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Enhancing Compliance with Hand Hygiene and Sterilization Protocols in Anesthesia Administration: A Comprehensive Review of Current Practices and Strategies

[1]-Sultan Makki Ali Sumayli ,[2]- Aedh Zayed Al-Shahri,[3]- Abdullatif Abdulaziz Alzallal,[4]- Abdullah Ayed Almuzaini,[5]- Thuwaini Abdullah Al Dosari,[6]- Aedh Zayed Al-Shahri,[7]-Fawzi Mohammed Mohammed Maashi,[8]-Majed Abdullah Almutairi,[9]-Abdullah Ali Mohammed Awaf,[10]-Khaled Salem Abusaled,[11]-Ali Moeed Saeed Alqahtani ,[12]- Ali Mohammed Ageeli,[13]-Naji Mohammed Saleh Al-Qahtani

[1] Ksa, Ministry Of Health, Hospital Jazzin General
[2] Ksa, Ministry Of Health, Al-Muzahmiya General Hospital
[3] Ksa, Ministry Of Health, King Saud Medical City
[4] Ksa, Ministry Of Health, Al-Dariyah Hospital
[5] Ksa, Ministry Of Health, Al Yamamah Hospital
[6] Ksa, Ministry Of Health, Al-Muzahmiya General Hospital
[7] Ksa, Ministry Of Health, Damad General Hospital
[8] Ksa, Ministry Of Health, Hotat Sudair General Hospital
[9] Ksa, Ministry Of Health, Samtah General Hospital
[10]Ksa, Ministry Of Health, Alwajh General Hospital
[11]Ksa, Ministry Of Health, Asser Central Hospital
[12]Ksa, Ministry Of Health, Alardah General Hospital
[13]Ksa, Ministry Of Health, Al-Fashah General Hospital

Abstract

Background: The increasing incidence of healthcare-associated infections (HAIs) poses significant challenges to patient safety and healthcare quality, particularly in the field of anesthesia administration. Adherence to rigorous hand hygiene and sterilization practices is critical in mitigating the transmission of infectious agents during surgical procedures.

Methods: This review synthesizes current literature on hand hygiene compliance and sterilization practices among anesthesia providers. It examines quantitative studies assessing infection rates related to surgical site infections (SSIs) and the efficacy of various hand hygiene interventions. Additionally, it evaluates multimodal infection prevention strategies implemented within anesthesia care teams.

Results: Evidence indicates that compliance rates with hand hygiene protocols among anesthesia providers are alarmingly low, often below 50%. Furthermore, interventions such as the use of alcohol-based hand rubs and wearable disinfection devices significantly enhance compliance, leading to a measurable reduction in bacterial transmission and postoperative infection rates. Implementation of structured infection control bundles has proven effective in lowering SSIs, with studies demonstrating up to a 30% decrease in infection rates.

Conclusion: Adopting a comprehensive, evidence-based approach to hand hygiene and sterilization practices is essential for the anesthesia care team to reduce HAIs and improve patient outcomes. Continuous education, monitoring, and the integration of innovative hygiene technologies are necessary to foster a culture of compliance and ensure the safety of surgical patients.

Keywords: Hand hygiene, healthcare-associated infections, anesthesia, surgical site infections, infection control.

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1. Introduction

The danger of infection in the hospital environment is fundamental to anesthesia providers [1]. Recent evidence indicates that the anesthesia care team plays a crucial role in mitigating this risk by restricting the transmission of infectious flora through hand hygiene and sanitized work environments, timely prophylactic antibiotic administration, and the maintenance of optimal patient physiological conditions, such as normothermia and glucose management [2]. Loftus et al. [3] showed in a randomized controlled experiment (RCT) that fundamental preventative actions may substantially reduce the transmission and, consequently, the infections of Staphylococcus aureus [3]. In continuation of this RCT, Wall et al. assessed the feasibility and efficacy of these preventative interventions in mitigating the transmission of S. Staphylococcus aureus with subsequent surgical site infections (SSI) [4]. The results demonstrated unequivocal proof that the implementation of fundamental preventative measures was both practical and efficacious, warranting their inclusion in the standard treatment provided by anesthesiology personnel.

