeon of the future consisted of 44 comments. Novice participants were also asked to discuss the “knowledge, skills, and other characteristics” necessary for a surgeon to be exceptional in the year 2015. Only two of the seven themes that emerged from the interviews were endorsed by over one third of the participants. However, three other themes were endorsed by three (21%) participants. Therefore, the two highest-ranking themes will be described in detail below and the three themes that did not quite reach criteria for inclusion will be discussed

briefly. The most frequently noted theme consisted of 16 comments made by 10 novices. The next highest theme consisted of four comments made by four novices. There were six comments that did not relate to any of the established themes and thus were not included in the analysis (See Appendix C).

Theme #1: Willingness to Integrate New Technologies into One's Surgical Practice

Ten residents indicated that exceptional surgeons in the future will need to embrace new technologies and procedures and integrate them into their practice. The novices specifically mentioned minimally invasive procedures and robotics. Exceptional surgeons will need to go beyond keeping up with the literature; they will need to incorporate the latest research into their practice. They may also need to take continuing education courses and practice their new skills in a laboratory setting or with medical simulators before they perform these procedures on their patients.

Exceptional surgeons will need to be highly self-motivated to stay abreast of the latest technology. They must be open to learning long after they leave their residency programs. According to the novice surgeons, open surgical procedures will become rarer in the future. Conditions that typically require surgery, such as breast or ovarian cancer, will be performed through MIS. Therefore, exceptional surgeons of the future must be well-versed in these new methods.

Theme #2: Primary Qualities Remain Unchanged

Four comments made by the novices indicated that the main qualities of an exceptional surgeon of the future will be the same as they are for surgeons today. Although the majority of participants commented that technological advances will bring about massive changes to the field, they did not believe that technology will alter the

characteristics of a truly competent surgeon. The novice surgeons believe that an exceptional surgeon in 2015 will still need to possess competencies including an Excellent Bedside Manner, Rapid Decision Making, a Tireless Work Ethic, Preparedness, and the ability to Maintain Composure. The challenge, as they see it, will be to reach this level of excellence and sustain it over the course of one's career.

Other Relevant Themes

The following three themes did not reach criteria for inclusion, but they were endorsed by over 20 percent of the participants. The first theme concerned strong computer management skills. At a minimum, exceptional surgeons must be fluent with the Internet and personal computers. They should also be able to retrieve electronic medical records and be comfortable using wireless devices, such as a Personal Digital Assistant (PDA) to keep track of their appointments.

The second theme focused on strong interpersonal skills. These skills will not only foster improved communication between surgeons and patients, but better communication among surgeons themselves. Exceptional surgeons will be expected to speak clearly and compassionately with their patients. According to one participant, many past behaviors, such as yelling and throwing instruments, will no longer be accepted of surgeons in the future. The novices also stated that surgeons will be required to communicate more readily with other surgeons, particularly when they must hand off cases due to vacation plans or conference schedules. There will also be an expectation for surgeons to address patients and other physicians with respect and benevolence.

Finally, exceptional surgeons of the future may also be expected to successfully manage an interdisciplinary surgical team. Three residents indicated that surgeons will

be responsible for coordinating an increasingly complex team of people, including members of the critical care service, nurse practitioners, physician assistants, and surgical assistants. Therefore, good surgeons must be able to facilitate interactions among workers while minimizing breakdowns in communication. The participants also stated that exceptional surgeons must embrace diversity in future teams and incorporate both traditional and non-traditional perspectives and talents.

Comparison between Competencies Identified by Experts and Novices

One objective of the competency analyses was to identify trends or patterns that might exist between the experts and novices. In the following section, similarities and differences between both competency lists are addressed.

Similarities between Expert and Novice Competency Results

Several similarities existed between the results of the expert and novice interviews. For instance, a similar number of competencies were identified for both groups and three specific competencies were mentioned by both groups. These competencies were Rapid Decision Making, Preparedness, and Tireless Work Ethic. Experts and novices agreed that exceptional surgeons are skilled decision makers that do not waver under stress. Both groups also held similar views regarding the importance of anticipating complications and setting up contingency plans before entering the OR. Furthermore, expert and novice participants agreed that exceptional surgeons are unstinting individuals who work through the exhaustion of the job and maintain high levels of energy and productivity throughout their careers.

The experts identified Dedication to Patient Care as the highest-ranking competency of an exceptional surgeon. This competency was similar to the novice's

lowest-ranking competency, Putting Patients First. However, the emphasis within each competency differed slightly for both groups. The novice comments focused more on the personal and familial sacrifices that exceptional surgeons make for their patients. By contrast, experts focused more on the welfare of their patients. In general, both expert and novice comments indicated that exceptional surgeons view the well-being of their patients as a critical component of their practice.

On the surface it appears that the experts identified several personality-related competencies, such as Humility and Compassion that the novices did not mention. It can be argued, however, that there is some overlap between Compassion and Excellent Bedside Manner reported by the novices. There is also overlap between the expert competency, Humility, and the novice competency, Positive Interactions with Staff. One important aspect of Humility concerns respect for healthcare professionals regardless of their rank or title. Although experts also viewed Humility as a display of modesty and recognizing one's strengths and weaknesses as a surgeon, there is clearly some overlap between this competency and Positive Interactions with Staff.

Differences between Expert and Novice Competency Results

There were several differences between the experts and novices. For instance, several competencies that emerged from the novice data were not found in the expert data, including Ability to Communicate in Nontechnical Terminology and Maintaining Composure. Ability to Communicate in Nontechnical Terminology was the highest-ranking competency for novices, but it was not mentioned by the experts. The experts were also much less inclined to discuss the ability of surgeons to remain calm during stressful or critical procedures.

There were four competencies that were exclusive to the expert participants. First, expert surgeons viewed Integrity as an integral component of excellence in surgery. Many experts believed that a surgeon's strength of character was directly linked to his or her level of performance. Second, the expert comments revealed that exceptional surgeons have high Intellectual Giftedness and Curiosity. In other words, they display curiosity, creativity, and innovation when dealing with both academic and non-academic medical issues. Third, experts were more likely to describe Devotion to the Field as an important competency. They believed that exceptional surgeons are extremely passionate about their work and dedicated to their profession. Finally, the experts were much more focused than the novices on the link between surgical excellence and Passion for Teaching. Only the experts mentioned the important role that surgeons play in training the next generation of medical students and residents.

Similarities between Expert and Novice Results of a Poor Surgeon

Both expert and novice participants identified Apathy toward Patient Care as one of the main characteristics of a poor surgeon. Experts and novices commented that poor surgeons are inflexible and even indolent when they are asked to exert extra effort on behalf of a patient (e.g., when they need to return the hospital after a shift is over). In addition, both groups indicated that poor surgeons tend to display Aggressive Behavior.

Differences between Expert and Novice Results of a Poor Surgeon

According to the novice participants, poor surgeons tend to demonstrate a Lack of Concern for Others' Feelings. Novices made more comments than experts regarding surgeons who are rude or disparaging toward patients, staff members, and other physicians. Although the experts did not mention this characteristic, they identified two

other qualities that the novices did not consider: Dishonesty and Lack of Preparation and Focus. Overall, the expert participants focused more on the integrity of exceptional surgeons and lack thereof in poor surgeons.

Similarities between Expert and Novice Results of an Exceptional Surgeon of the Future

Both experts and novices commented that exceptional surgeons of the future must be willing to incorporate new technologies and procedures into their practice. Although experts and novices agreed that the acceptance and integration of technology will be paramount to future surgeons, they also believed that the fundamental characteristics of an exceptional surgeon will transcend changes in technology. In other words, both groups stated that the core traits of an exceptional surgeon of the future will remain very similar to what they are today.

Differences between Expert and Novice Results of an Exceptional Surgeon of the Future

There was more variability between the expert and novice comments regarding the characteristics of an exceptional surgeon in the future. The experts generated four themes while the novices generated only two. The experts noted that exceptional surgeons in the future must resist the work shift mentality that may become associated with the 80-hour work week recently instituted in residency programs. They also indicated that future surgeons may gravitate toward higher degrees of specialization. The novice participants did not mention either of these themes in their interviews. Instead, the novices discussed that an exceptional surgeon of the future will remain the same as they are for surgeons today. They also indicated that future surgeons must be willing to integrate new technologies into their surgical practice.

