

## Intraoperative irrigation – “Do additives add any benefit?”

### Introduction

The use of topical agents to prevent wound infections dates back to Hippocrates and has evolved over time with the discovery of antibiotics and other medical advances.<sup>1</sup> The goal of wound care, in general, is to decrease the burden of microorganisms, remove devitalized tissue, and prevent further contamination.<sup>2</sup> Theoretically, wound irrigation could achieve this mechanically and, perhaps, biologically with the addition of antibiotics or antiseptics. While this paradigm is not new, there is a lack of high-quality evidence to standardize and support the practice, and the reasoning is largely experiential or based on small case series. A survey of general surgeons revealed that 97% reported using wound lavage, yet there was high variability in indications for use, solution type, and practices among those surveyed.<sup>3</sup> While this practice may be common, there are little data defining the optimal volume, delivery method, and additives to surgical irrigation solutions. Despite formal consensus recommendations on other practices aimed at reducing surgical site infections (SSI),<sup>4,5</sup> the topic of wound irrigation remains controversial, especially regarding the use of antibiotic and antiseptic irrigation.

(For more information on ways to reduce SSIs, please see the [April 2021 DICON Newsletter](#) and [Online Training Course: Prevention of Surgical Site Infection in the Operating Room.](#))

The most frequently used irrigation additives include antibiotics and antiseptics. The U.S. Food and Drug Administration (FDA) has only approved sterile normal saline, sterile water, and a 2-step wound debridement and irrigation system using a 0.05% chlorhexidine gluconate (CHG) solution followed by normal saline rinse (Irrisept®).<sup>6</sup>

### Antibiotics

Antibiotics commonly used as irrigation additives include bacitracin, aminoglycosides, penicillins, cephalosporins, polymyxin, and neomycin.<sup>2</sup> As demonstrated in a 2017 Cochrane review, there is lack of high-quality evidence to support the use of antibiotic irrigation,<sup>7</sup> therefore the Society for Healthcare Epidemiology (SHEA),<sup>4</sup> Infectious Diseases Society of America (IDSA), American College of Surgeons (ACS),<sup>8</sup> Surgical Infection Society (SIS), and American Society of Health-System Pharmacists (ASHP)<sup>9</sup> do not recommend their routine use. The World Health Organization (WHO)<sup>10</sup> and the International Consensus Meeting on Orthopedic Infections<sup>11</sup> recommend against the use of antibiotic incisional wound irrigation.

Despite the lack of demonstrated efficacy, providers may continue to use antibiotic solutions in an effort to optimize patient outcomes, on the premise that at least it does no harm. However, antibiotic irrigation does carry potential risks and safety concerns. Off-label use of bacitracin for intraoperative irrigation is common,<sup>12</sup> however there are reports of anaphylaxis and nephrotoxicity after the use of bacitracin irrigation.<sup>13,14</sup> Due to these concerns, the FDA issued a voluntary recall of bacitracin for injection on January 31, 2020.<sup>15</sup> Irrigation with triple antibiotic solution (cefazolin, bacitracin, and gentamicin) is common in breast reconstruction procedures with the intended purpose to reduce capsular contracture and reduce implant infection, however a recent meta-analysis failed to show efficacy for these endpoints.<sup>14,16</sup> A recent survey of infection prevention practitioners (IPs) across the United States revealed that only 17% of reported antibiotic irrigation solutions were being monitored by antibiotic stewardship programs (ASPs),<sup>12</sup> raising concern that adverse drug events are likely underrecognized and underreported.

Additionally, there is concern that the indiscriminate use of antibiotic irrigation solutions could contribute to emerging antimicrobial resistance. Based on varying pharmacodynamics of antibiotics and typically brief dwelling times, topical use may not be an effective mode of delivery to sufficiently reduce the bacterial bioburden within a surgical site, in turn leading to antibiotic exposure at subtherapeutic concentrations or insufficient time.<sup>12</sup>

### Antiseptics

Similar to antibiotic irrigation, there is inconclusive evidence regarding the efficacy of antiseptics, such as povidone-iodine and CHG, to reduce the incidence of SSIs. A meta-analysis of 24 RCTs inclusive of different surgical specialties found a reduction in SSIs with the intraoperative use of dilute povidone-iodine compared to no povidone-iodine (RR, 0.58 [95% CI, 0.40-0.83]).<sup>17</sup> However, other studies have found no benefit,<sup>2</sup> and povidone-iodine lacks FDA clearance for use on open wounds.

A recent study showed a reduction in gram-positive and gram-negative surgical isolates after exposure to 0.05% CHG solution.<sup>18</sup> Current practice guidelines from SHEA, IDSA, APIC<sup>4</sup>, WHO,<sup>10</sup> and the CDC<sup>19</sup> suggest considering antiseptic wound lavage based on moderate-quality evidence.

Use of antiseptic solutions is not without risk, however, including the potential to introduce microorganisms into a wound through products contaminated during manufacturing or storage, dilution with non-sterile water, or compounding under non-sterile conditions, in turn introducing the very problem they are intended to solve. There have been multiple outbreaks related to the use of contaminated antiseptic solutions, including alcohol, iodophors, CHG, and quaternary ammonium products.<sup>20</sup> Clinicians may not consider these as potential sources of infection, assuming that antiseptic solutions preclude microbial survival. But improper opening, storage, or dilution techniques can lead to contamination.

Additionally, use of antiseptics for SSI reduction requires achieving dilutions that are nontoxic to human

cells while retaining bactericidal activity, a process that is not standardized and could result in variations in antiseptic concentrations or local tissue damage.

### Conclusion

Based on the existing literature, DASON and DICON do not recommend the routine use of antibiotic or antiseptic irrigation. Use can be considered on a case-by-case basis after weighing the clinical risks and benefits. In efforts to reduce unnecessary antibiotic use, mitigate antibiotic resistance, and improve patient safety, partnerships between IPs, ASPs, providers, and facility leadership are necessary across the healthcare continuum. Your DASON and DICON liaisons are available to help you implement these recommendations and assist with review of current practices within your facility. Additional detailed materials are available in the reference list below.

### References

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