Discussion of 2021-1749

USING PROCESS FLOW DISRUPTION ANALYSIS TO GUIDE QUALITY IMPROVEMENT

**DR AMY HILDRETH** (Winston‑Salem, NC): Thank you, President Chapman, Secretary Chung, members and quests for the opportunity to present Dr Julie Freischlag's comments on this work. She was unable to make the meeting today and her comments are as follows:

I would like to thank the authors and the Southern Surgical Association for the opportunity to discuss this novel work on the use of process flow disruption to guide quality improvement. As the authors highlight in their work, traditional quality improvement (QI) methods have focused on identifying less than optimal outcomes as a target for improvement and, by necessity, must look retrospectively for the source of these outcomes. Alternatively, simulation can be used to train surgical teams in advance to avoid adverse outcomes. However, simulations can never accurately represent the complexity of an actual surgical patient or the reality of the operative environment. Recognizing these challenges, Dr Slakey and colleagues explore an approach to quality improvement that seeks to proactively identify flow disruptions that may adversely affect patient outcomes.

The approach included interviews and direct case observations evaluating several elements including communication, followed by a targeted QI intervention. Not surprisingly, initial interviews revealed significant disagreement among categories of team members about the source of flow disruptions. Several potential QI projects were identified, and the authors report on the initial project completed related to extubation in the operating room, yielding impressive reductions in the incidence of postoperative respiratory failure over time.

I have several questions for the authors about the methodology and findings. First, how are the personnel chosen for interviews? Was the sampling convenience or random? What role did the interview results play in guiding case observations or the resulting QI topics? Likewise, could you discuss the process used to choose the cases for observation and the selection process for the 267 process elements used in the survey tool? Additionally, I imagine it was difficult for a single observer to capture all the elements on the list, given the many simultaneous activities that are carried out at a time in the operating room. How did you ensure that important elements were not missed?

Regarding the QI projects, how was the Sugammadex project chosen as the first one? Were there other concurrently running QI projects or other practice changes that could have influenced your results? You describe a 67.3% decrease in postoperative respiratory failure. How do you plan to track and maintain the durability of your results? Could you give us an idea of the costs associated with this approach to QI? The initial steps of your approach seem somewhat time and labor intensive for routine use. Finally, what are next steps for your group as you refine your approach?

**DR CLIFFORD Y KO** (Los Angeles, CA): I would like to congratulate Dr. Slakey on the work, and to the Southern Surgical for putting a study like this about process flow, process mapping, on to the program. As everyone knows, process mapping and process flow is not new. It is probably a hundred years old now. It started in the early 1900s by Deming when he looked at manufacturing, reliability, and quality, and began teaching it to the country. It was brought over to Japan where it helped Japanese companies become leaders in several industries in terms of manufacturing, improvement and reliability, and developed a number of techniques that we use today, such as Six Sigma, Lean. We even call it the Lean Production Method. Acronyms like DMAIC and PDSA all came from the idea of process mapping, and how we figure out what we are doing, and looking at the pain points to figure out how what we are doing can be done better. And so what Dr Slakey has done is investigated some processes within the hospitals, and asked, where are our pain points in terms of doing this? We are seeing more process mapping, flow disruptions in our hospitals today, in surgery and outside of surgery, because we are all trying to get to value‑based care. At the American College of Surgeons, as a small project, Frank Opelka is in the audience. Frank Opelka and Dr Hoyt are leading an effort with the Harvard Business School to really process and map out, some people in the audience have participated in this with us, different aspects of where and what the flow is, what the cost is, to determine the production cost of developing and providing a service. Whether it is breast care, colon care, or whatever it may be, how do we figure out the cost to deliver this care so that when we are offering it, contracting with it, and when we are being reimbursed from it, we know exactly what we are doing. This is essentially what Deming did 100 years ago and what Toyota has been doing for decades. This is what we are trying to do within health care.

I have three questions for Dr Slakey. First, it seems plausible that addressing disruptions in process flow will absolutely improve efficiency. We will spend a shorter amount of time in the operating room, and for many of us, it is a race to the bottom. You also found that you improved the numerator of the value equation, the quality piece. You mentioned in the story here, and in the paper, the use of Sugammadex in doing this. What I am wondering is, when you were looking at this project, and probably hearing from the anesthesiologist that we need to use Sugammadex, was this something that was known before you did your process mapping and before you did your process flow disruption, or did you find this by doing the process of reliability looking at the process flow disruptions?

You have done a lot of process flow and process flow disruptions. Have you found other areas besides the use of an expensive drug that both improved efficiency as well as improved the numerator, improved quality, such as metric of postop respiratory failure?