Given the economic strain and the impact on patient quality of life associated with perioperative infections, it is imperative for hospital management and doctors to investigate strategies to enhance hand hygiene compliance and thereby diminish perioperative infections [5]. Relative to the substantial financial burdens linked to healthcare-associated infections (HAI), hand hygiene compliance is a cost-efficient strategy for enhancing quality with no additional expense [6].

This detailed analysis will include background information about the current demography of HAIs and SSIs. Furthermore, acceptable hand hygiene techniques, particularly those related to perioperative infection management, are delineated. Finally, HH practices will be examined outside operating rooms (ORs) and in frequently used clinical settings, including pre-operative holding spaces for regional anesthesia and labor and delivery suites.

2. Consequences and Demographics of Perioperative-Related Infections

A healthcare-associated infection (HAI) is characterized as any illness that manifests between 48 hours and 30 days after a patient's hospitalization or receipt of healthcare services [7]. Healthcare-associated infections (HAIs) are a major contributor to morbidity and mortality among patients receiving medical treatment in the United States, impacting 4–10% of all hospitalized individuals, resulting in over 700,000 infections and around 99,000 fatalities annually [8-10]. The COVID-19 pandemic has significantly influenced healthcare-associated infections (HAIs) and the emergence of multidrug-resistant organism (MDR) infections [11]. Data from many countries during the pandemic indicated a general reduction in the rates of multidrug-resistant (MDR) organisms isolated from hospitalized patients, likely due to enhanced compliance with hand hygiene (HH), personal protective equipment (PPE), and social distancing measures [12-19].

The most prevalent healthcare-associated infections (HAIs) include catheter-associated urinary tract infections (CAUTIs), hospital-acquired pneumonia (HAPs), bloodstream infections (BSIs), and surgical site infections (SSIs) [20]. The Centers for Disease Control and Prevention (CDC) defines a surgical site infection (SSI) as an infection occurring in an incision, organ, or organ space involved in a surgical procedure, manifesting within 30 days post-surgery or 90 days if a prosthetic device has been installed [21].

The predominant microbes responsible for healthcare-associated infections (HAIs) are *Enterococcus*, *Staphylococcus aureus*, *Klebsiella*, *Acinetobacter*, *Pseudomonas*, and *Enterobacter* species. ESKAPE [22]. The frequent treatment of these often-involved organisms has resulted in heightened resistance and the emergence of multidrug-resistant diseases, a concerning trend. Methicillin-resistant *Staphylococcus aureus* (MRSA) is considered the predominant pathogen responsible for surgical site infections (SSIs) [23]. In addition to other forms of multidrug-resistant organisms like vancomycin-resistant enterococci (VRE), methicillin-resistant *Staphylococcus aureus* (MRSA) exhibits resistance to a broader spectrum of drugs than its designation suggests, resulting in heightened treatment difficulties [24-26]. Annually, almost 2 million individuals may get a multidrug-resistant illness, resulting in 23,000 fatalities among them. The in-hospital

mortality of a patient doubles at the onset of a multidrug-resistant illness, with *Klebsiella pneumoniae* and *Escherichia coli* as the predominant causal agents [27, 28]. Moreover, gram-negative bacterial infections, particularly from organisms like *Klebsiella pneumoniae* and *Escherichia coli*, constitute 70% of all healthcare-associated infections (HAIs) in intensive care units (ICUs) and contribute to up to 40% of all ICU fatalities [12].

