

We would like to thank the Reviewer and Editor for their thoughtful comments. We have responded to all the comments and changed the manuscript accordingly.

Responses to the Reviewer

1. The authors mention in both the introduction and discussion that increasing surgeon age is associated with worse outcomes. That assertion is not clear in the literature, with some studies showing worse outcomes and some showing reasonable or even better outcomes. One study showed worse outcomes only for low volume older surgeons. In general, the weight of evidence agrees with the authors assertion, but it is not as clear-cut as they indicate. Among other studies that they might review are the following: O'Neill L, Neurology 2000; Tsugawa Y, BMJ 2018; Stevens H, Ann Surg 2018; Campbell RJ, JAMA Ophthal 2018; Guidry CA, Ann Surg 2016; Moon MR, Ann ThorSurg 2020; Waljee JF, Ann Surg 2006.

The reviewer is certainly correct in that this is somewhat of a controversial topic. There are indeed articles that support and contradict the statement. We have changed the wording in the 2nd paragraph of the Introduction section to reflect this uncertainty:

“The relationship between surgeon age and operative risk is controversial and uncertain, with some studies showing worse outcomes and some showing reasonable, or even better outcomes. Even so, there are accounts of prominent older surgeons struggling with simple fine motor skills and clinical decision making; while various studies have demonstrated that senior surgeons have worse outcomes than their younger colleagues, suggesting surgeon age is an operative risk factor.”

Likewise, the 3rd paragraph in the Discussion has been modified to

“Despite age being a variable process, the potential association within the surgical profession between increasing age and poorer operative outcomes has been reported in some studies.”

Although we do not want to do a comprehensive review of the relationship of surgeon age and outcome, we have added the following references to provide a more balanced view:

The following references have been added that have found no difference in surgical outcomes with surgeon age:

1. Tsugawa Y, Jena AB, Orav EJ, Blumenthal DM, Tsai TC, Mehtsun WT, Jha AK. Age and sex of surgeons and mortality of older surgical patients: observational study. BMJ. 2018 Apr 25;361:k1343. doi: 10.1136/bmj.k1343. PMID: 29695473

2. Effect of Surgeon Age on Bariatric Surgery Outcomes.

Stevens H, Carlin AM, Ross R, Stricklen A, Wood MH, Ghaferi AA.

Ann Surg. 2018 May;267(5):905-909. doi: 10.1097/SLA.0000000000002297.

PMID: 28486391

3. Waljee JF, Greenfield LJ, Dimick JB, Birkmeyer JD. Surgeon age and operative mortality in the United States. Ann Surg. 2006 Sep;244(3):353-62. doi: 10.1097/01.sla.0000234803.11991.6d. PMID: 16926561

As well, we have added these references that demonstrate an effect of older age on surgical results:

4. Moon MR, Henn MC, Maniar HS, Pasque MK, Melby SJ, Kachroo P, Masood MF, Itoh A, Kotkar KD, Munfakh NA, Damiano RJ Jr. Impact of Surgical Experience on Operative Mortality After Reoperative Cardiac Surgery. *Ann Thorac Surg*. 2020 Dec;110(6):1909-1916. doi: 10.1016/j.athoracsur.2020.04.077. Epub 2020 Jun 3. PMID: 32504601

5. Matar HE, Jenkinson R, Pincus D, Satkunasivam R, Paterson JM, Ravi B. The Association Between Surgeon Age and Early Surgical Complications of Elective Total Hip Arthroplasty: Propensity-Matched Cohort Study (122,043 Patients). *J Arthroplasty*. 2021 Feb;36(2):579-585. doi: 10.1016/j.arth.2020.08.040. Epub 2020 Aug 22. PMID: 32948425

2. There are more than 9 hospitals with late career practitioner policies just in the United States. I understand that the authors were only able to find those with him on line presence. Other hospitals with known policies include the following: Stanford Lifebridge (Sinai, Northwest, Carroll) University of Virginia Health System Intermountain Health University of Pennsylvania Scripps Health, San Diego Eisenhower Medical Center, Rancho Mirage Driscoll Children's Hospital Legacy Health Providence St. Joseph Health Peace Health Southwest Cooper University Healthcare Pittsburgh UPMC Virtua Health Main Line Health Yale New Haven Arkansas Children's Tahoe Forest Health System Banner Health University of Utah Surgery (Each Dept at U of U credentials their own house)