What is the take‑home message and how do we do this? You look at process flows in three areas, in three ways: simple, complicated, and complex. I think we all agree that most of what we do in the hospital is complex; it is not predictable and does not always respond to top‑down improvement. How should we do this? Can you process map complex things? Or do we need a process map engineer to do this, and what if we don't have one? How do we all improve our value using this technology if we don't have those resources?

**DR HENRY PITT** (Philadelphia, PA): Patient Safety Indicator (PSI) 11 (postoperative respiratory failure) has two parts: prolonged intubation and unplanned intubation. Presumably, in the early postoperative period you were dealing with unplanned reintubation. As a Chief Quality Officer for the past fifteen years, I have been following these metrics and have observed that they rarely occur right after surgery. So, my first question is why were you having this issue that needed a change in process in the recovery room?

When I was at the Indiana University Medical Center, we had an opportunity to improve PSI 11 and unplanned intubation in our NSQIP patients. Therefore, we did an extensive study which we published in *Surgery* in 2013. We found that the majority of unplanned intubations occurred 7 to 10 days postoperatively in patients with intraabdominal sepsis in whom the diagnosis was delayed. The second most common cause for unplanned intubation was aspiration in patients with abdominal distension who were taking opioids and were being fed but had an ileus or a partial small bowel obstruction. Again, your experience with PSI 11 is very different from mine. Do you have an explanation for this difference?

**DR JENNIFER ROSEN** (Washington, DC): Coming from Endocrine Surgery where I essentially do the same operation six to eight times a week for 30 years until retirement, I would very much appreciate seeing this applied to turnover time for para‑ and thyroidectomy. As we all know, there are many things that add to difficulties with turnover time as one issue. The union structure can be one thing to work with, staff changes and location of the PTH machine. In my area of the world, we are often encouraged to measure what is changeable, look for early successes, rather than the more difficult questions.

After you stopped watching and measuring, did you look or do an interrupted time analysis to see whether things returned to normal afterwards or not? Could you achieve sustained changes?

Did you look at impact? What had the largest impact but was just more difficult? And what is your next step?

**DR JEFFREY UPPERMAN** (Nashville, TN): As a closet sociologist, I love seeing this work out there. A couple questions regarding when, really, the rubber meets the road. Who is going to be the air traffic controller in this process world? And, in terms of that outcome measure, starting at the end, is revenue or value, is that going to be the best outcome measure as we look to attack the many different systems that we have in our facilities? Is there such thing as a system biome in the way we could look in real-time and at any given moment what the system of systems is in our facilities and how we could potentially intervene to really correct where we are going forward.

**DR DOUGLAS P SLAKEY** (Chicago, IL): First and foremost, we really did approach this as a value‑based improvement project. The concept was that if we could show improvement in quality, the reduction in cost, increase in efficiency, and other metrics that would contribute to value, it would therefore follow. And that is a bit of a different approach than what others have looked for before.

One of the greatest challenges, and I will jump to Dr Pitts' question, was that it is difficult to determine the outcome measure, and which is most appropriate. We really do not know. As we look at these clusters of flow disruptions and we look to improve these groups of process flow, we do not necessarily know the optimal outcome to measure.

In this case, one of the outcomes was PSI 11. It was improved across all different patients. In a complex system, you cannot really break it down with classic regression analysis that we are all familiar with to subdivide them into groups. In fact, we avoided doing that because we believe that if we are in a complex environment, there are unintended consequences of everything we do. I think we have all heard the term "butterfly effect," which interestingly goes back to 1963 in climate change publications, which is sort of timely today. That is the hallmark of this work; to try to avoid reductionist philosophy and look broadly at how we are doing.

We did have 5 different QI projects that were going simultaneously: this one; one on acute kidney injury and urinary retention; glucose control, which you may have seen in that graft is not very good; DVT; and then postoperative hemorrhage hematoma. When you think through the challenges of complexity, one of them is that there is so much that is inherently unknowable. The next transformational shift, I believe, and what we are already partnering with experts on in industry, is the application of artificial intelligence in machine learning to get to the next evolution of how we address these comprehensively. You just cannot do this through traditional historic statistical modelling, it does not work.

Dr Hildreth and Dr Freischlag asked about the interviews. They were random. Within one facility, we tried to get to as a diverse group as possible. The trained observers with the process flow certainly may have missed things, but because it was such a structured tool, and because it was over a 4‑month period, there was so much data we felt very confident we really understood some of the nuances. And finally, the thing about a system within a system is, I am fortunate we have 26 hospitals within our system, and we are pushing these findings out, so we start in a test case, arguably our largest, most complex hospital, then we push out across the system. There is remarkable buy‑in. It is interesting that because we look at the different stakeholder outcomes, we can show improvement or value for individuals and individual groups, which then transcend traditional siloed views of responsibility and roles in healthcare.