DISCUSSION

The overall intent of this study was to gain a better understanding of surgical excellence by interviewing a sample of outstanding surgeons. The main objective of the primary analysis was to develop a detailed list of competencies of an exceptional surgeon as well as a list of characteristics that define a poor surgeon. The second objective was to develop a list of themes that would describe exceptional surgeons in the future. In addition, a smaller sample of novice surgeons was interviewed and three similar lists were generated to understand how these surgeons conceptualize surgical excellence. The final objective was to examine both data sets for similarities and differences in the way experts and novices define excellence. Therefore, a comparison was made between the expert and novice lists of competencies, as well as the lists of characteristics of a poor surgeon and themes impacting future surgeons to determine if different cohorts place varying emphases on the cardinal traits of an exceptional surgeon.

Primary Analysis: Expert Comments

Competencies Expected to Emerge

Based upon previous research, as well as the ACGME competencies used in resident training, several predictions were made regarding the expert data. It was anticipated that several competencies would emerge including technical skill or proficiency, critical thinking, leadership ability, intelligence, and interpersonal skill.

Technical Skill

In the field of surgery, technical skill is referred to by several names. For instance, technical skill may be called hand-eye coordination, mechanical excellence, or psychomotor ability. In the present study, technical skill was defined specifically as

proficiency in two psychomotor factors: manual dexterity and hand-eye coordination. Surgeons are expected to have the technical skills to handle and maneuver their instruments with the greatest respect for tissue and maintain economy of motion during their actions. Thus, the first prediction was that technical skill would emerge from the expert data as an important competency.

Although seven experts mentioned technical skill as an important characteristic of the exceptional surgeon, it did not reach the criteria to be included on the list of competencies. Therefore, this prediction received only partial support. Instead, the majority of experts thought that technical skills would eventually be mastered by most surgeons. In other words, technical skill is necessary but not sufficient for becoming an outstanding surgeon. Most of the experts seemed to suggest that other characteristics, such as Dedication to Patient Care, Humility, and Integrity, were more important for distinguishing truly talented surgeons.

Critical Thinking

As previously stated, a high performing surgeon must possess a combination of technical skills and higher-order cognitive processes, such as critical thinking and independent thought. In the present study, critical thinking was defined as mental processes that allow a person to analyze and evaluate critical medical decisions, particularly when limited data are available. The second prediction was that critical thinking would also emerge as a key competency of exceptional surgeons. In other words, it was believed that the ability to make critical decisions, such as deciding whether to operate, determining diagnoses, and determining the level of risk to which a patient could be exposed by operating, would be necessary for surgical excellence.

The experts did refer to critical thinking; however, critical thinking was subsumed within two separate competencies: Rapid Decision Making and Preparedness. Experts indicated that exceptional surgeons make swift, informed decisions and are able to quickly analyze the risks and benefits of multiple courses of treatment for a patient. The competency definition provided for Rapid-Decision Making was very similar to the way in which critical thinking was originally conceptualized in the present study. Although the ability to anticipate complications before they arise in the OR was not hypothesized specifically, it would certainly be considered a component of critical thinking in surgery. It is also likely that the experts were referring to another aspect of critical thinking when they discussed the importance of Preparedness. Surgeons who are strong critical thinkers are typically prepared to handle unexpected problems or changes in a patient's status. Since it was anticipated that experts would mention the relationship between critical thinking and surgical excellence, the emergence of both Rapid Decision making and Preparedness as competencies supports this prediction.

Leadership

Surgeons have the responsibility of leading a team in the OR. Since the skills necessary to be a strong leader often come with many years of experience, it was predicted that the experts would describe leadership skills as another important competency of exceptional surgeons. Although leadership skills did not emerge as one of the top ten competencies, it is possible that the interview questions may not have prompted the experts to discuss the topic of leadership explicitly. Moreover, aspects of leadership may have been subsumed in other competencies. In the present study, leadership was defined by qualities including the ability to communicate effectively,

demonstrate integrity, and display professionalism. Therefore, it is conceivable that facets of leadership were included in Dedication to Patient Care, Integrity, and even Humility.

The experts who were interviewed are clearly leaders in their field. However, they may not think of leadership in the same way as leaders in other professions, such as business and the military. Also, since the experts tended to be older surgeons, they may not have been aware of recent leadership research emphasizing team dynamics in the OR. In fact, several articles in the past few years have focused on the importance of leadership in surgical teams (e.g., Edmondson, 2003; Wells, Jr., 2002). Therefore, it is very likely that future generations of surgeons may aspire to have some of the same leadership characteristics commonly observed in other fields such as business.

Another reason why the experts did not mention leadership more frequently could be that most surgeons do not have many opportunities to observe their colleagues in the OR. Although they may learn about the outcomes of other surgeons' procedures, they may not know whether they are strong leaders or whether they successfully facilitate collaboration among team members. Since other members of surgical teams (e.g., residents, nurses, and surgical assistants) are aware of and affected by a surgeon's leadership skills, they might be more likely to mention the importance of such skills than the surgeons sampled for this study.

Intelligence

It was also predicted that the experts would mention the importance of intelligence in surgery. For this study, intelligence was described as a combination of analytical, creative, and practical thinking skills and all three facets were expected to be

mentioned by the experts. The results revealed that experts viewed analytical and creative intelligence to be the most relevant forms of intelligence for exceptional surgeons. In fact, Intellectual Giftedness and Curiosity was ranked fifth on the competency list. Experts believed that exceptional surgeons tend to grasp new concepts very quickly and remain inquisitive about the field throughout their career. The ability to grasp new concepts quickly reflects analytical intelligence. The experts also mentioned that Intellectual Giftedness and Curiosity involves the ability to tackle medical issues in an innovative manner. Clearly, this ability is directly related to creative intelligence.

Practical intelligence, which is most often viewed as “street smarts,” “common sense,” or intelligence that functions in the real world, was not discussed explicitly. However, since practical intelligence refers to the application of learned information, it is likely subsumed within several of the competencies, including Rapid Decision making and Preparedness. For example, the ability to make swift and informed decisions is largely contingent on years of experience that contribute to common sense, as well as the knowledge necessary to solve practical problems. Given the frequency with which most experts discussed intellectual ability in general, this prediction was fully supported.

Dedication to Patient Care and Compassion

As noted earlier, several researchers have offered descriptions of a high performing surgeon. For example, Cuschieri, Francis, Crosby, and Hanna (2001) noted that outstanding surgeons tend to possess an amalgam of skills and abilities including, clinical skills, technical ability, academic potential, administrative skills, good judgment, and the ability to maintain strong relationships with patients and other health care professionals. Although the present competency model did not include technical ability

or administrative skills, it did account for the other characteristics. Specifically, Dedication to Patient Care and Compassion are directly related to clinical skills and the ability to relate well to patients and health care professionals. Dedication to Patient Care, which emerged as the highest ranking competency, includes an unwavering willingness to address all of a patient's questions and fears. Compassion, which ranked seventh on the list, relates to the caring and empathetic manner in which excellent surgeons relate to their patients. Because two competencies concerning interpersonal skills emerged, the prediction was also fully supported.

Unanticipated Competencies that Emerged

Five competencies emerged on the expert list that were not anticipated: Integrity, Tireless Work Ethic, Humility, Devotion to Field, and Passion for Teaching. Possible explanations for why the experts deemed these competencies to be important are considered below.

Integrity

Integrity was the second highest-ranked competency on the list. Integrity is a characteristic that is valued in nearly every profession. The experts seemed to view Integrity as particularly important to surgery because an inability to admit to one's weaknesses or accept responsibility for one's mistakes puts patients at risk. Several experts mentioned having fired surgeons for falsifying data or records or for shirking their responsibility when complications arose. Since surgeons hold a position of great esteem in the hospital and in society, their opinions and medical orders often go unquestioned. According to many of the experts, surgeons who appreciate and respect the power they hold and consistently act with integrity may be less common than most

people realize. Therefore, the experts may have included Integrity as an important competency not only because it is closely tied to patient safety, but because it is difficult to find a surgeon who consistently acts with integrity.

Tireless Work Ethic

Similar to Integrity, a high level of energy and drive is related to excellence across many professions. Given that most surgeons have long and exhausting work schedules, those who work through the fatigue and remain motivated and productive distinguish themselves from the majority of surgeons. It seems inevitable that most surgeons would reach a point in their careers where they could potentially burn out if they did not reduce their hours. On the other hand, there is a small percentage of surgeons who enjoy their work to such a degree that they maintain a high level of drive throughout the career. These are the surgeons who the experts believe are truly exceptional.

Humility

Humility is another characteristic that was not anticipated. Nonetheless, many experts believe that those surgeons who display modesty when interacting with patients and colleagues are often viewed as excellent surgeons. Although the stereotypical view of a surgeon's personality is often one of arrogance, the experts indicated that outstanding surgeons actually display the opposite demeanor. Once again, it is conceivable that the powerful position held by surgeons in hospitals may make them susceptible to developing a "God complex." The experts seemed to feel that great surgeons keep their ego in check and do not feel entitled to special treatment. It does appear to be a challenge; however, for most surgeons to maintain their modesty over time. This may be the cumulative

result of hundreds of patients and other healthcare professionals treating them with deference. Regardless of reasons why many surgeons might lose their modesty, it is not surprising that the experts would deem Humility to be indicative of surgical excellence.

