Research

The Aging Surgeon: Evidence and Experience

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Abstract

Background: With doctors in short supply and a strong demand for surgeon services in all areas of the United States, urban and rural, there are pressures to remain in active practice for longer. Even with an older workforce, there are currently no requirements for when a surgeon must retire in the United States.

Objectives: The aim of this article was to highlight the importance of the aging surgeon to the medical community and to provide an evidence-based overview of age-related cognitive and physical issues that develop during the later stages of a surgeon's career.

Methods: A search of the PubMed/MEDLINE database was performed for the phrase "aging surgeon." Inclusion criteria were applied to include only those articles related to surgeon age or retirement. Additional reports were handpicked from citations to substantiate claims with statistical evidence.

Results: The aging surgeon contributes extensive experience to patient care, but is also prone to age-related changes in cognition, vision, movement, and stress as it relates to new techniques, surgical performance, and safety measures. Studies show that although surgeons are capable of operating well into their senior years, there is the potential of decline. Nevertheless, there are proven recommendations on how to prepare an older surgeon for retirement.

Conclusions: Age-related trends in cognitive and physical decline must be counterbalanced with wisdom gained through decades of surgical experience.

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Excellence in surgery can happen at any age, but the aging surgeon's decades of experience is unparalleled and cannot be taught. A heightened sense of value during active clinical practice is cited as the most common reason why surgeons continue to operate.[1] This is augmented by the number of years it takes to reach autonomy in the operating room; by the time surgeons can practice independently, age is already significant.[2] Fears of identity, livelihood, and status are further concerning to surgeons who are on the brink of retirement,[3] especially with increasing life expectancy.[4]

Some surgeons cannot wait to retire, whereas others, with reservations, continue to be productive in spite of their age. Regardless, they too are human, and are therefore prone to the same ubiquitous neurological and physical changes related to the aging process that affect everyone.[5] The decision on retirement is compounded by a lack of formal guidelines in medicine,[6] despite the age of the surgical workforce being well-documented. The American Medical Association found, in 2015, that about 1 in 4 physicians was older than 65.[7] The American College of Surgeons noted, in 2016, that roughly one-third of surgeons was older than 55.[8] A 2017 survey by the Association of American Medical Colleges showed that 44.1% of all physicians and 49.0% of surgeons were older than 55.[9]

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These societal bodies currently possess no restrictions on practicing age in the United States.[7-9] Moreover, only a handful of institutions have explored pilot programs to outline aging protocols, but none are universally recognized across the surgical field.[10]

We present here a review of the current literature that outlines the evidence behind what happens when a surgeon ages (vs commonly held beliefs that are not grounded in published data) and the resultant recommendations for how the aging surgeon can transition away from clinical practice without stepping away altogether.

METHODS

A preliminary search of the literature on how aging affects surgeons was undertaken as a scoping exercise in September 2020 (J.E.J.). Next, a search of the PubMed/MEDLINE (U.S. National Library of Medicine, Bethesda, MD) database was performed for the phrase "aging surgeon" (D.B.A.). Screening by title allowed us to exclude articles not related to surgeon age or retirement. Screening by text allowed us to exclude articles without full access. Further text screening allowed us to exclude articles whose primary purpose was to give informal suggestions. Additional articles were handpicked from papers cited within the primary search in order to substantiate facts with numerical evidence. Both authors agreed on the selection of articles.

RESULTS

The initial literature return yielded 3359 results, which was reduced to 17 after inclusion criteria were applied, and increased to 77 after reports were individually added (Figure 1).

