

How hospital leaders can harness intraoperative technology to fight SSIs in high-risk surgeries

As hospitals and health systems work to prevent surgical site infections – particularly in high risk abdominal surgeries, such as colorectal procedures, where patients face a significantly higher infection risk – surgeons can incorporate emerging medical technology during the intraoperative stage to protect patients against harmful bacteria that enter incisions during surgery.

Infection control during surgery is key to delivering better patient outcomes at a reduced cost. Financial and clinical repercussions of SSIs include increased morbidity, longer hospitalizations, higher readmission rates and greater healthcare costs. They represent a particularly important problem in colorectal and abdominal surgery, for which infection rates are disproportionately high. Colorectal surgery is consistently associated with SSI rates between 5 percent and 45 percent greater than other forms of surgery, according to a 2017 study¹ by the American College of Surgeons.

Traditionally, practices for preventing SSIs involve intravenous and oral antibiotics, controlling patients' glucose levels, using skin prep agents and maintaining optimal temperatures. Although these methods are effective and important components of any infection prevention bundle, many surgeons are still challenged to eliminate SSIs completely.

In the pursuit of zero percent infection rates in high-risk procedures, intraoperative infection control systems have emerged as a more technologically advanced approach to intraoperative surgical site infection control. These systems can be harnessed in conjunction with traditional infection prevention protocols in colorectal and abdominal surgery and aid surgeons toward the lowest possible infection rates.

Prescient Surgical, a medical device innovator in San Carlos, Calif., developed CleanCision, an intraoperative infection control system that works to potentially reduce patients' SSI risk. The system utilizes a novel active cleansing technology to combine wound protection and irrigation into a retraction system, which can actively and consistently clear harmful bacteria that may invade the incision during surgery.

After being incorporated into surgical and infection reduction protocols, CleanCision has been shown to reduce contamination following a colectomy by 66 percent² and SSI by 61 percent³ in a clinical study.

To ensure patients are healthy after surgery and prevent costly penalties from high SSI rates, hospitals can incorporate intraoperative systems into their infection control bundles, which are sets of interventions hospitals use to promote better patient outcomes and prevent SSIs.

Becker's Hospital Review joined three industry leaders in infection control to discuss evolving methods for SSI prevention, gaps in current SSI approaches and ways surgical teams and other hospital staff can more closely collaborate to reduce SSI risk. Roundtable participants included:

- Harry Papaconstantinou, MD, Chair, Department of Surgery at Temple, Texas-based Scott & White Medical Center and colorectal surgeon

- Charles Edmiston, PhD, emeritus professor of surgery and director of the surgical microbiology and hospital epidemiology research laboratory at Milwaukee-based Medical College of Wisconsin, State of Wisconsin Peer Champion for SSI Reduction
- Mark Welton, MD, MHCM, CMO of Minneapolis-based Fairview Health Services, colorectal surgeon and co-founder of Prescient Surgical

Note: Responses have been lightly edited for length and clarity.

Question: What are some of the biggest challenges in SSI prevention and control today?

Dr. Harry Papaconstantinou: If you look at different surgical procedures, colorectal surgery has the highest SSI rate and is often an unclear procedure. In colorectal surgeries, surgeons have to go across the bowel while doing a resection, which can cause bacterial exposure to a sterile field. We have to think about how to reduce that risk and how to prevent exposure to the wound.

Dr. Charles Edmiston: One of the biggest challenges in infection control and prevention is consistent compliance to infection control bundles. To improve compliance, I meet with surgical teams and operating room teams at hospitals that may have SSI issues to discuss evidence-based infection control bundles for their specific practices.

In 2011, I spoke with seven colorectal surgeons and the chief of surgery at a U.S. hospital with a large colorectal practice to figure out what would be an appropriate number of evidence-based interventions to include in a surgical bundle. After hammering it out, everyone agreed to accept this bundle concept. Months later, the chief of surgery told me, 'What you're selling isn't working. We put your bundle of interventions in place and it didn't reduce our SSI rate.' When I asked what the compliance of these bundles was, he had no idea what that was. I learned a lot from that experience because surgeons have historically been perceived as captains of the ship, but they're not masters of their patients' destinies. There are so many things happening around patients that surgeons cannot control, and I realized that if I propose a bundle to a healthcare professional, there has to be some mechanism in place to provide compliance to that bundle.

Now, as I talk to my surgical colleagues about how to improve their practices, I need to have the complete buy-in of not just the surgeon, but the institution, particularly the institution's quality personnel, because they actually measure how the hospital is complying with each component of the infection control bundle. Risk reduction is not a solo recital – it's a symphony, and everyone in healthcare is a member of the orchestra.

Q: Why are some hospitals more effective at lowering SSI rates than others?

Dr. Mark Welton: First, hospitals that are more effective at lowering wound infection rates engage physicians and hospital leaders to focus on the importance of driving these rates down. The second part is hospitals have to commit sufficient resources to those areas to increase awareness and innovate ways to drive rates down. Driving wound infection rates down is a multidisciplinary task involving a hospital's anesthesia, surgery and nursing departments.

Q: What risks do hospitals face if they are unable to keep SSI rates down?

HP: Risks include the cost of care, CMS penalties and reimbursement issues. Since the average SSI can cost between \$3,000 and \$15,000, this added expense can be quite taxing to a hospital's financial stability. Reducing the incidence of SSIs across the board is not only important financially, but can also impact hospital reputation and referral patterns through public reporting of outcomes.