Devotion to Field

Devotion to Field was another unanticipated competency that emerged on the expert competency list. Many experts indicated that exceptional surgeons differ from average ones in the degree to which they are devoted to the profession. The experts noted that a small minority of surgeons are so passionate about their work that they believe it is their calling in life. A few experts added that some devoted surgeons have no intention of retiring and actually become depressed if they are forced into retirement. It would seem that this level of devotion would easily distinguish exceptional surgeons from the rest.

Passion for Teaching

The last competency mentioned by the experts that was not expected at the outset, was Passion for Teaching. Although it was the lowest-ranking competency, many experts indicated that exceptional surgeons display a love for education that is disproportionate to most other surgeons. Because the majority of experts in this sample were academic surgeons, it seems logical that they would focus on a surgeon's dedication to teaching others. Although this competency may not apply to surgeons working in private practice, it would seem to differentiate between average and exceptional surgeons in academic institutions.

Themes Expected to Emerge

In addition to the competencies, it was predicted that three themes related to surgery in the near future would be mentioned by the experts. Specifically, the experts were expected to mention the resident work hour mandate, new technologies and skill sets, and recertification and professional development. The interview data actually revealed four themes regarding competencies surgeons would require over the next ten years to achieve excellence in the field.

The Resident Work Hour Mandate

As stated earlier, many experienced surgeons oppose the ACGME's 80-hour work week limit. In fact, the Society of University Surgeons (SUS) released a statement indicating that restricted work hours "do not prepare residents for the real world of surgical practice" (Cole, Bertagnolli, & Nussbaum, 2002). Further, Komenaka (2003) commented that a different type of medical student may now be attracted to the surgical professional. He argued that students who prefer "lifestyle specialties" (e.g., dermatology, emergency medicine, anesthesia) may now be attracted to surgical programs because time commitment and training obligations are less taxing under the new mandate. In the present study, the experts did indeed indicate that a major issue facing surgeons today, and one that will continue to impact them throughout the next decade, is this work hour restriction. The majority of experts had strong opinions concerning whether this mandate would be a benefit or detriment to the field. Few surgeons believed that the work week restriction would produce better surgeons. In fact, the consensus was that residents would be less prepared than their predecessors to handle complicated cases or work the long hours required for surgery. Many experts also feared

that the 80-hour work week would eventually decrease to 50 or 60 hours per week as it has in Western Europe (Pickersgill, 2001). It was generally believed that exceptional surgeons in the future will need to resist the work shift mentality that may result from this restriction if they wish to distinguish themselves from other surgeons. Given the frequency with which the experts discussed the impact of the ACGME work hour restriction, the results of the present study support the statements made by the SUS and Komenaka.

New Technologies and Skill Sets

Advancements in technology are rampant in nearly every field of medicine including surgery. The experts were expected to discuss the impact of technology on the role of future surgeons. As predicted, most experts believed that surgeons must be prepared to adopt new technologies and develop new skill sets throughout their careers. Experts indicated that surgeons who make the effort to keep abreast of new technological advances, such as lasers and robot assistants, will be more likely than others to excel in the field.

Recertification and Professional Development

One way to ensure that surgeons continue to develop new skills sets is through certification and recertification/revalidation programs. These programs ensure that surgeons maintain a high professional standing and acceptable “qualifications of practice” (i.e., skills) in their surgical specialty, as well as a commitment to continuing education (Patil, Cheng, & Wong, 2003). Although it was predicted that the issue of recertification and professional development would emerge as an important theme for future surgeons, experts did not discuss this topic during their interviews. Since all

board-certified surgeons must adhere to the same guidelines, the certification process may not distinguish between exceptional and typical surgeons in the future.

Unanticipated Themes that Emerged

Stability of Attributes

The experts mentioned two themes they believe will impact future surgeons that were not anticipated at the outset. One of these themes concerns the core attributes of an exceptional surgeon. Specifically, they indicated that the core attributes will not change over the next ten years. Although the experts acknowledge that advances in technology will always impact the field, they argued that technology does not characterize excellence in surgery. Several surgeons stated that the qualities of an excellent surgeon are the same today as they were one hundred years ago and are likely be the same over the next hundred years. Experts indicated that a strong commitment toward patients will always be a defining characteristic of an outstanding surgeon. Furthermore, personality traits such as Integrity, Humility, and Compassion will be important regardless of the era in which a surgeon works.

Surgeons Will Become Highly Specialized

The final theme mentioned by the experts concerned specialization: future surgeons are likely to gravitate toward more specialized surgical subfields. The experts mentioned that they have already noticed many surgeons limiting their practice to perform smaller numbers of similar procedures. This theme is related to the notion that the 80-work week restriction is creating a different mindset among today's younger surgeons, many of whom are seeking ways to make surgery fit their lifestyle rather than to adapt their lifestyle to meet their patients' needs. The majority of experts expressed

disdain toward this new breed of surgeons who they described as lacking commitment to the profession. Therefore, the idea that surgeons are moving away from being generalists so that they can have more control over their schedules and increase their income is consistent with the fear experts expressed regarding the “clock-watching” mentality of the next generation of surgeons.

Secondary Analysis: Novice Comments

Comparison of Competencies Mentioned by Experts versus Novices

The objective of the primary analysis was to use the expert data to create a list of competencies. A second set of interviews was conducted with 14 novice surgeons. The two data sets were compared to identify patterns that distinguish how exceptional and novice surgeons conceptualize surgical excellence.

Similarities between Expert and Novice Competency Results

It was anticipated that some degree of overlap would exist among the competencies provided by the experts and novices, but on the whole they would look quite different. That prediction was confirmed. Turning first to the few similarities, both groups mentioned three specific competencies: Rapid Decision making, Preparedness, and Tireless Work Ethic. The underlying theme of Rapid Decision Making and Preparedness is the ability to perform at the top of one’s game in the OR in the face of sudden complications or crises. Experts and novices alike commented that exceptional surgeons are always prepared for a procedure and remain vigilant for any problem that may arise. In addition, experts and novices agreed that exceptional surgeons differ from average ones because experts can make swift, yet informed decisions in high pressure

situations. In other words, such individuals are not hesitant or self-doubting. They have gained the experience and knowledge to make good decisions with confidence.

Experts and novices also agreed that a Tireless Work Ethic is another distinguishing characteristic of exceptional surgeons. The majority of surgeons reach a point in their careers where the hectic pace of their schedules becomes less appealing. Many surgeons will begin taking steps to devote more time to their personal lives. However, both participant groups believe that exceptional surgeons are different because they have energy and an intense drive that allows them to continue to work long hours and sacrifice personal time for their patients. Although novices were more likely to focus on the personal and familial sacrifices made by exceptional surgeons for their patients, both groups noted that outstanding surgeons consistently view their patients as their highest priority throughout their careers. Accordingly, experts and novices alike believed that the drive to work as many hours as necessary for their patients was one of the most important characteristics of an exceptional surgeon.

Although the experts and novices sometimes used different language to describe the personality of exceptional surgeons, there were several similar underlying concepts. For example, novice surgeons discussed the importance of a good bedside manner while experts often used the words “compassion” and “concern”. Both groups attempted to define this trait as the tendency to be warm, caring, and respectful toward patients and their family members. Experts and novices described exceptional surgeons as truly connected to patients and willing to comfort them, particularly when bad news must be delivered. Moreover, both groups believe it is crucial that surgeons treat not only their patients well, but also other staff members and physicians. Outstanding surgeons

acknowledge the collaboration inherent in surgical teams and therefore, never diminish or invalidate the efforts of nurses, technicians, and other individuals who assist them in their efforts.

Differences between Expert and Novice Competency Results

As expected, there were more differences than similarities between the expert and novice competency results. There were four competencies exclusive to the experts: Integrity, Intellectual Giftedness and Curiosity, Passion for Teaching, and Devotion to the Field. Integrity describes a willingness to appraise one's strengths and weaknesses honestly and admit when one is wrong. Integrity emerged as the second most important competency on the expert list, however, the novices rarely discussed this quality. Since the experts have been in a position to observe and train other surgeons for many years, they may have had more opportunity to witness instances of dishonest behavior than did the residents in their limited experiences. Residents, by contrast, may be less able to recognize unethical behavior in a more senior surgeon and they would not be in a position to reprimand another surgeon or terminate his or her employment. It is likely that novices will gain a greater appreciation for the importance of integrity as their training continues.