Human Physiology

When Powell and Whitla created the MicroCog (The Psychological Corporation, San Antonio, TX) test of cognitive function in 1994 and administered it to physicians and nonphysicians, the physician group scored better at each age, which corroborates the high functioning and intelligence of physicians.[11] However, the same study found a marked decrease with age in both groups, indicating that age-related changes in physiology occur regardless of profession.[11] There is a predictable age-related degeneration across multiple domains of cognitive function,[4,12] and a pronounced decline is seen after the age of 65.[11,13] Although individual variations exist, there is diminishing capacity to focus attention (selective and sustained), correlate information, and inhibit incorrect rationale.[11,14-16] These accompany diminishing processing speed, clinical reasoning, and adaptive thinking.[17] Short-term memory and the ability to arrive at a solution to fix problems, both of which are crucial to a surgeon, are also affected.[18-21] Reaction time, important in instances of surgical error, is yet another domain that is heavily influenced by age.[22] In addition to physiological changes, anatomic changes occur with age,[23] such as shrinking of the frontal lobes, which may influence insight and judgment and has been shown to have an impact in the clinical setting.[24] Furthermore, an increase in ventricular size, decrease in overall healthy brain tissue, and a reduction in neuron size and synapse quantity can contribute to clinical impact.[25-27] Certain areas of cognitive function are preserved, however, including semantic understanding, verbal skills, and cumulative knowledge, which seemingly establishes clinical wisdom.[15,17,28,29] This wisdom, albeit significant, is unable to compensate for the unavoidable age-related declines that affect the complex tasks involved in surgery.[30]

Standard prescription glasses, loupes, and microscopes assist surgeons with detail when operating, but ideal vision for anyone has an expiration date. A surgeon's capability to continuously identify such detail becomes impacted by ocular optics and degeneration of visual neural pathways, which alter visual acuity, depth and motion perception, peripheral visual field and temporal sensitivity, and color discrimination.[17,31,32] The lenses of the eyes begin to harden and the pupils begin to shrink, necessitating greater illumination in the operating room and increased optical compensation through eyewear; by age 55, 100% more illumination is required for optimal performance.[31-33]

Age is commonly associated with the slowing of physical activity. The motor cortex does not reorganize and accommodate new information gathered by practice and repeated training as a surgeon ages.[19] Movements become less integrated with cognitive thinking.[34] When decisions are involved, the aging surgeon responds more slowly to spatial motor tasks.[35] Aging further influences coordinated movements.[36] Hand dexterity, which is fundamental to the success of a surgeon, is known to deteriorate with increasing age.[37,38] Although an older surgeon can reach performance levels comparable to those of a younger surgeon, control and manual force remain problematic.[39] To counteract this, intuition is hypothesized to take over.[6]

Physical and psychological stress can come into play the longer a surgeon is in practice. Fatigue begins to interfere with work.[40] Musculoskeletal complaints, as a consequence of long operations and high case volumes, become apparent.[41,42] Burnout (seen in 40% of surveyed surgeons) in the form of depersonalization, depression, anxiety, sleep disturbance, substance abuse, and lowered immunity is rampant in the older population of surgeons,[43,44] but this claim has been challenged by those who state they learn lessons on how to cope with impending burnout over time.[45] Suicidal ideation, as well

