How do you figure out how much of a delay to schedule when 2 surgeons are operating in the same OR on the same day? If you are using a seat-of-the-pants estimate, there is a better way using data you probably already have on hand.

Consider the following scenario:

• An outpatient surgery center has full-time hourly employees who work at least 8 hours each work day Monday through Friday. Scheduled hours are 7 am to 3 pm. There are virtually no cases added on the day of surgery.
• OR 4 is allocated on Fridays as first-come first-served, open, unblocked OR time for use by surgeons who do not schedule enough cases on Fridays to fill an entire OR.
• On Thursday at 12 noon, OR 4 has 4 cases scheduled for Friday: From 7 am to 11:30 am, Surgeon D has 3 cases. Then, from 11:45 am to 1:45 pm, Surgeon E has one case. 
• No case can likely be moved from OR 1, OR 2, or OR 3 into OR 4.
• Surgeon D has probably underestimated the durations of his 3 cases.

In this scenario, there is no disadvantage to scheduling Surgeon E’s case to start somewhat later (eg, 12:15 pm). Doing so would reduce the average expected time the patient would have to wait after arrival on the day of surgery. Doing so also would reduce the average time Surgeon E would be delayed upon arrival. And doing so likely would improve Surgeon E’s professional satisfaction.

The scheduler can call Surgeon E’s office and figure out if he or she would like to start a bit later. If so, a small delay is scheduled between Surgeon D and Surgeon E. Nice and simple.

Some OR managers will say: “This scenario doesn’t apply to my situation at all.” If so, skip this article.

If it does apply to you, the big question is how to make sure that if a delay is scheduled, Surgeon E does not take so long that the case ends after 3 pm, the end of the scheduled work day. That is where the science can help.

Maximum duration of scheduled delay

Suppose we could say: “There is a 90% chance that Surgeon E’s case will take no more than 2.5 hours.” Then Surgeon E’s case should be scheduled to start no later than 12:30 pm. (12:30 pm -3:00 pm = 2.5 hours).

The scheduled delay would then be the difference between 12:30 pm and the time Surgeon D’s cases are scheduled to end, at 11:30 AM. This maximum scheduled delay of 1 hour does not necessarily mean there would be a 1-hour gap between the end of Surgeon D’s cases and Surgeon E’s case. If on the day of surgery, Surgeon D finishes his last case later than scheduled, the actual delay between the 2 surgeons’ cases would be shorter than the scheduled delay. Unless Surgeon D finishes his cases after 12:30 pm, Surgeon E’s case would start at 12:30 pm.

Calculating the maximum scheduled delay

The trick is to figure out the longest time Surgeon E’s case will likely take. This can be done using historical case duration data, which is stored in most OR information systems, anesthesia information management systems, or anesthesia billing systems.

What is necessary is to use:

• the mean duration of cases of the same scheduled procedure, anesthetic, and surgeon
• the standard deviation of those cases and
• the number of such cases.

The mean, standard deviation, and N are used in the calculations. The standard deviation and N are used so the uncertainty in the estimated duration is included in the calculation. The final value is rounded to the nearest 15 minutes, so that the start time is some useful value like 12:30 pm instead of 12:32 pm. The equations are given in the paper by Dexter et al, 2004.

This works at getting the right answer using just historical case duration data. For single cases, the calculated 90% upper prediction bounds are at least as long as their actual duration for 90% ± 0.2% of cases (mean ± standard error). For pairs of cases, the 90% upper prediction bounds are at least as long as the actual duration for 91% ± 0.6%.

Just as the mathematics works so well in this situation, ad hoc efforts to estimate the answer work very poorly. Is it sufficient to use an average case duration and add a fudge factor to it (eg, 0.5 hr longer)? No, because the standard deviation varies among scheduled procedures, as does the number of historical cases (N). Dexter and Traub (2000) give some examples of how poorly this type of estimate performs.

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