Only the experts noted the relationship between exceptional surgical performance and Intellectual Giftedness and Curiosity. In other words, experts believe that exceptional surgeons grasp new concepts very quickly and display an insatiable inquisitiveness about the field. By contrast, most residents are still struggling to learn their specialty. Therefore, it is possible that the novices did not mention qualities related

to intellectual giftedness because they may perceive themselves at an intellectual disadvantage compared to more seasoned surgeons.

Furthermore, only the experts believed Devotion to the Field was a characteristic important enough to be included among their competencies. It is quite possible that the experts actually attained their levels of distinction within the profession because they possessed such strong devotion. On the other hand, the novices who were interviewed were not selected on the basis of their achievements. In essence, they represented a typical sample of surgical residents. Therefore, the novices may not necessarily have viewed devotion to surgery as a necessary component of a successful surgeon.

Likewise, it is also not surprising that the residents failed to mention the relationship between surgical excellence and Passion for Teaching. Because the novices in this sample were in the early to middle years of their residencies, most had not reached the stage of instructing other surgeons. It is also possible that many residents do not intend to remain in an academic environment after they complete their training. If that is the case, they are unlikely to view a passionate attitude toward education as essential to surgical excellence. The majority of the experts in this study were academic surgeons, and more specifically, chairs of surgery departments. As such, many of them mentioned that a love for teaching was an important competency for exceptional surgeons, although it was the lowest-ranking competency on the expert list on the expert's list.

Just as the experts identified unique competencies, the novices also offered two distinct competencies: Ability to Communicate in Nontechnical Terminology and Maintaining Composure. The Ability to Communicate in Nontechnical Terminology was the highest ranking competency among the novices, but was not mentioned by the

experts. It is possible that novices emphasized this competency because they are still learning to put complicated concepts into language that laypeople can understand. Residents may be able to converse easily with other medical personnel, but they may not have enough experience with patients to adequately express medical terminology clearly and succinctly to non-experts. If this is true, residents would be impressed by more senior surgeons who can readily shift their communication style to match the needs of their audience.

It is also not surprising that residents viewed the ability to remain clam in critical situations as an essential characteristic of exceptional surgeons. The majority of residents admitted that they still become anxious during critical procedures or when complications arise. They hold surgeons who are able to maintain composure in high regard. Although experts surely believe that is important to remain calm in the OR, they made very few comments related to this competency. Perhaps it has become second nature to expert surgeons to maintain their composure in stressful situations having dealt with many such experiences in their careers. It is possible that the residents will eventually regard Maintaining Composure and the Ability to Communicate in Nontechnical Terminology as less essential to surgical excellence as they advance in the careers.

Similarities between Expert and Novice Characteristics of a Poor Surgeon

Experts and novices agreed that two attributes characterize a poor surgeon: Apathy toward Patient Care and Aggressive Behavior. The majority of interviewees contended that poor surgeons often fail to make patients their top priority. Both groups commented that this type of surgeon would rather shift patient schedules around to accommodate their personal interests than adapt to their patients' needs. It is not

surprising that experts and novices alike believed that Apathy toward Patient Care should be on the list of characteristics of defining a poor surgeon because both groups clearly articulated the opposite attitude toward patients in their descriptions of an exceptional surgeon.

Both participant groups also believe that poor surgeons exhibit aggressive behavior. Experts and novices alike commented that poor surgeons tend to yell, swear, and even throw instruments to express their frustration. The majority of participants could recall examples of surgeons they knew who fit this mold. Further, most participants described stories of surgeons who either acted aggressively or bullied others in the OR. Given the frequency with which experts discussed belligerent and bullying surgeons, it is not surprising that both experts and novices described aggressiveness as a characteristic of poor surgeons.

Differences between Expert and Novice Characteristics of a Poor Surgeon

One major difference that distinguished how experts and novices defined a poor surgeon was that the former group commented on a lack of honesty. Dishonesty can manifest in several ways, including falsifying records and data, submitting the same publications to different journals or conferences, and performing surgeries that are ethically questionable. In most situations, residents are not in a position to know whether other surgeons falsify information or submit dual publications. These activities could be easily shielded from novice surgeons who are in a subordinate position to senior surgeons. Moreover, residents may not know the qualifications of other surgeons. Therefore, residents may assume that a more senior surgeon is qualified to perform a particular procedure when in reality he or she is not. In essence, the naiveté of novice

surgeons may serve to obscure some of the dishonest actions of another surgeon, particularly when that surgeon is their superior. Experts also indicated that poor surgeons tend to display a lack of preparation and focus in the OR. According to several expert remarks, many poor surgeons can be characterized as self-doubting and hesitant. Since the majority of surgical residents may also fit this description, they may not recognize these qualities as being characteristic of poor surgeons.

Unlike the experts, novices indicated that poor surgeons tend to demonstrate a lack of concern for the feelings of patients, staff members, and other healthcare professionals. A possible explanation for why only the novices commented on this characteristic is that residents may be part of a new generation of surgeons who place more emphasis on protecting the feelings of those individuals with whom they interact. In fact, in a recent *Bulletin of the American College of Surgeons*, Chao and Wallack (2004) urged educators to “teach our residents to embrace the definition of a surgeon as a skilled, compassionate healer” (pg. 15). Given the growing number of recent articles and books devoted to producing compassionate young physicians (e.g., Carmel & Glick, 1996; Crawshaw, 2002; Kim, Kaplowitz, & Johnston, 2004), there is good reason to believe that current residents may be concerned than older, more experienced surgeons with developing communication, listening, and teamwork skills.

Similarities between Expert and Novice Views of an Exceptional Surgeon in the Future

Experts and novices agreed on two themes that will be important for an exceptional surgeon in the future. The first theme is that future surgeons must be willing to adopt new technologies and skill sets if they wish to achieve exceptional status. Both groups stated the surgeons of the future will need to stay abreast of the latest technology,

whether that includes taking continuing education courses throughout their career or practicing their skills in training laboratories that are equipped with simulators.

Moreover, these surgeons must be able to discern which technologies are most beneficial to their patients and which may be passing fads.

Experts and novices also agreed that the primary qualities of an exceptional surgeon will be no different in the future than they are today. Both groups commented that although advances in technology will continue to transform the field of medicine, the core attributes of an outstanding surgeon will not change. Therefore, the list of competencies produced from the present study will probably be apropos to future generations of outstanding surgeons.

Differences between Expert and Novice Views of an Exceptional Surgeon in the Future

The experts mentioned four unique themes that will be important for an exceptional surgeon in the future and the novices discussed two. The first theme that was exclusive to the experts concerned the impact of the 80-hour work week. It is surprising that the novices did not discuss the 80-hour work week restriction because it affects them directly. However, it is conceivable that many residents welcome the restriction in hours since it affords them more personal time. Because many current residents have not been permitted to work more than 80 hours per week, they have no basis for comparison. By contrast, the experts are from a generation in which there was no restriction on the number of hours they could work; thus, they are able to compare the new type of surgeon with those from previous generations. As stated earlier, the majority of experts are unhappy with this restriction and are extremely concerned that future surgeons will be less prepared and motivated than those in the past.

Also, only the experts mentioned that surgeons in the future are likely to become more specialized. They believe there will be fewer general surgeons as increasing numbers of graduates choose to reduce their workload by concentrating on narrower surgical subspecialties. The residents did not predict this trend toward greater specialization. It is likely they did not comment on this issue because they are too new to the field to recognize this shift toward greater specialization. In sum, residents may simply lack the requisite experience to make educated predictions about future trends in surgery.

Moving From Novice to Expert

As noted earlier, several differences were found between the expert and novice competency models. An important follow-up question is whether these differences reflect a new way of conceptualizing surgical excellence among younger surgeons. One way to answer this question would be to compare views of today's residents with those of other eras. Since that is not possible, a second approach is to examine views of residents from other eras based on "descriptions" in the literature.

In 1979, medical sociologist, Charles Bosk published *Forgive and Remember: Managing Medical Failure*, a seminal book about surgical education. Bosk performed an ethnographic study in a prestigious American teaching hospital. He was interested in uncovering how surgeons perceive, classify, and account for medical errors. Moreover, he described how surgical faculty dealt with residents' errors and how residents modified their behavior to avoid the wrath of attending surgeons.

