



# Understanding Sterile Field Challenges with Robotic-Assisted Surgery

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# 01 Introduction

Maintaining a sterile environment in the operating room is a fundamental concern for reducing the incidence of intraoperative surgical site infection. Among the challenges in preventing contamination, utilization of large equipment positioned around the patient, such as Robotic-Assisted Surgery (RAS) systems, emerges as a concern due to the management of these devices within the sterile field. This white paper explores the significance of keeping the sterile field free of equipment during surgery, exploring the ramifications of sterile contamination, flow disruptions caused by overcrowded surgical environments, and need for emergency access to the patient. It also highlights the RAS systems developed by Asensus Surgical that are designed to minimize the impact of equipment in the sterile field, optimizing patient outcomes and fostering a culture of patient-centric care.

# 02 Why does it matter?

Three primary factors are susceptible to influence when an RAS system occupies a significant portion of the sterile field:

## 1. Maintaining Sterility

Increased risk of contamination of the sterile field when occupied with additional equipment

## 2. Minimizing Flow Disruptions

Surgical staff flow disruptions are often caused by equipment

## 3. Maximizing Patient Access

In emergency situations, immediate direct patient access is critical

Surgical asepsis and the principles of sterile technique guidelines offer clear instruction around maintaining sterility. Any additional equipment or supplies added to a sterile field, even though sterilized or draped, can increase the risk of contamination. The same theory can apply to equipment that occupies the sterile space around the operating table: the less equipment in this space, the less risk of introducing contaminants.

Patient access is critical throughout the surgical procedure. RAS equipment can negatively impact access during setup, particularly when multiple tasks are being performed simultaneously and large equipment is hindering the flow of traffic.<sup>1</sup> Less frequent, but even more critical is when an unplanned conversion to laparoscopy is necessary. In this scenario, any unnecessary equipment needs to be immediately removed from the working space around the patient. This is more easily done with an RAS system that is designed to reduce equipment within the sterile field around the table.

### 03 When does sterile occupancy matter?

Access to the sterile field is crucial at two distinct phases of the surgical procedure, aside from the obvious necessity during the direct patient intervention: (1) during the setup phase encompassing pre-docking and docking, and (2) during potential emergency transitions to a laparoscopy approach.



The setup phase often proves to be particularly susceptible to flow disruptions, primarily due to concurrent tasks aimed at expediting the preparation process for surgery. Recent research underscores the prevalence of flow disruptions during this phase, with a significant proportion occurring regardless of room size.<sup>1</sup> Notably, a substantial percentage of these disruptions stem from challenges posed by equipment obstructing or impeding the workflow of the operating room staff, often attributed to the size or positioning of robotic arms and bases.<sup>1</sup>

“Moving the robot towards the patient was the most disrupted task, caused by the robot being obstructed by or colliding with equipment (monitors, IV poles and drips, lights, and booms, the patient bed, anesthesia equipment, surgical tables, robotic equipment, trash cans, and cords on the floor). This is especially challenging, as the driver (usually OR staff) has to listen to the surgeon for guidance while simultaneously steering and avoiding obstacles. Often the driver is unsure of where the robot should dock in relation to the surgical anatomy. We noted damage to the robot, equipment, injury to team members or the patient, and a delay in the docking process.”<sup>2</sup>”

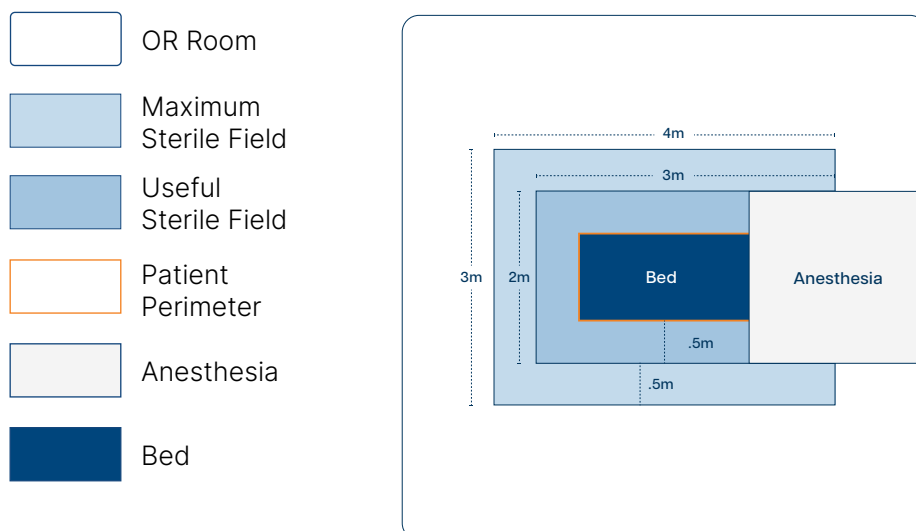
Conversions to laparoscopy represent a critical aspect of procedures, occurring either as planned or unplanned necessities. When conversions are planned, surgical teams are equipped with prior knowledge, enabling seamless workflow adjustments. However, unforeseen circumstances, such as accessibility issues or complex anatomy, may prompt impromptu shifts to traditional laparoscopy. The Senhance® Surgical System streamlines this transition with its easily maneuverable boom-style arms, swiftly facilitating direct patient access. In contrast, other RAS systems often present logistical challenges, requiring the cumbersome relocation of bases and entire arm configurations away from the bedside. The advantage of minimal footprint within the sterile environment becomes particularly evident in such emergency scenarios, where reduced equipment obstruction allows for expedited response and adaptation.