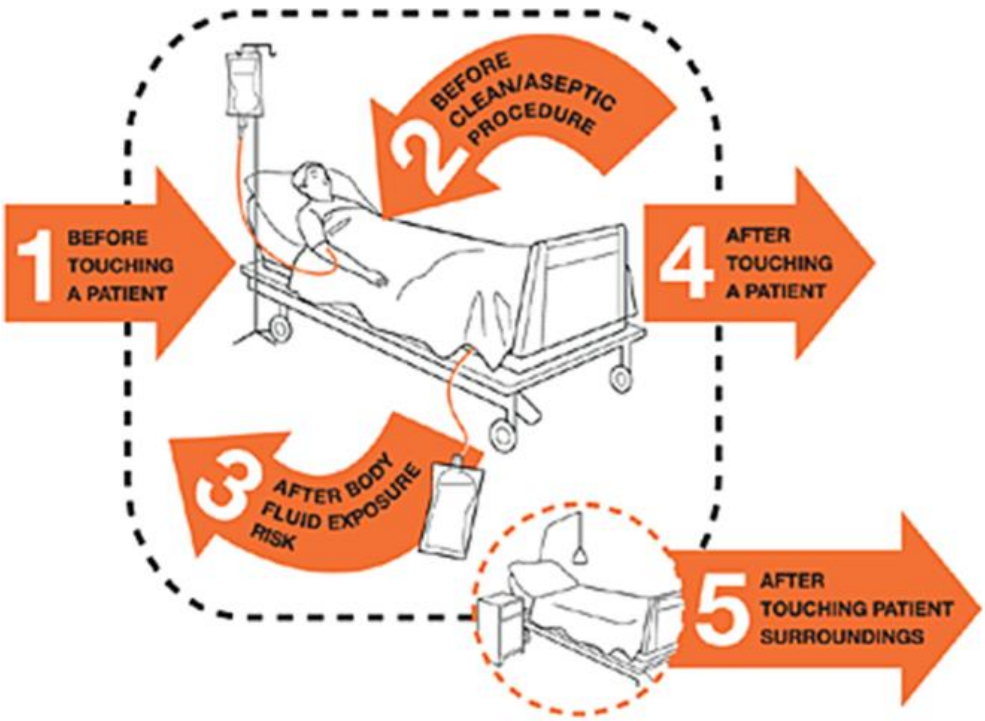
The battle against HAIs and MDRs is complex, although the World Health Organization (WHO) and CDC have identified hand hygiene (HH) as a fundamental preventive measure [29, 30]. Despite the critical significance of hand hygiene (HH) in combating healthcare-associated infections (HAIs), healthcare personnel and anesthesia providers exhibit alarmingly low compliance rates of fewer than 50% and 23%, respectively [31]. A study of anesthesia practitioners revealed a gap in their understanding of the significance and opportunity for adequate hand hygiene (HH) [32].

3. The Anesthesia Care Team's Role in Mitigating Bacterial Infection Transmission

Anesthesia practitioners' involvement in combating HAIs in surgical patients extends beyond the prompt delivery of antibiotics. Measures must be implemented to safeguard patients against ambient bacterial exposure in the operating room (OR) and to prevent anesthetic providers from serving as vectors for intraoperative bacterial transmission. Studies indicate that contamination of the anesthetic workspace occurs swiftly and extensively. Birnbach et al. discovered that following a 6-minute simulated intubation sequence, during which a fluorescent dye was introduced into the mannequin's oral cavity, the dye was detected on IV hubs in 100% of instances, as well as on medication syringes, the anesthesia keyboard, and the OR door handle in most cases [33]. Additional research has assessed the impact of this cross-contamination on patient care and results. Loftus et al. [3] discovered a significant rise in bacterial contamination during general anesthesia, resulting in IV stopcock contamination in 32% of instances, an escalation in postoperative VRE sepsis, and an increase in fatality rates [34]. The same author determined in a later investigation that up to 16% of 30-day postoperative infections resulted from bacterial transmission originating in the anesthetic work area [8].

Due to the practical demands of clinical anesthesia and the substantial work density required of the anesthesia team, the frequency of hand hygiene indications may exceed 300 times per hour, as per the WHO's five moments for hand hygiene [35] (Figure 1). As work density increases, the need for more frequent HH rises correspondingly. The frequent hand hygiene needs, along with the acute and dynamic characteristics of the operating room environment, have resulted in a rate of 83% [36]. The need for consistent hand hygiene (HH) in the anesthetic work area (AWA) creates a demand for conveniently situated alcohol-based hand rub (ABHR). Numerous studies indicate that wearable ABHR resulted in heightened overall use and improved compliance with appropriate hand hygiene practices [37, 38].

