The Aging Surgeon

Implications for the Workforce, the Surgeon, and the Patient

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KEYWORDS

• Surgeon • Aging • Retirement • Outcomes

KEY POINTS

- The surgical workforce is aging. Nearly one-third of currently active surgeons are older than 55 years.
- Surgeons undergo the same age-related decline in neurocognitive, sensory, and neuromuscular function as the remainder of society; however, this decline may have a negative impact on patient care.
- The complexity of surgical practice and the surgical literature is expanding at an exponential rate. However, the physiologic impairments associated with aging limit the aging surgeon's ability to keep up. As a result, older surgeons frequently have a knowledge deficit and do not fully adhere to modern standards of care.
- Although greater experience might be considered a benefit, an evolving body of literature shows that there is an inverse and paradoxic relationship between greater experience and quality patient outcomes.

According to the US Department of Health and Human Services, the expected lifespan of a baby born in 2010 is 78.7 years, and this life expectancy is anticipated to continue to increase.[1] Not only will the surgeon of the future care for a greater number of elderly patients, the number of elder surgeons will also increase. Surgeons are not immune to the age-related deterioration of neurocognitive, sensory, and motor functions. Likewise, medical and psychiatric conditions common in the elderly also impact aging surgeons. Although greater clinical experience may benefit patients, these age-related physiologic changes may also paradoxically result in poor patient outcomes. Because aging surgeons are reluctant to abandon their career, alterative pathways to contribute need to be considered.[2]

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THE AGING OF THE SURGICAL WORKFORCE

The surgical workforce is aging. According to the American Medical Association, 18% of practicing physicians are older than 65 years.[3] It is estimated that in the United States, nearly one-third of surgeons currently in practice are older than 55 years.[4] This same trend also being seen in other countries. In Australia, the average age of a surgeon is 52 years with 19% of active surgeons being 65 years or older.[5] Not only are surgeons aging, they are doing so at an exponential rate, with the number of Australian surgeons age 65 years and older increasing by 11% between 2011 and 2012.[6] Complicating matters further, the age at which surgeons retire is also increasing.[7] The larger number of nontraditional medical students, increasing duration of residency training (ie, orthopedic surgery), and the exponential increase in fellowship training means those just entering practice are starting at an age much older than those in previous generations.[8]

The graying of the surgical work force is affecting different patient populations more than others. Using data from the 2009 American Medical Association Physician Masterfile and the American Board of Medical Specialties, Walker and colleagues[4] studied 137,426 surgeons. They found that the specialties of urology and thoracic surgery had the oldest surgeons, with median ages of 52 and 51 years, respectively. Orthopedic, ophthalmic, and plastic surgeons all had a median age of 50 years or older, with 34% to 37% of surgeons older than 55 years. Across all subspecialties, rural surgeons are significantly older compared with their urban counterparts. Geographically, the Midwest has the lowest percentage of surgeons older than 55 years (32%), whereas the West has the highest proportion of older surgeons (35%).[4]

US medical schools have also experienced the impact of aging. In 1967, the average faculty age was 41.7 years; this increased to 44.7 years in 1987 and then 48.5 years in 2007. The percentage of all faculty members older than 55 years was 9% in 1967, 19% in 1987, and 29% in 2007.[9] Between 1967 and 2007, there has been a 7-fold increase in the number of US medical school faculty; however, the starting faculty members are significantly older. As a result, the recruited faculty may not be young enough to offset the overall aging of the retained faculty.[9] The rate of attrition for full professors, who would logically be older, is much slower than that seen for younger assistant and associate professors.[10] Most National Institutes of Health–funded research occurs at medical schools; in parallel with the aging of medical school faculty, the age distribution of National Institutes of Health principal investigators is also increasing. In 1980, less than 1% of principal investigators were older than 65 years but in 2012 that number had increased to 7%.[11]