Bosk's study resulted in a categorization of four types of medical errors: technical, judgmental, normative, and quasi-normative. A technical error reflects one's

level of skill. Bosk observed that as long as a surgeon learns from his or her technical errors, they are forgivable within the surgical community. A judgmental error occurs when a surgeon chooses an inappropriate treatment strategy. For instance, a surgeon may fail to create a clear strategy for a patient with a chronic condition. Bosk found that these errors are also forgivable if a surgeon learns from them and perhaps undergoes further training. Normative errors, on the other hand, are violations in the etiquette and norms that come to be expected between attending surgeons and residents. If a resident fails to adhere to his or her role, perhaps by not keeping the attending surgeon fully informed of a patient's status, he or she is committing a normative error. Further, residents who treat nurses, staff members, or patients rudely are also culpable of normative errors. Bosk found that these errors were difficult to overlook because they are considered to be a direct reflection of a surgeon's integrity and ability to handle responsibility. Finally, quasi-normative errors occur when residents do not follow the protocol of a particular attending surgeon. In essence, residents who commit these errors appear insubordinate to authority figures. When residents blatantly disregard the expectations of their attending surgeon, they are committing a quasi-normative error.

Bosk observed that technical or judgmental errors made by residents were tolerated and even expected. They were forgivable as long as they were not repeated. By contrast, normative and quasi-normative errors could actually have a deleterious effect on a surgeon's career. An occasional technical or judgmental error that occurred on was not likely to have a lasting negative impact as long as the resident did not attempt to cover up the error. Bosk found that surgeons could be transferred or even fired if they were not

honest about the errors they committed or if they did not interact appropriately and respectfully with staff and patients.

Two of the four types of errors that Bosk identified were related to the competencies in the present model. In particular, normative and quasi-normative errors are directly related to the model. Surgeons whose integrity is questioned are often viewed as unreliable and untrustworthy. In his study, Bosk noted that several surgeons were placed out of prestigious hospitals for demonstrating “a lack of integrity and a desire to take the easy way out” (p. 162). In addition, Bosk revealed that surgeons would also be removed from esteemed programs if their interactions with patients, staff members, and authority figures could not be trusted. Therefore, in Bosk’s study, surgeons were expected to demonstrate the competencies, Integrity, Humility, and Compassion identified in the present model.

The views of experts in the present study support Bosk’s findings in that they both highlight the notion that character flaws are more likely to prevent a surgeon from achieving excellence than a lack of technical ability. Bosk’s findings suggest that most surgical faculty expect inexperienced surgeons to commit technical and judgmental errors. In fact, none of the experts in the present study mentioned that they had reprimanded or fired surgeons for making technical errors. However, several experts commented that they had fired surgeons due to their dishonest behavior, such as falsifying data in a research study.

Bosk also observed how the values of the attending surgeons influenced the behavior of the residents in his study. The attending surgeons expected residents to respect the chain of command that exists within every surgical service. Consequently, a

resident must be willing to humble himself and “acknowledge his subordination to the group and its standards” (p. 180). Residents who failed to adjust their behavior and accept their position in the service could be asked to leave. The values of the attending surgeons observed by Bosk are similar to those espoused by the experts in this study. They both believed it was important for surgeons to display humility and respect toward other healthcare professionals. According to many of the experts, poor surgeons not only lack humility, but they often disparage other surgeons and staff members.

One of the main findings from Bosk’s study was that surgeons of that generation viewed technical errors as “easily correctable shortcomings” but errors of morality and character were punishable offenses (p. 175). It is conceivable that today’s surgical residents espouse a somewhat different view of surgical excellence than their predecessors. Recall that in the present study the novice competency model differed from the expert model in that it placed greater emphasis on effective communication with patients, a strong bedside manner, and sociability. Other than these differences, there was a good deal of overlap between the two models. It is possible that younger surgeons simply value interpersonal skills more than surgeons from previous generations. A second explanation is that novice surgeons are still idealistic in their thinking and therefore, their view of the qualities that comprise an outstanding surgeon do not yet coincide with those of more experienced surgeons. Thus, an interesting follow-up question is whether surgical residents will consistently regard communication and sociability as important competencies throughout their career.

Biography of an Outstanding Surgeon

One of the most renowned surgeons of the past century, Denton Cooley, was a pioneer in cardiovascular surgery. In 1968, Cooley performed the first successful human heart transplant in the United States. The following year he became the first heart surgeon to implant an artificial heart into a man. Cooley's biography reveals a detailed account of his personal and professional accomplishments (Minetree, 1973). Since there are few biographies that focus on outstanding surgeons, this particular one provides a rare opportunity to examine the characteristics of a truly exceptional surgeon. According to Minetree, Cooley shares many of the attributes that were found in the present competency model.

One of Cooley's most salient qualities was his absolute commitment to the profession and his patients. In fact, Minetree (1973) noted that Cooley was "a man who spent more time inside human hearts than his own home" (p. 22). Cooley even insisted that his family vacations be spent in locations near hospitals that were equipped for heart surgery. Minetree noted that Cooley's personal and familial obligations nearly always came second to his work. In fact, Cooley's dedication to his patients prevented him from spending a lot of time with his five daughters. This quality is akin to the Dedication to Patient Care and Devotion to Field competencies within the present model. Minetree also provided many examples of Cooley's conscientious nature. In fact, Cooley referred to himself as a "work addict" who became depressed during slow periods. He would use gaps in his work schedule to perfect complicated operations. This compulsive tendency reflects the Tireless Work Ethic competency identified in the present model.

An additional competency that Cooley appeared to reflect was Preparedness. Cooley was a surgeon who had a tremendous capacity for pressure. Despite the fact that he was participating in ground-breaking and life-threatening procedures, he was consistently described as not only having the ability to remain calm, but he was able to rally his surgical team under periods of high pressure. Cooley also displayed Compassion. In an interview with Minetree, Cooley noted that he tried to temper his comments toward young surgeons when they made mistakes in the OR. He stressed the importance of handling these situations with patience and understanding. Finally, Cooley was described throughout the biography as a highly intelligent man. He also possessed an insatiable curiosity about cardiac surgery and devotion toward developing new and improved heart procedures. Therefore, Cooley also mirrored the competency, Intellectual Giftedness and Curiosity.

Cooley also possessed several characteristics that were not reflected in the present competency model. For instance, Minetree described Cooley as having “a sense of competitiveness that bordered on fanatic” (p. 23). Although it is likely that a successful person in any profession displays some degree of competitiveness, a competitive nature did not emerge within the present model. In addition, Minetree described Cooley as a “technical wizard.” Although technical ability is clearly necessary for surgery, it did not reach criteria for inclusion in the final competency model.

Comparison of the Expert Competency List and the ACGME Competencies

The ACGME established a list of six competencies that residents are expected to master throughout their medical training (Dunnington & Williams, 2003). It was predicted that there would be some overlap between the ACGME competencies and the

expert list of competencies, but that additional knowledge, skills, and abilities would distinguish the two lists. In other words, it was anticipated that experts would identify additional KSAOs unique to exceptional surgeons.

Similarities between the Expert List of Competencies and ACGME Competencies

Interestingly, none of the experts mentioned the ACGME competencies during their interviews. One possible reason that the experts did not mention this topic was that the interviewer did not use the word “competency” in the actual interview questions. Rather, experts were asked to think of the finest surgeons they knew and explain the rationale behind their choices. It is more common and effective to use this phrasing in a competency interview rather than to simply ask participants to list the qualities that they would deem to be competencies in their profession (Lucia & Lepsinger, 1999). In addition, this format personalizes the interview process for the participants and thus generates more discussion.

One of the most noticeable similarities between the expert and ACGME lists is that they both emphasize patient treatment. The first ACGME competency, Patient Care, refers to patient treatment that is “compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.” The expert competencies, Compassion and Dedication to Patient Care, are clearly linked to the ACGME competency of Patient Care. A second ACGME competency, Interpersonal and Communication Skills, is also related to Compassion and Dedication to Patient Care, but perhaps less directly than the aforementioned ACGME competency. The ACGME defined Interpersonal and Communication Skills as those “skills that result in effective information exchange and collaboration with patients, their families, and other healthcare

professionals.” It involves both caring and effective communication with others.

Although the experts did not offer a competency that focused exclusively on communication skills, aspects of communication components were subsumed within Compassion and Dedication to Patient Care.

Another ACGME competency related to the expert competencies was Medical Knowledge. The ACGME defined this competency as “medical knowledge about established and evolved biomedical, clinical, and cognate sciences and the application of this knowledge to patient care.” Although the term, medical knowledge, was not explicitly used by the experts, it was subsumed in several of their competencies. For instance, medical knowledge involves the use of scientific and clinical information in operative decision making and patient management. It also concerns the ability to demonstrate basic and clinical knowledge, as well as critically evaluate scientific information. Therefore, this definition is somewhat related to the expert competencies, Rapid Decision Making and Intellectual Giftedness and Curiosity.