A comparable investigation revealed that the wearable ABHR device augmented hourly decontamination events by 27 times, concurrently decreasing bacterial transmission to stopcocks, AWA contamination, and 30-day postoperative HAIs [39]. Analysis of identical wearable ABHR devices used in the ICU revealed a decrease in ventilator-associated pneumonia, underscoring the essential function of adequate hand hygiene in mitigating bacterial transmission in acute care settings [40]. Alongside enhanced access to ABHR and suitable HH procedures, further methods, such as double gloving during intubation followed by the prompt removal of contaminated gloves, have shown potential in mitigating bacterial transmission during anesthesia [41]. Although factors like improved environmental decontamination, meticulous management of intravascular access sites, and patient decolonization have demonstrated efficacy in combating SSIs, substantial evidence from a randomized clinical trial and extensive post-implementation analysis indicates that enhancing hand hygiene awareness and practices among anesthesia providers can significantly decrease the incidence of SSIs. Transmission of aureus and surgical site infections (SSIs) [42].



1 BEFORE PATIENT CONTACT	WHEN? Clean your hands before touching a patient when approaching him or her WHY? To protect the patient against harmful germs carried on your hands
2 BEFORE AN ASEPTIC TASK	WHEN? Clean your hands immediately before any aseptic task WHY? To protect the patient against harmful germs, including the patient's own germs, entering his or her body
3 AFTER BODY FLUID EXPOSURE RISK	WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal) WHY? To protect yourself and the health-care environment from harmful patient germs
4 AFTER PATIENT CONTACT	WHEN? Clean your hands after touching a patient and his or her immediate surroundings when leaving WHY? To protect yourself and the health-care environment from harmful patient germs
5 AFTER CONTACT WITH PATIENT SURROUNDINGS	WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving - even without touching the patient WHY? To protect yourself and the health-care environment from harmful patient germs

Figure 1. The 5 moments of hand hygiene of WHO.

4. Economic Consequences of SSI and HAI

The financial impact of HAIs is substantial, with projected direct expenses ranging from $28 to $45 billion per year in the USA [43]. This figure significantly underrepresents overall expenses, since it excludes indirect costs related to missed income and productivity, death, and diminished leisure time, among others. However, the total expense of HH compliance is small, but the costs incurred by patients and healthcare systems due to non-compliance are substantial [44,45]. Chen et al. established that each dollar invested in health promotion had a benefit of $23.70 [44]. Moreover, the prevention of healthcare-associated infections (HAIs) yields substantial cost savings, with a mere 1% improvement in hand hygiene compliance at a 200-bed hospital leading to an annual savings of $39,650 [45].

Healthcare value, defined as (Value = Quality/Cost), has a negative correlation with healthcare-associated infections (HAI), whereby patients encounter diminished quality characterized by heightened mortality, pain, reduced quality of life, and lower satisfaction levels [46-48]. Health insurance companies have acknowledged the rising expenses associated with HAIs, leading to a trend of reduced payments to hospitals when a patient acquires a HAI. The alteration in compensation has resulted in a decrease in the incidence of HAIs and decreased the likelihood of acquiring an HAI within three years after the implementation of this policy adjustment [49]. Despite comprising around 20% of all healthcare-associated infections (HAIs), surgical site infections (SSIs) are regarded as the most expensive category of HAI [50,51]. Furthermore, SSIs correlate with a 2- to 11-fold elevation in mortality risk, with 75% of fatalities associated with SSIs being directly attributable to the infection. These concerns compel healthcare systems and hospital management to explore strategies for enhancing hand hygiene compliance, mitigating surgical infection risk, and ultimately improving patient outcomes [52].

5. Contemporary Protocols for Perioperative Infection Prevention

Despite a dramatic reduction in the incidence of surgical site infections (SSIs) over the last decade, SSIs continue to be among the most prevalent and expensive healthcare-associated illnesses. The Centers for Disease Control and Prevention advocate for enhanced fundamental preventative strategies to diminish bacterial infections in surgical patients [53,54]. Pathogens often linked to surgical site infections (SSIs) include Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus, and Escherichia coli [55]. Diverse institutions possess distinct practice criteria for their strategies for perioperative infection control, sometimes exhibiting some degree of overlap in implementation and compliance across different locations. A study conducted at the University of Iowa implemented a perioperative infection prevention bundle that included a multimodal program aimed at enhancing hand hygiene, intravascular catheter disinfection, environmental cleaning, and patient decolonization, optimized through OR PathTrac surveillance feedback, to tackle the intricate dynamics of intraoperative bacterial reservoirs [56-59].