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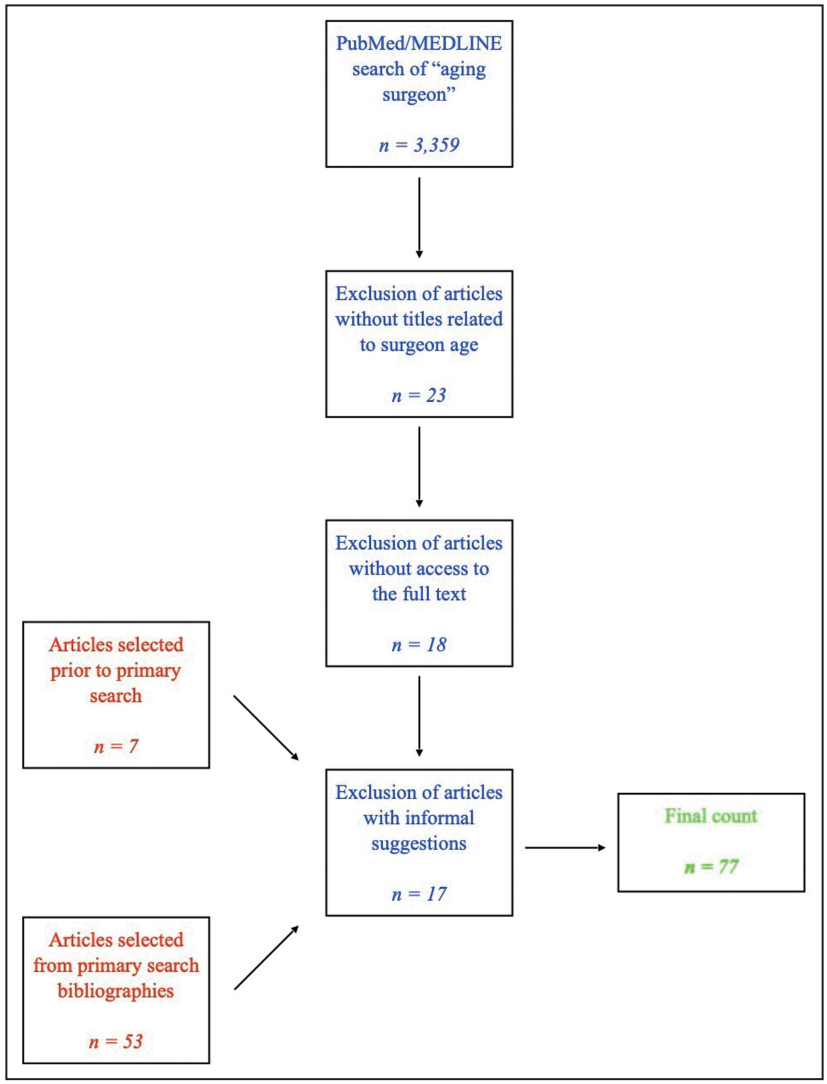

Figure 1. Method of article collection for literature review.

as a denial of psychiatric illness, is increasingly omnipresent, with 10% to 15% of all surgeons opting out of their careers as a consequence.[46]

New Techniques

Over the last several decades, surgical training has evolved to decrease morbidity by the advent of minimally invasive procedures such as laparoscopic and robotic surgery. Yet, for the reasons listed above detailing a decline in the acquisition of new and fine motor skills, there can be a steep learning curve for the aging surgeon, who is often reluctant to incorporate new techniques.[29,47] In 2005, Neumayer et al even noted increased recurrence rates after laparoscopic hernia repair performed by surgeons over the age of 45.[48] As for research, this sector not only adds novel information to the medical community, but can sometimes cause a major alteration to a surgical algorithm, and the aging surgeon is more likely to stick with what is familiar.[49,50]

Surgical Performance

Older surgeons have been observed to achieve better clinical outcomes than their younger counterparts, as the former have greater experience dealing with perioperative and postoperative complications. Specifically, Tsugawa et al found adjusted operative mortality rates of 6.6%, 6.5%, 6.4%, and 6.3% for surgeons aged under 40, 40 to 49, 50 to 59, and 60 and over, respectively (P = 0.0001).[51] In contrast, there is an increasing body of literature that has found worse outcomes.[48,52-57] As

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an example, Waljee et al showed that surgeons 60 and over had higher mortality rates than those aged 41 to 50, with adjusted odds ratios of 1.21 (95% CI: 1.04-1.40) for carotid endarterectomy, 1.17 for coronary artery bypass grafting (95% CI: 1.05-1.29), and 1.67 for pancreatectomy (95% CI: 1.12-2.49).[56] The quality of care provided by the aging surgeon is not always on par with that of the younger attending,[55] with an inverse relation between years of experience and knowledge base,[55,58] which may also explain why older surgeons do not perform as well on recertification exams: scores were more than 7 percentage points lower for the 61 to 73 age group than for the 40 to 45 group on the first recertification exam in 1980.[59] Standards of practice for diagnosis, screening, and prevention are less likely adhered to by the aging surgeon.[55,60] Inappropriate prescribing of medication is another issue among this population, with older age correlated to only 40.8% of appropriateness of prescribing.[61,62] Some studies do suggest that although there is no relation between surgeon age and mortality, hospital length of stay is significantly increased, especially in patients who undergo abdominal, cardiovascular, and orthopedic procedures.[63]