SURGEONS AND RETIREMENT

The issue of when to transition from practice to retirement is not unique to surgeons. However, the physical and cognitive demands of surgical procedures and perioperative care make the timely retirement of an aging surgeon a public health concern. In the United States, mandated retirement on the grounds of age alone is illegal based on the Age Discrimination in Employment Act of 1967. Additionally, mandatory retirement based on age does not fit well with the universally accepted understanding that onset of cognitive or physical decline is a physiologic process occurring in different individuals at different rates, not a light switch that turns off at a specific age. In contrast, in the commercial airline industry, commercial pilots face mandatory retirement at 60 years of age; similarly, the retirement age of British Surgeons is 65 years from institutional practice and 70 years from private practice.[12]

At age 60 years, most surgeons continue to work, and 17% continue to operate after 70 years of age.[2] The average age of retirement of a general surgeon in 1984 was 60.5 years of age. By 1995, that age had increased to 63 years.[7] In a classic study of members of the American Surgical Association by Greenfield and Proctor, less than 50% of survey respondents reported having any retirement plan, and, among those who did, 75% planned activities in retirement that involved medicine.[2]

There are several potential reasons why surgeons resist retirement. Many surgeons see their own sense of self-value in the ability to perform surgery. In a study of orthopedic surgeons, one-third of respondents reported that the most difficult aspect of retirement was the loss of the role as a surgeon.[13] The all-consuming nature of a surgical practice and the feelings of indispensability, particularly in rural communities, may also be a contributing factor.[14] Other reasons for resistance to retirement include lack of self-esteem, fear of death, resistance to change, loss of financial security, and fear of boredom.[8,15] Further, some doctors feel that their advanced age confers greater credibility, more respect, and better perspective, and nearly one-half feel advanced age gives them greater clinical confidence and competence.[16] An often unrecognized contributing factor for not retiring when the time has arrived may be the inability for the surgeon to perceive his or her own poor performance.

Despite these potential concerns, several studies have documented that most physicians enjoy retirement.[17,18] In a study of 2132 retired surgeons, those who took up postretirement activities outside of medicine were more satisfied than those who remained in medicine in a nonsurgical capacity.[17]

PHYSIOLOGIC CHANGES OF THE AGING SURGEON

Although a surgeon may be the subject of a catastrophic life-changing or life-ending event, the more typical pattern is a slow, insidious deterioration of multiple physiologic processes that impact surgeon performance and ultimately patient care. Further complicating this picture are data documenting that physicians do not adequately look after their own physical health.[19] For example, despite hepatitis B being a major risk of the profession, vaccination rates may be as low as 49%, whereas dentists have nearly a 100% vaccination rate.[20,21]

The attributes of a surgeon could be defined as the ability to think clearly in complex and dynamic situations, while utilizing sensory information to impact patient well-being through the use of dexterity and judgment. Unfortunately, all of these functions decline as a part of the normal aging process.

Decline in Cognition and Neuromuscular Function

As a consequence of normal aging, there is a predictable decline in neurocognitive function across many different domains. Although there are individual variations, of particular concern to the surgeon is the decline in the ability to focus attention, the ability to process and correlate information, and native intelligence.[22] Other examples of age-related deterioration include fluid intelligence (adaptive thinking and clinical reasoning), processing speed, episodic memory (incorporating personally experienced events), and manual dexterity.[23] The aging process also specifically affects cognitive speed and short-term memory and the ability to arrive at a solution for a new type of problem.[24] Reaction time, the time required to move in response to a stimulus, also declines with age, albeit slowly.[8] Although many of these changes are thought to occur at very advanced age, these changes may be seen in older but not yet elderly physicians. In a study of nonsurgeons (psychiatrists) older than 55 years, 10% reported poor memory.[16]

In addition to these physiologic changes, there are also anatomic changes with advancing age. There is a preferential shrinkage of the frontal lobe. Although not well correlated with cognitive decline, the frontal lobes are responsible for the exercise of judgment and insight. Deterioration of these executive functions are particularly relevant in clinical practice.[25]

Further complicating the normal cognitive changes of progressive aging is the development of chronic medical illnesses. Cardiovascular disease, depression, dementia, and excessive alcohol use all further complicate the normal decline in neurocognitive function.[26]