Professionalism is defined by the ACGME as “commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse population.” Thus, Professionalism is directly related to the expert competency, Integrity. Although the ACGME competencies and those of the experts are referred to by different names, their definitions are interrelated. Both competencies address the ethical conduct of physicians as it relates to their patients and fellow healthcare professionals. Furthermore, elements of Humility may be subsumed within Professionalism. Humility refers to treating patients and healthcare professionals with respect regardless of their rank. Likewise, Professionalism involves treating patients and other healthcare workers

with respect and sensitivity, particularly in regard to their age, gender, and cultural background.

The ACGME competency, Practice-Based Learning and Improvement, is defined as “the investigation and evaluation of one’s own patient care, appraisal and assimilation of scientific evidence, and improvement of patient care.” According to this ACGME competency, physicians must be able to integrate scientific evidence when diagnosing patients and developing treatment plans. This notion is related to the expert competency, Rapid Decision making, which involves the ability to make the best decisions for patients based on available data. Furthermore, “the evaluation of one’s own patient care” is related to the expert competency, Integrity, which involves taking an honest look at one’s strengths and weaknesses. Finally, Practice-Based Learning and Improvement involves the effective use of information technology to manage information. Although the competencies did not mention the importance of using technology, the experts discussed this topic as a theme impacting future surgeons. Specifically, Practice-Based Learning and Improvement is directly related to the expert theme, Willingness to Adopt New Technologies and Skill Sets.

Differences between the Expert List of Competencies and ACGME Competencies

Only one ACGME competency, System-Based Learning, was unrelated to the expert competencies. Recall that the ACGME defines System-Based Learning as “system-based practice manifested by actions that demonstrate an awareness of and response to the larger context and system of health care and effectively call on system resources to provide optimal care.” This competency may be demonstrated by an understanding of the role played by different specialties and other health care

professionals in overall patient management. It could also reflect the ability to access and mobilize outside resources. Although the experts probably deemed an awareness of and response to the health care system as an important quality for surgeons, they did not appear to think it would be sufficient to distinguish between experts and average surgeons. An understanding of the system in which surgery is practiced is important knowledge that surgeons should attain during their career, but possessing that knowledge most likely does not ensure surgical excellence.

Several expert competencies emerged that were not among the ACGME competencies. Specifically, Tireless Work Ethic, Devotion to Field, and Passion for Teaching were not included in the ACGME list. Tireless Work Ethic and Devotion to Field reflect the vigorous efforts of exceptional surgeons to excel in their profession and propel the field forward. Since a purpose of the ACGME competencies is to guide the educational and training objectives used across academic institutions, it would be difficult, and possibly inappropriate, to assess physicians' level of devotion or commitment to the field unless, of course, their lack of commitment compromises their ability to treat patients. Similarly, the ACGME cannot mandate that physicians be evaluated on their love of teaching, especially since many physicians in training do not intend to remain in an academic setting or teaching hospital upon graduation. Nonetheless, the experts believed that a passionate attitude toward education was a characteristic that distinguishes between outstanding and typical surgeons.

Caveats of the Present Study

The present research is unique because it is the first of its kind to distill interview data from twenty-six expert surgeons into a detailed model that describes the knowledge, skills, abilities, and other characteristics (KSAOs) associated with surgical excellence. However, given the nature of the competency modeling approach, there are several concerns regarding the external validity of the results that should be noted. Most of these concerns are tied to the characteristics of the sample. For instance, the majority of experts who participated were from academic institutions. Specifically, 22 surgeons were drawn from academic institutions but only 4 were drawn from private practice. Given that some of the criteria for inclusion in the study were having multiple literature citations, editing textbooks, and holding offices or titles in professional societies, it should not be surprising that the majority of participants were drawn from teaching hospitals and academic institutions. Consequently, comments from surgeons working strictly in private practice were limited. However, a comparison of the information provided by experts from these two settings yielded no appreciable differences. In fact, two of the experts from private practice commented that outstanding surgeons tend to have a great love for teaching. Therefore, the limited representation from nonacademic surgeons probably had minimal impact on the final competency model.

Another concern regarding the sample was that it contained only one female expert. Given that most of the participants were at least 50 years of age, they finished their residencies in a time when males represented the vast majority of surgeons. Thus, it is not surprising that the expert sample was predominantly male. The low female representation probably did not have a significant impact on the results because the

competencies identified were sex indifferent. In other words, none of the competencies could be labeled as strictly male or female issues. In fact, the comments from the female participant in the sample were indistinguishable from the comments made by the male participants. More specifically, her comments reflected seven of the ten final competencies. Therefore, there is little reason to believe that additional female experts in the sample would have had any appreciable impact on the results.

Unlike the experts, however, fifty percent of the participants in the novice sample were women. The different proportions of males and females in the two samples reflect actual demographic shifts in surgery. In fact, the Association of American Medical Colleges reported that as of 1999, the number of women in general surgery had increased to 21% (Baumgartner, Tseng, & DeAngelis, 2001). The greater number of females in the novice group allowed for a direct comparison between male and female comments. Once again, there was nothing unique about the comments from females and males. Both male and female comments reflected a majority of the competencies that were included in the final model. Interestingly, males and females placed equal emphasis on the importance of effective communication, empathy toward patients, and an excellent bedside manner.

The results from the present study provide the foundation of a model that could be used for selecting and training excellent surgeons. However, the model still needs to be validated. It is important to emphasize that the approach taken in the present study represents the initial phase in this process. Since a job analysis or competency model for surgeons does not presently exist, it was necessary to create such a model before any selection, training, or appraisal methods could be developed. Thus, this study should serve as a platform for future quantitative projects. For example, it would be important to

determine whether each competency measures a unique construct or whether there is some overlap among them. Consequently, a questionnaire based on the competencies would need to be developed so that each competency could be examined in more detail. The questionnaire would then be administered to a much larger sample of surgeons than used in the present study. The results from the questionnaire would be subjected to a confirmatory factor analysis (CFA) to determine whether each competency (i.e., subscale) measures a single construct. The CFA procedure is important because it can establish whether the number of dimensions or competencies conforms to the number found in the model. Further, the CFA would show how the ten competencies could be condensed into fewer dimensions if overlap exists among them.

In addition, the subscales could be correlated with existing and well-validated measures. For example, to establish construct validity, the Rapid Decision Making and Preparedness subscales might be correlated with the California Critical Thinking Skills Test (CCTST; Facione & Facione, 1998) described above since its scales measure many of the important characteristics and behaviors related to these competencies. For instance, one scale on the CCTST focuses on inductive reasoning. An important aspect of inductive reasoning concerns how individuals use their past experiences to make predictions about future events (Facione, 1990). Thus, one would expect this subscale of the CCTST to be positively correlated with the competencies, Rapid Decision Making and Preparedness, identified in the present study.

To determine construct validity, it is also necessary to establish discriminant validity (Cascio, 1998), that is, the absence of correlations among measures of unrelated theoretical constructs (Campbell & Fiske, 1959). Therefore, the subscales derived from

these competencies should also be assessed with established tests of unrelated constructs. For example, Rapid Decision Making and Preparedness might be evaluated with a measure of emotional intelligence because critical thinking is considered to be unrelated to emotional intelligence.

An additional use of such a questionnaire would be to discriminate between outstanding and typical surgeons. Since competencies are those KSAOs that have the most direct impact on success for a surgeon, the model should distinguish among surgeons. In many organizations, competencies are often correlated with performance measures such as productivity, increases in sales or profit, and performance ratings (Lucia & Lepsinger, 1999). In the case of a surgeon, performance measures are a more complicated concern because measurable indicators of performance are less common. Nonetheless, the competencies could be correlated with patient satisfaction scores, complication rates, or scores received from standardized patient encounters.

Implications for Training and Selection

Once competencies are identified, they are often used to guide and improve training and selection procedures for organizations. Likewise, the results of the present competency model could be incorporated into residency programs. The following section provides some examples of how training and selection processes for surgical residency programs could benefit from the competencies identified in the present study.

Enhancing the Training Process

Once competencies are identified and validated, the next logical step is to consider how they could be used to train outstanding surgeons. In other words, what type of training could be implemented to help typical surgeons become excellent surgeons?

Interpersonal Skills Training

Based upon the present competency model, it is reasonable to believe that surgeons are more likely to achieve excellence if they possess strong interpersonal skills. Therefore, it is recommended that some form of interpersonal skills training be incorporated into the curriculum. One method that is currently used for interpersonal skill training and evaluation is "standardized patient encounters" (Ainsworth, Rogers, Markus, Dorsey, Blackwell, & Petrusa, 1991). Standardized patients are healthy individuals who are trained to portray patients by simulating the symptoms of a variety of illnesses, as well as the history, personality, and response patterns of typical patients. Although standardized patient encounters are well accepted as a method for improving interpersonal skills, their use as a formal method has yet to be fully integrated into many medical schools or surgical residency curricula (Yedidia et al., 2003). Because the present results indicate that there is a strong link between strong interpersonal skills and surgical excellence, it is recommended that validated standardized patient encounters be incorporated into surgical residency training.

