Today, we’re going to talk with the lead author of an original research article that appears in the November 2017 issue of the journal. With us today is Dr. Deborah Culley. Dr. Culley is Associate Professor of Anesthesia at Harvard Medical School and an attending anesthesiologist who specializes in neuroanesthesia at the Brigham and Women’s Hospital here in Boston. She’s the lead author of an article titled “Poor Performance on a Preoperative Cognitive Screening Test Predicts Postoperative Complications in Older Orthopedic Surgical Patients.” Dr. Culley, thank you for joining me.

Dr. Deborah Culley: Thank you, Dr. Rathmell. This is a great opportunity to share our study with your audience.

Dr. James Rathmell: Dr. Culley, congratulations on the publication of your work. I know that you and your research team have had a longstanding interest in the effects of anesthesia on cognitive function, so it seems natural for your group to have taken your expertise into the preoperative realm and look carefully at preoperative cognitive function. Can you start by telling us why you got interested in the question of how preoperative cognitive function might affect the trajectory of recovery after surgery? What was your hypothesis for the study?

Dr. Deborah Culley: Those are both great questions. We got interested in the question of how perioperative cognitive performance might affect surgical outcomes based upon two things. The first was that we’ve been studying the effects of anesthesia, as you have previously mentioned, on cognitive performance for nearly 15 years in aged rodents. In the course of that work, we noticed that there was a significant amount of variability in the performance of older animals at baseline before surgery and anesthesia when compared to younger animals. So, that’s kind of where we start.

But then there was a lot of information also out in the literature, demonstrating that somewhere between 20 to 40% of community-dwelling elders have some level of cognitive impairment, as detected by these validated brief screening tools, and that would suggest to us that at least some percentage of the patients that are presenting for an elective surgical procedure are likely to have some degree of baseline cognitive impairment.

When we combine that with data demonstrating that cognitive impairment is associated with poor surgical outcomes, we thought it was important to start evaluating whether or not poor performance on a cognitive screening test administered in a busy preadmission testing center was associated with adverse patient outcomes, including things like discharge to place other than home; hospital length of stay; and delirium, which is one of the most common postoperative complications occurring in older surgical patients.

Dr. James Rathmell: Yes. We pulled together a team of experts not only in cognition but also in preoperative evaluation, including Angela Bader, one of our coauthors and is in charge of the preadmission testing center here at the Brigham and Women’s Hospital.

So, for this study, we enrolled patients in the preadmission testing center after obtaining informed consent. We then went on to administer that Mini-Cog screen to patients 65 years of age and older that were scheduled for an elective lower extremity joint replacement procedure, and then performed chart reviews to gather data on hospital length of stay; discharge destination—in other words, whether or not they were going home or to a care facility; and delirium. We also evaluated the patients for delirium formally by using the Confusion Assessment Method developed by Sharon Inouye on postoperative days one, two and three.

Dr. Deborah Culley: Sure. The Mini-Cog involves a three-item recall test from memory and a clock-drawing test that serves partially as a distractor to allow some time between the time that the patient recalls initially those three items, and then later has recall at a later point in time. It tests visual-spatial representation, recall and executive function, and only takes a couple of minutes to complete, which makes it very suitable for a busy preadmission testing center.

We chose the Mini-Cog because it was validated in community-based populations; it has minimal education, language or ethnic biases; and it’s highly sensitive and specific for cognitive impairment with really good inter-rater reliability.

Dr. Deborah Culley: So, it’s a pretty simple thing to do. Basically, what you do is you ask someone to remember three words. I’ll give you an example: things like banana, sunrise and chair. Then you ask them to say those three words back to you. After they’ve said them back to you correctly, then you give them a piece of paper that’s got a circle on it and ask them to draw on that piece of paper, inside the circle, the hours of the clock; and then set the time to ten minutes after 11. And then after that, you ask them to recall those three words.

Dr. Deborah Culley: For those individuals that can recall, each word is worth one point. And then if you have an appropriate clock you get two additional points, whereas for an inappropriate clock you get none. So, those individuals who have a total score of less than or equal to two points are thought to be cognitively impaired.

Dr. James Rathmell: Phew. I drew the clock right but I couldn’t remember the words.