Although these areas of decline are important, there are some neurocognitive functions that are preserved despite aging. Verbal skills and semantic memory (knowledge of facts and meanings) remain intact.[23,27] Crystallized intelligence (the cumulative end product of information acquired over time, hence, clinical wisdom) is also preserved.[24] Additionally, some evidence suggests older physicians may be superior at the use of nonanalytic diagnostic strategies, such as pattern recognition.[28]

Sensory Impairment

Age-related decline in hearing, visual acuity, depth perception, and color discrimination all could negatively impact surgeon performance.[23] With advancing age, there is a progressive hardening and yellowing of the lens of the eye and pupillary shrinkage. The result is that workers older than 55 years require 100% more illumination for optimal performance.[15]

Impact of Prolonged Physical and Psychological Stress

The practice of medicine in general, and surgery in particular, is both physically and mentally challenging. Prolonged, repetitive exposure to these stressors is bound to have consequences. In a study of nonsurgeons older than 55 years, 27% reported that fatigue interfered with their work.[16] The physical nature of surgical work also takes its toll. For example, up to 87% of laparoscopic surgeons reported physical complaints, of which the strongest predictor was high case volume. However, even low case volume surgeons experienced eye and back complaints.[29]

Mental or emotional exhaustion may also take a toll. As one progresses through a career, symptoms of burnout may appear. In addition to feelings of depersonalization and reduced sense of personal accomplishment, a host of other medical conditions, such as anxiety, depression, substance abuse, sleep disturbance, lowered immunity, and possibly ischemic heart disease, may further impair the aging surgeon's performance.[30]

The incidence of burnout in surgeons of all age groups is as high as 40% according to a survey of 8000 members of the American College of Surgeons in 2008. This burnout is associated with suicidal ideation in up to 6.4% (1.5–3 times more than that in the general population).[31]

One of the major contributing factors to burnout is chronic sleep deprivation.[30] Although concerns about patient safety have resulted in duty hour restrictions for trainees, heretofore there has not been any focus on this issue for the aging surgeon, who would be expected to have even less physical reserve and who is not subject to the same oversight as younger trainees.

The question about older surgeons being more at risk for burnout is, however, controversial. Peisah and colleagues[32] found that older practitioners experienced less burnout, and this was attributed to lessons learned over the course of their careers (although women might be more vulnerable to burnout).

Psychiatric Illness

The presence of mental and psychiatric disease has an increased incidence in the elderly physician. In a study of impairment in older doctors, 54% were found to have cognitive impairment or dementia, including 12% with frank dementia; 22% had depression, 17% had a neurodegenerative disease, and 29% had some form of substance abuse (of which, 20% had alcohol abuse and 17% had opiate abuse).[28] Another Australian study of 11,379 practitioners found nearly 10% of surgeons reported having suicidal ideation in the previous year. In the same study 2.5% of surgeons had serious psychological distress, and 20.5% had a high likelihood of a minor psychiatric disorder.[33] This same study reported that physicians had a higher degree of denial with regard to the impact illness was having on their performance.

Neurocognitive Testing

Several tests have been developed that could be used to monitor cognitive function of the aging surgeon. In particular, the MicroCog, which is designed to measure reactivity, attention, numeric recall, verbal memory, visiospatial facility reasoning, and mental calculation, has been suggested as a method to detect impaired competence in surgeons.[12] However, although good scores on items such as visuospatial facility and reaction times would be important for surgeons, there have been no studies correlating good or bad scores with actual clinical outcomes.[8] Another useful test may be the game of chess. Playing chess has several similarities to surgery, such as complexity, time pressure, and rewards or penalties for decisions made. These results can easily be objectified based on wins and losses adjusted for the skill of the opponent. Unfortunately, similar to the MicroCog, there is no evidence that a chess rating correlates with clinical outcomes.[8] The use of the Mini Mental Status Exam has been explored, but there is a ceiling effect, so it may not be useful in detecting impairment among physicians.[28,34]

DIFFICULTY TEACHING "OLD DOGS NEW TRICKS"