The late practitioner policy at Stanford and Yale was already included in the manuscript, however, as the reviewer has pointed out, there are several late career practitioner policies that are not necessarily readily available to the public and on the internet. We have attempted to find the specifics of the late practitioner policies for the hospitals the reviewer listed. Although the specifics of the policy are not available online, this is an extremely important point and therefore, we have expanded this limitation in the Discussion section as follows:

"The number of late practitioner policies identified was also small, as they needed to be accessible online. It is clear that other policies exist, some of which have been referenced to online, such as Sharp Rees-Stealy Medical Group (SRSMG), Intermountain Healthcare in Utah, Scripps Health network in San Diego, Arkansas Children's Hospital, Cooper University Hospital, University of Pittsburgh Medical Center, and Virtua Health.^{ref 6,7} However, their policies are not explicitly described so that it is unclear whether or not these policies address older surgeon competence in a similar manner to the policies discussed in this study, or in a manner separate from cognitive testing or peer-assessment. As well, there are likely other late practitioner policies that exist but are not present online."

6. <https://www.medpagetoday.com/publichealthpolicy/generalprofessionalissues/78716>. Accessed January 24, 2021.

7. <https://www.physicianleaders.org/news/balancing-safety-with-dignity-when-evaluating-aging-practitioners>. Accessed January 24, 2021.

3. Sinai Hospital of Baltimore's aging surgeon program is not a late career practitioner program. Table 2 as well as the text in the manuscript are therefore wrong. I am familiar with this hospital.

They do have a late career practitioner policy which applies to all practitioners over the age of 75 regardless of specialty (see Katlic MR and Coleman J. Properly Balancing Safety with Dignity (Late Career Practitioner Policy). Physician Leadership Journal 2018; 5: 34-38.). However, the aging surgeon program is completely separate and different. It is a comprehensive 2-day evaluation of a surgeon's physical and cognitive capabilities. The aging surgeon program is specifically for surgeons sent to Baltimore by their hospitals for this comprehensive assessment. To my knowledge this particular program is unique. The authors reference the Katlic paper about this program, but did not understand that it is not a late career practitioner policy but rather a discrete comprehensive program.

Thank you for the correction. The reference in the manuscript, Katlic MR, Coleman J. The aging surgeon. Ann Surg. 2014;260:199-201, clearly identifies the program as THE AGING SURGEON PROGRAM and outlines the 2-day program that you have described, as does reference 25 - "The Aging Surgeon Program". The error was in Table 2 where the program was incorrectly described. This Table has been revised as follows.

Objective: Designed to protect patients from unsafe surgeons and guard surgeons from arbitrary or unreliable methods of assessing competence or cognitive capacity. The program can identify potentially treatable or reversible disorders that, if properly treated, could restore or improve functional capacity.

4. Abbreviations in the manuscript should be spelled out the first time that they are used, for example OSATS, GOALS, GEARS and more.

This has been done throughout the manuscript

5. The use of simulators would be wonderful but would need to be specialty specific and the specialty societies have not stepped up to build this type of program. Assessment of intraoperative videos has been studied, initially in Michigan with bariatric surgery, and was quite effective in distinguishing intraoperative skill and judgment. However, the barriers to broaden the use of this very labor-intensive process are enormous.

We completely agree with the reviewer. These concepts have been included in the Discussion section:

In the paragraph discussing the present limitations of simulators (Discussion section, paragraph 5), the following sentence has been added: "In addition, the use of simulators would need to be specialty specific and the specialty societies have not yet built these programs."

As well, we have modified the sentence in the 6th paragraph in the Discussion section: "In addition, even when there is a valid technique for objective assessment of competence in the execution of particular operations by surgeons, such as the assessment of intraoperative videos, there has been low utilization due to its labor-intensive nature involving human factors (cognitive engineering) expertise."

Responses to the Science Editor:

(1) The authors' information should be added in the first page

The information has been added as per the guidelines from the journal

(2) The "Author Contributions" section is missing. Please provide the author contributions

The information has been added at the end of the manuscript, as per the guidelines from the journal

(3) PMID and DOI numbers are missing in the reference list. Please provide the PubMed numbers and DOI citation numbers to the reference list and list all authors of the references. Please revise throughout

The reference section has been updated as to include the PMI and DOI numbers