Safety Measures

Regulations to identify aging surgeons who elevate risk to patients during and following surgical procedures are scarce, if nonexistent, which is not a fault of the surgeons themselves. The policing of the surgical profession is consequently almost entirely up to peers, and there exists minimal scrutiny of the aging surgeon, as would be expected with the senior figurehead in any field of work.[64,65] Studies indicate that a physician is more likely to report a colleague who is impaired due to substance abuse than neuropsychological collapse.[66,67] In medicine, senior physicians are highly respected,[64,65] thereby putting those below them in an awkward position when it comes to reporting. These younger colleagues may additionally act as enablers by assigning senior residents and the best surgical staff to cases headed by an aging surgeon.[64,65] Lastly, change performance is not easy to document, and thus a worrisome surgeon may only fall into a gray zone that remains in the standard of care.[64,65]

Retirement

Implementing a mandatory retirement age would be unfair given the variability in function with age, but requiring objective periodic testing has value. Cognitive and psychomotor evaluation is the most direct way to address issues related to human physiology.[68,69] According to the Department of Surgery at the University of Toronto, having earlier discussions of career transitioning with aging surgeons makes retirement a more welcoming and anticipated process, and it is suggested that institutions establish a protocol to assist with such transition.[70] When combined with self-reflection of one's operative skills and outcomes over time, these modalities are likely to help surgeons decide on the appropriate timing for retirement.

Postretirement

The retired surgeon has multiple options for maintaining involvement in medicine. Intellectual stimulation and continuing contribution can be found through teaching and mentoring.[12,71] Whereas clinical teaching may not be appropriate for reasons mentioned above, teaching anatomy, history taking, physical examination, and basic surgical skills could be of great benefit to students.[72] Those who retire from the operating room do not necessarily have to retire from the hospital either—administrative positions can be held by these individuals, particularly in the form of surgical decision-makers.[71,73,74]

DISCUSSION

The aging surgeon is an invaluable asset to the medical community. A lifetime of experience equates to an unparalleled understanding of surgical care. These individuals also provide considerable economic worth to their healthcare systems and exceptional mentorship to future generations of physicians. With this background, aging surgeons impact the scientific literature, provide leadership, and bridge communication between institutional departments. Without them, there is truly no way to advance the realm of surgery.

Evidence-based, age-related changes in cognition, vision, and motor skills are inescapable. Competency is better off determined by objective evaluation of functional age rather than chronological age because of the great variation of abilities between individuals.[75] Large professional organizations should identify acceptable policies to address the aging surgeon while leaving institutions the flexibility to customize their approaches.[76] In this manner, transitioning to retirement would be an agreeable and productive process.

Reliable longitudinal testing of cognitive function and manual dexterity are needed both to elucidate predictive value and to correlate with surgical performance. If implemented, these tests can help quantitatively determine if deficits are associated with increasing age.[10] A multi-institutional study that collects data through a neuropsychological test battery and simulators has been proposed.[10] Although maintenance of certification by member medical boards is frequently considered

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adequate for knowledge tracing, accountability by peers must also be incorporated because of the everyday interactions of collegial surgeons, which no organization, institution, or board can observe.[77]

Although our search of the literature did not yield any evidence specific to plastic surgery, we can look at the aesthetic plastic surgeon as an example of another means of evaluation. In particular, aesthetic surgeons may not be directly assessed by anyone, and should openly welcome the concerns of patients, the toughest critics of all.[77]

CONCLUSIONS

There is a great challenge in striking a balance between surgeon preference to continue practicing and patient safety. It will be up to the surgical workforce and its many employing institutions to develop a plan that negotiates both, thereby permitting a robust and secure future of surgery.

As long as the surgeon exemplifies the appropriate level of competence and skill, there is no reason to stop operating.

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