Current clinical practice is vastly different than formal educational training obtained by the older surgeon. The remoteness of education or the timeframe between ending formal education and current practice is significant for the aging surgeon. Based on the average older surgeon entering practice at age 31 years, remoteness of education has been estimated to be 31 years minus the surgeon's age.[8] Consider the example of orthopedic surgery. Over the last 25 years, essentially every surgical treatment has changed. Femoral shaft fractures, treated with 6 weeks of traction, followed by another 6 weeks in a plaster cast were first replaced with plate fixation, and that technique has been abandoned for locked intramedullary nailing.[8] Other examples of evolving techniques over the last several decades include laparoscopic surgery, modern bariatric surgery, nonoperative management of blunt organ trauma, and robotic surgery. The evolution of each of these new techniques requires the older surgeon to learn, embrace, and incorporate them into their daily practice.

Unfortunately, typical neuropsychological changes of advanced age make this learning particularly difficult. The following findings on testing significantly impair learning in this age group: decreased auditory memory, decreased learning abilities, motor and mental slowing, difficulty retaining facts, difficulty reading, and tendency to become more concrete in thinking.[28] These factors contribute to a mentality of "my mind is made up don't confuse me with the facts." The manifestation of this learning impairment may have clinical consequences. In a study of 395 plastic surgeons investigating the role of age on practice patterns in the treatment of melanoma,

older surgeons ordered more chemical tests such as 5-S-cyteinyl dopa, which is no longer believed to be helpful, whereas younger surgeons ordered chemical tests currently thought to be more useful.[35] In a study of 498 specialized breast surgeons, older surgeons were significantly less likely to perform immediate reconstruction (odds ratio, 5.2) and more likely to feel that immediate breast reconstruction had disadvantages.[36] Despite the multiple advantages of laparoscopy, 2 studies found an inverse relationship between the years in practice, advanced age, and performance of laparoscopy.[37,38] Neumayer and colleagues,[39] however, found that patients of surgeons older than 45 years had increased recurrence rates after laparoscopic hernia repairs. Although the results of these studies suggest concern, it should be noted they were all performed more than a decade ago. However, these studies do document the difficulties with older surgeons learning new surgical techniques.

THE GREAT PARADOX OF THE AGING SURGEON: GREATER EXPERIENCE BUT WORSE CLINICAL PERFORMANCE

Evaluation of quality of performance metrics has become a central focus across all of medical practice. It would be reasonable to assume that older physicians who have greater experience would provide better quality care and have improved outcomes. Evolving data, however, paradoxically finds the opposite to be true. In a comprehensive, carefully constructed systematic review, Choudhry and colleagues[40] found that physicians who have been in practice longer are at risk for providing lower quality care. In their investigation, 12 studies found an inverse relationship between years of experience and knowledge base.[40] An example of interest was a study of surgeons and anesthesiologists assessing knowledge of the indications for and the risks associated with blood transfusion. In that study, Salem-Schatz and colleagues[41] found a highly significant association between knowledge deficit and the number of years in practice. Given this, it is not surprising that older surgeons have an inferior performance on recertification examinations.[42] Choudhry and colleagues[40] also found that most (63%) studies investigating adherence to standards of practice for diagnosis, screening, and prevention found the longer a physician is in practice, the less likely they are to adhere to standards. A large study assessing adherence to nationally established cancer screening guidelines found that physicians who graduated 20 years earlier were less likely to adhere to these recommendations.[43] A similar trend was also seen with adherence to standards of appropriate therapy. A full 74% of studies found a negative association between physician age and adherence to standards of therapeutic care.[40] Not only are older physicians less likely to incorporate new treatment strategies, they are also more likely to prescribe inappropriate medications.[44,45]

Unfortunately, a growing body of literature suggests that more experienced physicians and surgeons paradoxically have worse clinical outcomes.[39,40,46–50] Although Burns and Wholey[51] found no relationship between physician age and mortality, they did find that after adjusting for comorbid conditions, patients of physicians of greater experience did have a longer hospital length of stay. In contrast, another more recent systematic review found that increased volume and greater surgeon experience with specific procedures did result in improved outcome.[52]