Dr. Deborah Culley: [Laughter]

Dr. James Rathmell: It—it well, what’s important here is that you excluded older patients that had established diagnosis of dementia—those with major cognitive impairment. But even after your excluded patients with dementia, 24% of this group having elective total joint replacement
screened positive for probable cognitive impairment. Can you describe what level of cognitive impairment would look like when you’re talking to a patient like this, that’s screen in on the Mini-Cog?

Dr. Deborah Culley: That’s another great question. Consistent with what others have found, it’s really difficult to detect cognitive impairment without screening for it. So, most of the time these patients seem fairly normal, and often we would be really surprised by the results of the screening.

Dr. James Rathmell: So, these minor degrees of cognitive impairment that you detected are surprisingly common. Why do you think that these minor degrees of cognitive impairment might affect surgical outcome, and how did you go about selecting your primary outcome measure?

Dr. Deborah Culley: I’m not sure that I would call these minor degrees of cognitive impairment, as these screening tools are used in primary care to screen for dementia. So, there was a reasonable amount of information suggesting that with a cutoff of less than or equal to two on the Mini-Cog, that some of these patients likely had some significant degree of cognitive impairment.

As I’ve mentioned earlier, our basic science laboratory started and still does study the basic science mechanisms of cognitive impairment after surgery and anesthesia. So, we didn’t really have that much experience in clinical studies but we wanted to look at something that was important, and we noted a high percentage of these patients having lower extremity joint replacement surgery were being discharged to a care facility rather than home. This is something that older patients really don’t like to have happen. They really want to remain in their home. And so, we wondered whether or not baseline cognitive impairment was predictive of failure to return home after surgery, which would represent a patient-centered outcome.

Dr. James Rathmell: What did you find? Did patients’ scores on preoperative cognitive tests have any relationship to their outcomes after surgery?

Dr. Deborah Culley: Yes. We were surprised to the degree at which this brief cognitive screen identified patients who were at risk, not only for discharge to place other than home but also longer hospital length of stay and the development of postoperative delirium.

Dr. James Rathmell: So, preoperative cognitive impairment was associated not only with development of delirium postoperatively—I suppose that’s not so surprising—but also with longer hospital stays and a lower likelihood of going home upon hospital discharge. Why do you think these not-so-minor degrees of cognitive impairment have such a profound effect?

Dr. Deborah Culley: There are a number of possibilities and we really can’t say for sure, but it’s possible that they are less able to care for themselves independently and that this might be unmasked by surgery, which is a major stressor, and then identified as part of the postoperative physical therapy evaluation; or perhaps they’re then having trouble remembering things, like when to take their medications.

Dr. James Rathmell: Were there any limitations to your study or any glaring questions that remain unanswered?

Dr. Deborah Culley: Well, like with every study, I think you walk away with more questions going out of the study than you do walking in. We were concerned that the stress of performing the exams during the preoperative evaluation might lead to a high false positive rate, but we chose to look at it more like a cognitive stress test, similar to an exercise stress test that can be utilized to test the durability of the heart. So, we’re not sure that they necessarily have severe cognitive impairment, but rather a brain that is in some way compromised, that makes them more likely to have adverse outcomes. The other thing we didn’t do was evaluate frailty, and frailty is also known to be associated with adverse outcomes in our older surgical patients, so we intend to look at that in subsequent studies and populations.

Dr. James Rathmell: So, what comes next for you and your research group? Now that you’ve shown a clear link between preoperative cognitive impairment and postoperative complications, have you devised any way to routinely identify these patients that are at risk and improve their outcomes?

Dr. Deborah Culley: We’ve been working on exactly that. Our hope is that eventually we will be able to identify those patients at greatest risk, and that this work would allow us to be able to direct precious healthcare resources to those high-risk elderly patients that need it the most.

Dr. James Rathmell: I hope today’s discussion will lead many of you listening to read this new article that appears in the November 2017 issue of Anesthesiology to learn more about preoperative cognitive screening, cognitive impairment in the elderly, and its dramatic effect on surgical outcomes. Dr. Culley, thank you for joining us today, and thank you for the terrific discussion.

Dr. Deborah Culley: Thank you, Dr. Rathmell, for the opportunity to share our work with the anesthesiology community.

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