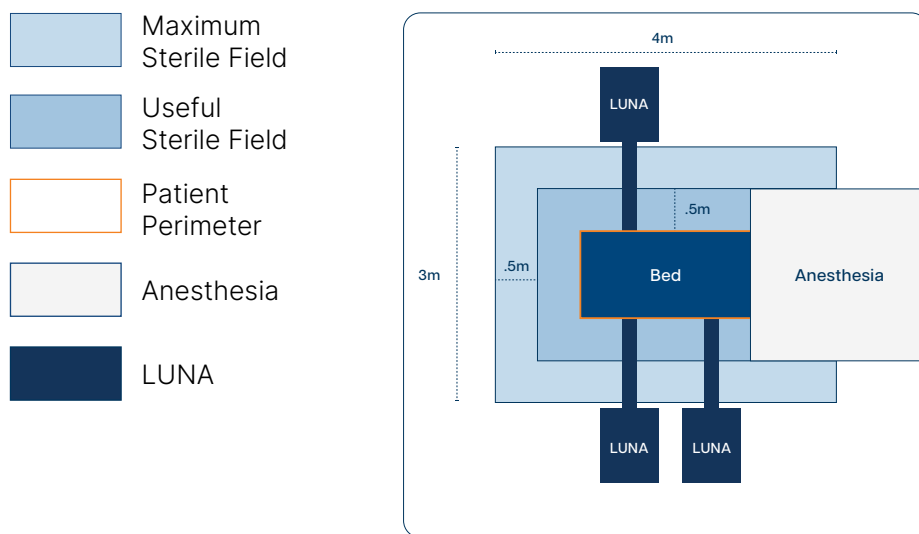
In contexts beyond emergencies, the integration of an RAS system fundamentally reshapes the dynamic of the surgical team, requiring repositioning staff in the surgical space displacing from their “typical” positioning. A recent analysis discusses the nuanced changes imposed on the team as they are forced to position themselves around the operating table with respect to the robot. These modifications not only affect physical positioning, but also influence the teams’ situation awareness throughout the procedures.<sup>3</sup> Emphasizing this in future investigations may be warranted as there could be a potential link to patient outcomes.

## 04 An RAS solution that maximizes the sterile space

A recent analysis was conducted by Asensus Surgical to quantify the amount of space in the sterile area occupied by robotic equipment. A comparison was made between the current Senhance configuration, LUNA (the next generation system), and other RAS systems including Da Vinci 5, Da Vinci Xi, and CMR Versius.

In an average operating room of approximately 6m by 6m, the sterile field may occupy a space of approximately 2m x 3m around the operating table.





The analysis calculates the accessible sterile perimeter and accessible useful sterile area of each RAS system accounting for the footprint from a top-down view. LUNA provides more access in the sterile area and more access around the perimeter of the operating table than the Da Vinci or CMR systems.<sup>4</sup> In addition, LUNA occupies 0% of the sterile field with the arm base as it sits beyond the sterile area, a feature no other RAS in this analysis currently offers.<sup>4</sup>

SYSTEM	ACCESSIBLE STERILE PERIMETER %	ACCESSIBLE USEFUL STERILE AREA %	MAXIMUM STERILE FIELD
DA VINCI XI DAVINCI 5	79.2%	53.32%	71%
CMR VERSIUS	69.6%	86.4%	91.5%
SENHANCE SURGICAL SYSTEM	88.2%	94.1%	92.6%
LUNA SURGICAL SYSTEM	91%	95.5%	94.38%

## 05 Conclusion

The integrity of the sterile field and ensuring direct patient access in emergency situations are paramount concerns in surgical environments. The presence of equipment in the sterile field not only jeopardizes sterility but also complicates rapid response measures during unforeseen events. Asensus has addressed this challenge adeptly with the Senhance Surgical System, offering a solution that minimizes equipment footprint and facilitates swift adjustments for direct patient access. Asensus continues this with the innovative LUNA System, currently in development, highlighting the focus on this critical aspect of RAS design. Asensus is empowering surgical teams to maintain sterility and optimize patient care even in the face of emergencies. Thus, the adoption of Asensus technology not only enhances surgical efficiency but also underscores a commitment to patient safety and procedural excellence.

## 06 References

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## 06 About Asensus

Asensus Surgical, Inc. and our amazing 200+ team members in 12 countries are committed to developing technology that helps surgeons deliver life-changing patient care with better outcomes for all.

For so long, the industry has focused on incremental advancements in robotic equipment; innovations that bring speed, dexterity, and a clear view of what's in front of us to do surgery. Augmented Intelligence goes further by giving surgeons a sense of what's around the corner. And as a surgeon builds on their digital legacy, our technology only gets smarter, ensuring that every surgery that follows will be, too.

Asensus Surgical is revolutionizing surgery with the first intra-operative Augmented Intelligence technology approved for use in operating rooms around the world. Recognized as an award-winning leader in digital technology, Asensus is committed to making surgery more accessible and predictable while delivering consistently superior outcomes. The company's novel approach to digitizing laparoscopy has led to system placements globally. Led by engineers, medical professionals, and industry luminaries, Asensus is powered by human ingenuity and driven by collaboration. To learn more about the Senhance® Surgical System and the new LUNA™ System, visit [www.asensus.com](http://www.asensus.com).

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