ASSURING COMPETENCY AND PHYSICAL AND MENTAL CAPABILITIES

Why Problem Surgeons Are Not Identified

Assuring surgeon competence is the responsibility of 2 agencies. The respective Board, and subspecialty board, of Medicine and Surgery have traditionally been

focused on determining suitability for entrance into practice but have recently taken greater responsibility for ongoing monitoring of competence through more robust maintenance of certification requirements.[53] Although state boards provide a mechanism for discipline in the event of a major untoward event, the aging surgeon tends to fail gradually, and this issue may remain undetected. There are conflicting data on whether older physicians are overrepresented among those referred to regulatory agencies.[14] A study of allopathic physicians in Oklahoma found that the proportion of physicians disciplined increased with each successive 10-year interval since first licensure.[54] Individual hospitals may also identify older surgeons at risk for unsafe practice. However, because health care is a redundant system, the errors of an individual may not be obvious. Even if obvious, hospitals, particularly small rural hospitals, may have a potential conflict of interest in disciplining the surgeon because of financial concerns.

Assuring Competent Care

As outlined above, older surgeons may suffer from a knowledge deficit and not adhere to modern standards of care.[40] These concerns could be addressed easily with the recent changes toward a more robust recertification program. Unfortunately, dependence on peer review or self-reporting may not be useful, as there are political difficulties in approaching a senior surgeon, and most senior surgeons are not actually providing care with a surgeon of equal authority or experience.

Evaluating Physical and Mental Capabilities

Older surgeons fail as the result of biology, rather than willful misconduct. The surgeon has no control over the deterioration of cognitive function, reaction time, dexterity, and evolution of medical or psychiatric disease. Currently, there is no required battery of neurocognitive or physical testing of older surgeons to remain in practice. Trunkey and Botney[12] have outlined a schema for such an evaluation. In brief, this schema involves obtaining a complete medical history, physical examination, and electrocardiogram at age 50 years. In addition, some measure of neurocognitive function, such as the MicroCog Test would be performed. This process would be repeated every 2 years until age 60 and annually thereafter. Trunkey and Botney[12] also suggest that a recertification examination be conducted every 3 years after the age of 55 with the emphasis on recent concepts and new knowledge. Others have added the importance of mental health screening to this paradigm.[32]

Katlic and associates[55] propose a 2-day comprehensive multidisciplinary, objective, and confidential evaluation of a surgeon's physical and cognitive function, designed to protect surgeons from an unreliable or arbitrary evaluation and to identify a treatable disorder. This program is also helpful in determining when it is time to retire.

Adaptive Strategies

As surgeons age, their practice patterns change. Bieliauskas and colleagues[56] found that as they age, surgeons reduce the volume and complexity of cases. Older physicians also adapt to the decline in cognitive function by allocating more time to each patient, increasing use of memory aids, working with others, and increasingly seeking second opinions.[14,57] The workplace may also adapt to meet the needs of the aging physician. In 2009, the American College of Emergency Physicians recommended that older physicians work weekend day shifts instead if night shifts, more consistent shifts at a set time of day or night, and fewer consecutive shifts and exchange clinical responsibilities for teaching or administrative duties.[58] Ceasing all night calls and

reducing overall duty hours after a specified age, similar to what is now required of interns, may also be an option.

UTILIZING THE AGING SURGEON

As surgeons progress toward the end of their operative career, they continue to need intellectual stimulation and feel the obligation to continue contributing. One potential outlet for the surgeon emeritus is teaching. Given the concerns presented earlier about knowledge deficits and nonstandard practices of aging surgeons, the assignment of educational roles needs to be considered carefully. Whereas clinical teaching of residents may not be appropriate, teaching anatomy, history, and physical examination skills and basic surgical skills could be of great benefit to surgeons and students alike.[59]

Sir William Osler once said: "The teacher's life should have three periods, study until age twenty-five, investigation until forty, profession until sixty, at which age I would have him retired on a double allowance."[60]

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