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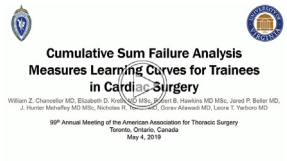

Conflict of Interest Statement

Dr Ailawadi is a consultant for Abbott, Edwards, Medtronic, Admedus, and Gore. All other authors have nothing to disclose with regard to commercial support.

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Key Words: education, training, fellowship, AVR, CABG

Discussion

Dr Prakash Punjabi *(London, United Kingdom)*. In the United Kingdom, public reporting of results has been going on for several years with the associated issues in terms of surgeon-specific mortality data, and we do that with the use of a variable life-adjusted display plot, which is done for institutions as well as surgeons.

My first question regards the case mix and validity of the model. As you are aware, there is a significant evidence base that subspecialty surgery, such as aortic and mitral, have superior outcomes when done in higher volume. In your model, 73% of the surgery is isolated aortic valve replacement or CABG, with only 40% being mitral valve surgery. On a practical perspective, this is 593 cases done by 19 residents, or 31 cases per resident over a 2-, 3-year period. If a surgeon has poor outcomes in one particular subspecialist field (eg, mitral valve surgery), does this model have the risk of being buried in a larger number of other cases, and so should this model be used for the same operation. What I am trying to say is, should you be doing specialist per case rather than using as a whole case mix to look at the trainee experience?

Dr W. Zachary Chancellor *(Charlottesville, Va)*. We chose to use both because it is a higher number and risk adjusted. We thought that the risk adjustment would account for any variation between the cases. However, I do see some utility in a world where we want to track our outcomes and training that looking at them individually is certainly possible and could be worthwhile.

Dr Punjabi. Second, coming to you on the angle that seeks to bring some evidence based on a learning curve, training, and the number of cases required to become competent, as you note, the Accreditation Council for Graduate Medical Education requirements are for 140 cases, 80 revascularizations and 60 vascular, and we heard this

morning about the different integrated ways of getting training. Figure 3 in your article suggested a learning curve of approximately 140 cases, no particular difference up to 200, and then potentially some improvement after that. In the United Kingdom, I and my colleagues have decided that a trainee needs to do between 200 and 250 cases before getting final certification to be a consultant. To play devil's advocate, does the further improvement beyond 200 cases suggest that the Accreditation Council for Graduate Medical Education requirement should be higher?

Dr Chancellor. I don't think that is what this analysis is showing. I can't speak to that based on this analysis. But the learning curve we saw does show the initial upslope, which shows higher than expected morbidity and mortality initially, but the downslope that levels off at approximately 140 cases indicates that they are actually doing better than expected. I think that one of the fallacies of overinterpreting these graphs is that a level line, no matter where it is on the graph, represents that the residents are doing well or doing as they are expected to do. They don't necessarily need to be downsloping all of the time.

Dr Punjabi. I take your point. I think you are right. It just brings out 2 other small points. One is the definition of ownership of a case by the trainee. As I am sure you will agree, training in different centers within the same country varies quite a lot in the definition of a case. However, my last comment is more about a practical aspect. As you know, a lot of our safety aspects come from the aviation industry. When a new pilot is learning to fly and the plane goes off course, it is taken over by the senior pilot. Presumably these operations and postoperative care were all done under the direct supervision of the attending surgeon, and sometimes the number of cases or the morbidity and the mortality cannot necessarily be blamed on the surgeon, on the training. What are the particular implications in terms of training to reassure the trainer and the institute that training can still be provided safe?

Dr Chancellor. That's an excellent question and one every institution struggles with and is one of the reasons that we used institution-specific data in this model, and every institution's curves are going to look a little different based on their approach. University of Virginia is all I can speak to personally, but I do know that residents do have quite a bit of operative autonomy; honestly, it's safe. The attending has oversight within the operating room and in the postoperative management. I do think that outcomes are reflective of the resident's management style. However, this particular analysis is not going to account for any oversight that the attending surgeon provides. I agree.

Dr Punjabi. I fully agree. Congratulations once again and look forward to further collaboration.

Dr Paul T. Sergeant *(Sint Joris Winge, Belgium).* I congratulate you for any work that is done on the learning process, but in fact what you have addressed is what is called in the science of learning operational learning or organizational learning, and that is preceded by all the different aspects of induced learning. The whole discussion about number of cases is, according to the science of learning, totally irrelevant. What is important is the process that precedes the operational and organizational learning.

A resident who does a case should, by definition, have the same result as the standard of that same unit. It cannot be accepted by society that a resident has a lower performance. You are absolutely right when you made the statement on line. We have been using exactly the method that you have described for more than 20 years in our residency training program, but on line, immediately, so that we can track immediately any deviation from the Cusum lines.

I congratulate you for your effort. There is only one additional limitation that you have not addressed. You are conceptually looking at maybe an incomplete perspective. The surgeon today is a member of a team. So you are only addressing the surgeon as the only member of the team. In fact, today we work as a team.

The crew resource management, as it is called, is an important matter on which we must evaluate our young residents. And so putting the young surgeon as responsible for a negative outcome is I think an outdated concept. It is the interaction with anesthesia, it is intensive care. It, of course, changes from country and from different socioeconomic environments. But we must get rid of that idea.

The consequence of the inappropriate surgeon-focused outcome monitoring is that some surgeons have had their career closed. Some very good surgeons had their career closed because of inappropriate public reporting. The reporting was catastrophic, but their performance was not.