Therefore, a multimodal, evidence-based, and multifaceted strategy for perioperative infection prevention, which has demonstrated effectiveness in mitigating transmission and infection from patient skin sites, environmental surfaces, hands, intravascular catheter injection ports, and syringe tips, along with a surveillance system for continuous feedback, is expected to diminish perioperative transmission.

6. Contemporary Guidelines for Hand Hygiene

The WHO first released Guidelines on Hand Hygiene in 2006, followed by suggestions aimed at preventing the transfer of harmful organisms between patients and healthcare personnel [61-63]. The analysis and suggestions may be summarized in the World Health Organization's five moments of hand hygiene (Figure 1). The first instant occurs before any physical interaction with patients, is aimed at safeguarding them from detrimental bacteria present on healthcare practitioners' hands. The usage of hand hygiene here prevents the colonization of patients and their environments by healthcare-associated bacteria. Secondly, hand hygiene should precede any clean or aseptic technique to safeguard patients at an elevated risk of infection transmission due to the disturbance of surface tissues. These deleterious bacteria may be found both inside and outside the patient area [64]. Healthcare practitioners may encounter contaminated surfaces in the patient area without direct contact with the patient. Third, hand hygiene should be initiated following any exposure to body fluids or potential exposure, as this safeguards the healthcare worker and the healthcare environment from potentially harmful patient microorganisms, diminishes the colonization of healthcare workers by organisms, and inhibits the transmission from a colonized area to a sterile area. The fourth moment instructs healthcare personnel to perform hand hygiene after each patient interaction, so averting the risk of healthcare workers and the healthcare environment serving as vectors. This should especially occur, if feasible, during the transition from the patient zone to the outside to prevent contamination and dissemination to the broader healthcare environment. Finally, hand hygiene should be performed after re-engaging with the patient's environment to safeguard the healthcare practitioner and the surroundings from pathogenic bacteria in the patient area.

7. Supplementary Perioperative Circumstances

Regional anesthesia procedures, including peripheral nerve blocks and neuraxial anesthesia, are prevalent in contemporary anesthesiology practice and provide additional concerns for HH. Infectious problems associated with peripheral nerve blocks and neuraxial anesthesia are seldom seen. Clinical practice guidelines advocate for the use of the WHO's five moments of hand hygiene during the execution of a regional procedure. Obstacles to hand hygiene compliance resemble those encountered in other domains of anesthetic practice. As previously stated, the availability of personal hand gel enhanced adherence among regional anesthetic teams [65]. Likewise, it was shown that alcohol-based hand hygiene was the most effective method before labor epidural insertion [66]. Continuous nerve catheters are becoming a prevalent method in regional anesthesia. Similar to other methods, the occurrence of infectious problems is infrequent. Complication risk variables include severely unwell patients, catheter use length, and anatomical location [67]. Maximal sterile precautions, similar to those used during epidural installation, are advisable for nerve catheter insertion [68]. Hand hygiene is a fundamental principle of aseptic technique and patient safety in regional and neuraxial anesthesia. Nevertheless, the potential for infection during these operations persists, presenting an opportunity for ongoing study in infection prevention within these domains.

8. Conclusions

An evidence-based, multimodal infection control approach for anesthetic work areas is essential to minimize pathogen transmission and prevent infection development. This encompasses hand hygiene, ambient sanitation, vascular management, and measures for enhancing patient decontamination, refined via feedback. A crucial aspect of intraoperative hand hygiene adoption is the closeness of providers, considering the rapid speed and high job density of the environment. Evidence indicates that anesthesia practitioners should aim for eight hand decontamination occurrences each hour according to the WHO's five moments of hand hygiene. Although intraoperative infection control is more complex than mere handwashing, hand hygiene is a crucial element of multimodal, evidence-based techniques that, when well implemented, may significantly decrease surgical site infections and pathogen transmission occurrences.