In addition to the use of standardized patients, medical schools and residency programs should place greater emphasis on communication skills. On an informal level, it is important for experienced surgeons to use casual opportunities that arise during clinical activities to model good interpersonal skills. On a more formal basis, classes or workshops on communication skills could be offered. Further, it is important to provide regular assessment and feedback to ensure that these skills are learned and maintained. One instrument that might be used to assess interpersonal skills is the Doctors' Interpersonal Skills Questionnaire (DISQ; Greco, Sweeney, Broomhall, & Beasley,

2001). This instrument may be completed by patients or surgeons who are in a position to train and evaluate residents. Two examples of items on the DISQ include, “On this visit I would rate the doctor’s ability to really listen as _____” and “The respect shown to be by this doctor was _____”. When responding to these questions, individuals are given a scale that ranges from “poor” to “excellent.”

Professional Ethics Seminars

Given the frequency with which the experts discussed the importance of Integrity, it is also suggested that surgical residents take a seminar in ethical training during their residencies. By exposing residents to this topic, faculty members will demonstrate that they take professional ethics very seriously. Such seminars should provide theoretical foundations, as well as practical skills required for ethical reasoning (Hattab, 2004). Potential topics for discussion during professional ethics seminars could include informed consent, end-of-life care, and methods for dealing with medical error. It may also be beneficial to include role play opportunities in these seminars.

Enhancing the Selection Process

Residents can acquire many important skills through on-the-job training and formal coursework. However, there are some important characteristics that may be less amenable to training, such as the character-related competencies found in the present study (e.g., Compassion, Humility, and Integrity). When training alone may be inappropriate or insufficient for certain competencies, it may be worth considering new methods to enhance the selection process used by many surgical residency programs. The following section contains several recommendations for improving the selection of surgical residents.

Critical Thinking

Given that Decision Making and Preparedness emerged as important competencies, it is recommended that residency programs also include a measure of critical thinking or decision making ability in their selection process. As mentioned earlier, the CCTST is a standardized and validated multiple-choice measure of critical thinking skill (Facione & Facione, 1998). Although it is considered to be a discipline-neutral test, it has been used previously in medical research (Bondy, Koenigseder, Ishee, & Williams, 2001). Just as this measure would be appropriate for establishing evidence of construct validity, it would also be a useful selection device because it measures many of the important characteristics related to critical thinking (e.g., inductive and deductive reasoning). An alternative to the CCTST could be a context-specific decision making test. If a context-specific measure is used to assess critical thinking, subject matter experts should be instrumental in its formation.

Characteristics of a Poor Surgeon

The experts identified several characteristics of a poor surgeon, including Apathy toward Patients, Dishonesty, and a “clock-watching” or work-shift mentality. If the selection process could distinguish applicants who possess these characteristics, residency programs would save a great deal of time and resources because, if selected, these individuals might eventually be removed from the program or require additional attention and training. One way to identify candidates with a tendency toward apathetic or uncaring attitudes is to administer an emotional intelligence test, such as the Bar-On Emotional Quotient Inventory (EQi; Wagner, Moseley, Grant, Gore, & Owens, 2002). In particular, the Interpersonal and Stress Management Scales of the EQi would be

appropriate to use in this context. The former measures one's ability to be empathetic and develop strong interpersonal relationships while the latter assesses impulse control and stress tolerance. Questions from an emotional intelligence test could also be adapted into structured interview questions.

Characteristics Unique to a Competency Model for Surgery

One might expect that the present competency model is unique to surgery. In order to make this assertion, it is necessary to compare the present model to models from other domains. Lucia and Lepsinger (1999) created and validated several models for various professional roles, including manager, salesperson, finance employee, attorney, and research associate in a consulting firm. Some of the competencies listed for a manager include Informing, Monitoring, Delegating, Planning, Problem Solving, and Mentoring. Clearly, this competency model differs from the surgeon's model. According to Lucia and Lepsinger's research, a successful manager should disseminate relevant information to employees, review their progress, assign responsibilities, determine strategic objectives, systematically analyze problems, and facilitate employees' career growth. Unlike the model for a surgeon, there were no competencies that related to one's character or personality. However, many of the competencies for a manager relate to one's obligation toward subordinates. While most of the competencies for a surgeon are not related to their subordinates (i.e., residents), they are directly related to patients.

The competency model for an attorney is closer in scope to the surgeon's model. Some of the competencies for an attorney include Writing Skills, Oral Communication Skills, Analytical Thinking, Detail Handling, Planning and Organizing, Influencing and

Negotiating, Competitiveness, Reflectiveness/Introspection, and Endurance. Models for attorneys and surgeons are similar in that they both emphasize Analytical (or critical) Thinking, Planning and Organizing (or Preparedness), Endurance (or Tireless Work Ethic) and Reflectiveness/Introspection (Integrity). In fact, Reflectiveness/Introspection for attorneys refers to a willingness to admit to mistakes. However, the experts in the present study did not comment on the importance of written or oral communication skills, nor did they mention Detail Handling, Influencing/ Negotiating, or Competitiveness.

The present model appears to be different from models in other domains for several reasons. First, surgeons are expected to make rapid, well-informed decisions in high pressure situations. In addition, the field of medicine is one of the few domains in which a significant part of the job involves the ability to relate well to patients and their family members. Consequently, the present model is also unique in that successful surgeons are expected to demonstrate empathy and to allow their relationships with patients to take priority over their personal needs and obligations.

CONCLUSIONS

The present study was designed to identify the competencies associated with excellence in surgery. Twenty-six expert surgeons were interviewed and their comments aggregated to establish a collective opinion of the KSAOs required of an outstanding surgeon. The interviews resulted in 10 competencies revealing that outside of intelligence, success in surgeons is largely contingent upon their interpersonal and communication skills.

As noted above in Dr. William Silen's keynote address at the 2003 Annual Meeting of the Society of University Surgeons, he stated that the apprenticeship model of training surgeons is no longer viable and that there is almost no time available for practicing, teaching, and thinking. Not only is the "see one, do one, teach one" approach to surgical training now considered obsolete, but even with the 80-hour work week restriction many residents find themselves drained by their work schedules. In the present study, it was extremely difficult to find novice surgeons to participate in the 30-minute interview. It took twice as long to recruit half as many novices as experts. In fact, many novices agreed to participate but had to withdraw due to their hectic schedules. Silen's point appears to be true. Many residents seem overwhelmed by their workload and simply do not have enough time to sleep, much less participate in a voluntary interview.

The process of executing the present study, as well as the results obtained, also support the idea that what is needed to train the next generation of surgeons may be changing. At the outset, it was expected that exceptional surgeons would differ from others in their intellectual abilities and technical skills. The results provide only partial

support for this view. On the one hand, Intellectual Giftedness, Preparedness, and Rapid Decision Making are clearly related to excellence in surgery. On the other hand, the importance of technical skills was not emphasized in the competency model. This does not suggest that manual dexterity and procedural skills are unimportant. Rather, technical skill may be necessary, but not sufficient to achieve surgical excellence. Instead, many of the qualities that set exceptional surgeons apart from the rest are related to one's character. The present model demonstrates that a truly outstanding surgeon must also display compassion, humility, and integrity. Historically, these characteristics have not received much attention in surgical education. Thus, the traditional Halstedian training paradigm that stresses procedural skills may be ill-suited to produce the breadth of qualities expected in exceptional surgeons.

Surgical educators may need to consider offering mandatory courses or workshops to help residents recognize and develop the behaviors associated with these competencies. On the other hand, the present model revealed that there are certain characteristics that educators will not be able to address through formal educational methods. For example, surgical excellence involves a tireless work ethic and a tremendous devotion to the field. Although educators can encourage residents to approach their work with passion and energy, there is no prescribed curriculum that will produce surgeons with these competencies.

From a psychological perspective, the present study showed that many of the characteristics of an outstanding surgeon are personality related. A comparison of the competency model for surgeons with those from other professions revealed several common "core" competencies (e.g., communication skills, detail-oriented, planning, etc.).

In this respect, there may be opportunities to include surgeons in future research aimed at identifying common traits among leaders. On the other hand, some of the competencies for surgeons were unique. Specifically, the top competency identified in the present study was Dedication to Patient Care. It is unlikely that one would find this level of dedication to the “customer” in any other service industry. Thus, future researchers may be interested in studying the psychological processes that underlie this commitment to helping and healing others.