CE: CMS' Hospital Compare website lets patients search hospitals by zip code and look at their healthcare-associated infections, readmission rates and other morbidities to see if that hospital is either at, below or above the national level. Patients are consumers, and if they feel uncomfortable with the Hospital Compare results, such as seeing a hospital that is unable to keep SSI rates down, that's a patient that institution could lose.

Q: What is the role of SSI infection control and prevention methods during the intraoperative stage in colorectal and abdominal surgeries?

CE: In terms of standard interventional strategies that can be used intraoperatively, in colorectal surgery, we have used supplemental oxygen to enhance immune process in the tissue bed, change gloves at closure and have also given patients oral antibiotics and mechanical bowel prep. Additionally, many colorectal surgeons have embraced wound edge protectors, which are plastic, sleeve-like devices you put into the wound to protect its internal margins. Another strategy that I've been interested in is wound irrigation. There is an old surgical adage "the solution to pollution is dilution," which makes a lot of sense. We are seeing more and more interest in what kinds of irrigation fluids would be optimal for some of these higher-risk procedures that have a potential risk for bacterial contamination.

Q: Overall, SSI rates have been declining in U.S. hospitals, yet published data suggests SSI rates are still high for certain types of high-risk abdominal surgeries. Should hospitals consider newer methods of SSI prevention and control for these surgeries?

MW: Yes, hospitals should consider newer methods for these surgeries. Since hospitals and clinicians can't address patients' preexisting conditions, such as obesity, which is a major risk factor for SSIs, we have to think about ways to innovate around these preexisting conditions and gain better local control of the wound. Additionally, a risk factor for wound infection is a dry, desiccated and cold wound, so hospitals need to consider how to keep the wound warm and moist.

Q: What role does emerging medical technology play in the new bundle approach to infection prevention and control?

HP: In terms of new technologies, we're always looking to see if a technology might reduce the complication rate while providing value to the patient and procedure. In a published study where we looked at a novel wound retractor that combines continuous irrigation and barrier protection, the retractor was shown to reduce wound contamination in colorectal operations.

MW: Incorporating an emerging medical technology such as CleanCision into a bundle approach is a difficult decision for a hospital to make because they are focused on the upfront cost compared to other options. But I think it's an easy decision if you look at bundled care. My argument would be that hospitals can use these technologies to drive down wound infection rates, which also decreases the facility's readmissions and skilled nursing visits for wound dressing changes multiple times a week. The upfront cost is mitigated by the understanding that you're preventing all these other future costs.

Q: How should medical technology aid the efforts of surgical and infection control teams and processes?

CE: To validate whether an innovative technology really is beneficial in aiding the efforts of surgical and infection control teams and processes, hospitals need to consider four metrics. The device needs to be safe, whether it is being used intraoperatively, postoperatively or prior to surgery. If it is an antimicrobial technology, it must be effective against gram-positive and gram-negative surgical wound pathogens. The third metric is evidence-based clinical effectiveness, and the final metric is cost effectiveness. If I use this technology to reduce infection risk and get that patient home and back to work, that's a very effective technology.

Q: How can surgical and infection control teams better collaborate to prevent and control SSIs?

HP: No. 1 is transparency and communication. I frequently see a lack of effective communication between teams about specific nuances of cases. There are a lot of things to learn about every SSI case, and the best way to learn is to have a multidisciplinary approach to talk about it.

If an SSI comes up, that case is reviewed not only by the infection control group, but also by the surgeon that performed the operation. They talk about the case to ensure documentation is correct and discuss strategies that could have prevented the SSI. As a result of this multidisciplinary approach, we have standardized strategies such as changing our gowns and gloves and using newly opened sterile instrument trays before surgical wound closure.

CE: When I was a hospital epidemiologist, I realized we need to have an open dialogue with surgical practitioners so they would be willing to come to us when they have a problem and are receptive to us when discussing the issue. I also realized surgeons know their patients better than we were ever going to. The surgeons could provide more conclusive insight in terms of what was going on during the operation or what their thoughts were about the patient in terms of comorbid risk.

Q: Dr. Welton, what are some of the reasons why you co-founded a company devoted to infection control and prevention technology?

MW: My primary motivation in being part of this company was to improve outcomes for the patient, rather than develop a technology that would decrease hospital readmissions or length of stay.

Patients view wound infections as a devastating complication, a sign that something went wrong during the operation. They have to pack their wounds and have prolonged hospital stays, as a result of these infections, which can be a difficult and unpleasant experience.

I thought this technology was the best thing for patients because when they have a clean incision that heals nicely, they avoid the complications of an incisional hernia or another operation and won't have to take as much time away from work and their families.

As colorectal surgeons, we recognize that we may see wound infections because we're opening the colon. But, we'd all like that number to be zero. The CleanCision technology could potentially allow us to leapfrog ahead to get closer to that goal. ■

References

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²Papaconstantinou, H.T., Ricciardi, R., Margolin, D.A. et al. (2018) 'A Novel Wound Retractor Combining Continuous Irrigation and Barrier Protection Reduces Incisional Contamination in Colorectal Surgery', *World J Surg* (Published online March 9, 2018) DOI: 10.1007/s00268-018-4568-z.

³Papaconstantinou HT, Ricciardi R, Margolin D, et al. Impact of Novel Wound Protection Device on Observed vs. Expected Surgical Site Infection Rates Following Colectomy Using the National Surgical Quality Improvement Program Risk Calculator. Paper presented at: WSA 2017 Annual Meeting 2017; Scottsdale, AZ.