Finally, it should be noted that surgical educators could benefit from I-O psychologists who have expertise in selection, training, and performance assessment. For example, physicians may currently rely on standard questionnaires developed for other applications as indirect measures of competency. Industrial-Organizational psychologists, however, could develop measures that specifically assess competencies at a behavioral level. Regarding the present competency model, I-O psychologists could assist the surgical community through the development of reliable and valid tests that measure personality-related competencies. For example, since Integrity emerged as an important competency, I-O psychologists may wish to work with subject matter experts to develop and validate a specific measure of integrity that can be used to screen surgical candidates. Thus, if the requirements for the next generation of surgeons are to reflect the competencies identified in the present study, it is likely that I-O psychologists will help surgery its vision.

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APPENDIX A
RECRUITMENT LETTER

Dear Dr. _____,

My name is Hope Hanner-Bailey. I am a graduate student in Industrial-Organizational Psychology, studying at Old Dominion University in Norfolk, Virginia. In my dissertation, I am investigating the job of a surgeon. More specifically, I am looking at the characteristics that distinguish expert surgeons from average ones. The objective of this study is to develop a thorough description of competencies that can ultimately be used to enhance curriculum development, selection, training, and performance evaluation of surgical residency programs.

You have been identified by a small group of surgeons at Eastern Virginal Medical School as an exceptional surgeon in your specialty. I am conducting brief phone interviews with several exceptional surgeons from across the country. The interview consists of seven questions and it will be approximately 30 minutes in duration. In this interview, you will be asked to share your opinions regarding some of the traits, skills, and abilities that combine to form the truly exceptional surgeon.

Thank you very much in advance for considering to be interviewed for my dissertation. If you have any questions, or if you are willing to participate, please e-mail me at: hhanner@odu.edu and I will work around your schedule to find at time that is convenient for you. I look forward to hearing from you.

Thank you,

Hope Hanner-Bailey

APPENDIX B

CONTENT AREAS AND COMMENTS BY EXPERTS THAT FAILED TO MEET THE INCLUSION CRITERION

Technical Skill

1. An exceptional surgeon has highly honed technical skills.
2. This surgeon can maneuver difficult pelvic areas and tumors.
3. They have great hand-eye coordination.
4. Technical part- relatively fast in the OR because he has a plan and he sticks to it. Economy of motion.
5. An exceptional surgeon displays technical excellence.
6. He is technically excellent.
7. They have amazing technical ability.
8. They are technically adroit.
9. He takes pride in any difficult operation that others would have a hard time performing.

Leadership Skill

1. Being a leader- one people go to with problems.
2. Being a strong team leader. Prefers to work alone but also does well in a group setting.
3. Being a strong leader.
4. The third example was a great technician and a great leader. People respected him and wanted to emulate him. It is very difficult to find all three examples/qualities in a single surgeon.
5. Collaborative; willing to share the playing field with others.
6. Values the opinions of everyone he works with, including physician assistants. They often can tell him how other surgeons in his practice perform and offer advice "Dr. Such and Such does it this way." He wants to create a climate where everyone's input matters.
7. He remained a calm team leader. He had the presence of mind to fix the problem.

Communication Skill

1. They are good communicators. They communicate (verbally and written) well with patients and other professionals.
2. S/he must be a strong communicator.
3. They speak very clearly.
4. He has the ability to communicate well.
5. Communicates well with patients, particularly when dealing with complicated ideas- much more important than technical skill.
6. They use appropriate language; they quickly size up patients to determine what they can understand and what to tell them about their illness.

7. Great ability to communicate.
8. They are emotionally intelligent and good communicators.

Ability to Maintain Composure

1. These surgeons remain very calm and patient under stress.
2. This surgeon brought her current OR in order. The nurses commented that everything had quieted down since her arrival.
3. They present a calm appearance during consultations, dealing with families, dealing with emergencies, and in the OR.
4. They exhibit patience.
5. He is a patient surgeon.

Critical Nature

1. They have a critical nature. They critically evaluate their work. They are great at self-evaluation and self-analysis.
2. They are skeptical of their own research findings.
3. He is self-critical.
4. Continual self-improvement- they are never totally satisfied.
5. They are incredible at self analysis; they are self critical. They can analyze what went wrong.
6. Constant self-analysis and self improvement (always try to make themselves better).

Self-Confident

1. They have confidence in their ability to do the case at hand- although being over-confident can get you in trouble.
2. They are confident in general.
3. Fearless – very little scares them.
4. They are confident with their skills.
5. Courage- not boldness though. Sometimes the most courageous option is not to intervene.
6. Supreme confidence to handle situations.

Sense of Humor

1. Sense of humor- with residents, nurses, patients, family members, etc.
2. He has a good sense of humor.
3. Good sense of humor/doesn't take himself too seriously. Able to laugh at himself.
4. They have a sense of humor.

APPENDIX C

CONTENT AREAS AND COMMENTS BY NOVICES THAT FAILED TO MEET THE INCLUSION CRITERION

Technical Skill

1. They are talented and have very good technical skill.
2. Strong technical skills and decision-making skills.
3. Excellent technician/brilliant takes on complicated cases.
4. He has excellent technical skills.
5. They have good manual dexterity.

Ability to Distill Problems

1. He has the ability to reduce a problem to its more basic components. Ability to focus and discern crucial from periphery.
2. Focusing on essentials of problems.
3. They have the amazing ability to decipher what is and is not important; cut through the details. Boil it down or distill information

Devotion to Field

1. These surgeons have a sense of duty, a calling. They are the marines of medicine. They have an overwhelming sense that they are going to get the job done.
2. They have an extreme sense of commitment to the field.
3. Dedication to the field- if they are not doing surgery, they are not happy.
4. They are extremely dedicated.
5. He is dedicated to the field.

Passion for Teaching

1. He was willing to back up residents.
2. They enjoy teaching medical students and residents.
3. They are strong educators/mentors.
4. Taking a junior resident through a case safely and confidently. Helping them to get out of trouble.

Awareness of Limitations

1. Great surgeons are aware of their limitations.
2. They are open to other people's opinions, have no issue asking others for help and incorporating their advice into action.
3. Patient has unusual surgical problem and surgeon wasn't sure how to resolve it. Surgeon explained available options to the patient. He started researching related

articles and he implemented a procedure that was in the article. He asked residents and medical students for their input as well.

Efficiency

1. An exceptional surgeon does procedures very quickly and efficient. He or she doesn't get bogged down.
2. They don't take shortcuts even though their work is time consuming and technically demanding. They work quickly.
3. Efficiency in the OR. Knowing the proper speed to go; being able to cut down on anesthesia.
4. They are thorough and efficient individuals.

Team Leaders

1. They believe in teamwork.
2. They have the ability to build coalitions and teams.
3. They lead others by example.
4. He has the ability to build and maintain a team.

VITA

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EDUCATION

B.A. (Psychology), Queens College, 1996
M. A. (Psychology), Fairleigh Dickinson University, 1998
M. S. (Psychology), Old Dominion University, 2002

ACADEMIC APPOINTMENTS

Course Instructor, 9/02 to 5/04, Introduction to Industrial and Organizational Psychology, Department of Psychology, Old Dominion University.

SELECTED PUBLICATIONS

- Schmidt, E. A., Scerbo, M. W., Bliss, J. P., Hanner-Bailey, H. S., Garcia, H. M., Weireter, Jr., L. M. (in press). Surgical skill performance under combat conditions in a virtual environment. *Proceedings of the IEA 2000/HFES 50th Annual Meeting*, San Francisco, California.
- Scerbo, M. S., Weireter, Jr., L. J., Bliss, J. P., Schmidt, E. A., & Hanner, H. S. (August, 2004). An examination of surgical skill performance under combat conditions using a mannequin-based simulator in a virtual environment. Paper presented at NATO HFM Combat Casualty Care, St. Pete Beach, FL.
- McIntyre, R. M., Hanner, H. S., Tedrow, L., & Camic, J. R. (2004, April). Using analogue behavioral assessment for assessing intra-personal and inter-personal skills. Paper presented at the 19th Annual Conference of the Society for Industrial and Organizational Psychologists, Chicago, IL.
- Hanner, H. S., & McIntyre, R. M. (2002, March). *The effects of team process training and perceived task workload on team performance*. Paper presented at the 23rd Annual Industrial/Organizational Graduate Student Conference, Tampa, FL.

APPLIED EXPERIENCE

Manager of Training, 4/99-7/00, Ernest Hart, Personnel Commissioner of the City of Yonkers, Yonkers, New York.

Research and consulting employee, 8/03-present, Dr. Bryan Hayes, Psychological Consultant for Kenexa, Lincoln, Nebraska.