References

1. Munoz-Price LS, Birnbach DJ. Hand hygiene and anesthesiology. Int Anesthesiol Clin. 2013;51(1):79–92.
2. Long DR, Alverdy JC, Vavilala MS. Emerging paradigms in the prevention of surgical site infection: the patient microbiome and antimicrobial resistance. Anesthesiology. 2022;137(2):252–62.
3. Loftus RW, Dexter F, Goodheart MJ, McDonald M, Keech J, Noiseux N, et al. The effect of improving basic preventive measures in the perioperative arena on Staphylococcus aureus transmission and surgical site infections: a randomized clinical trial. JAMA Netw Open. 2020;3(3): e201934.
4. Wall RT, Datta S, Dexter F, Ghyasi N, Robinson ADM, Persons D, et al. Effectiveness and feasibility of an evidence-based intraoperative infection control program targeting improved basic measures: a post-implementation prospective case-cohort study. J Clin Anesth. 2022;77: 110632.
5. Gould DJ, Moralejo D, Drey N, Chudleigh JH, Taljaard M. Interventions to improve hand hygiene compliance in patient care. Cochrane Database Syst Rev. 2017;9:CD005186.
6. Graves N, Page K, Martin E, Brain D, Hall L, Campbell M, et al. Cost-effectiveness of a national initiative to improve hand hygiene compliance using the outcome of healthcare-associated Staphylococcus aureus bacteraemia. PLoS ONE. 2016;11(2): e0148190.
7. Revelas A. Healthcare - associated infections: a public health problem. Niger Med J. 2012;53(2):59–64.
8. Loftus RW, Koff MD, Birnbach DJ. The dynamics and implications of bacterial transmission events arising from the anesthesia work area. Anesth Analg. 2015;120(4):853–60.
9. Centers for Disease C. Guideline for hand hygiene in health-care settings. MMWR. 2002. p. 1–44.
10. Centers for Disease C. 2014 national and state healthcare-associated infections progress report. 2016.
11. American Society of A. ASA Committee on Occupational Health Task Force on Infection Control. Recommendations for infection control for the practice of anesthesiology. American Society of Anesthesiology; 2011.

12. Bentivegna E, Luciani M, Arcari L, Santino I, Simmaco M, Martelletti P. Reduction of multidrug-resistant (MDR) bacterial infections during the COVID-19 pandemic: a retrospective study. Int J Environ Res Public Health. 2021;18(3).
13. Wee LEI, Conceicao EP, Tan JY, Magesparan KD, Amin IBM, Ismail BBS, et al. Unintended consequences of infection prevention and control measures during COVID-19 pandemic. Am J Infect Control. 2021;49(4):469–77.
14. Cole J, Barnard E. The impact of the COVID-19 pandemic on healthcare acquired infections with multidrug resistant organisms. Am J Infect Control. 2021;49(5):653–4.
15. Hirabayashi A, Kajihara T, Yahara K, Shibayama K, Sugai M. Impact of the COVID-19 pandemic on the surveillance of antimicrobial resistance. J Hosp Infect. 2021;117:147–56.
16. Bork JT, Leekha S, Claeys K, Seung H, Tripoli M, Amoroso A, et al. Change in hospital antibiotic use and acquisition of multidrug-resistant gram-negative organisms after the onset of coronavirus disease 2019. Infect Control Hosp Epidemiol. 2021;42(9):1115–7.
17. Tiri B, Sensi E, Marsiliani V, Cantarini M, Priante G, Vernelli C, et al. Antimicrobial stewardship program, COVID-19, and infection control: spread of carbapenem-resistant Klebsiella pneumoniae colonization in ICU COVID-19 patients. What did not work? J Clin Med. 2020;9(9).
18. Polly M, de Almeida BL, Lennon RP, Cortes MF, Costa SF, Guimaraes T. Impact of the COVID-19 pandemic on the incidence of multidrug-resistant bacterial infections in an acute care hospital in Brazil. Am J Infect Control. 2022;50(2):238–9.
19. Moso M, Cairns K, Peel T, Macesic N. 165. Decreased antimicrobial consumption and decreased rates of multi-drug resistant organisms following onset of the COVID-19 pandemic: experience from an Australian tertiary hospital. Open Forum Infect Dis. 2021;8(Supplement_1):S192-S.
20. Khan HA, Baig FK, Mehboob R. Nosocomial infections: epidemiology, prevention, control and surveillance. Asian Pac J Trop Biomed. 2017;7(5):478–82.
21. Nichols RL. Preventing surgical site infections: a surgeon's perspective. Emerg Infect Dis. 2001;7(2):220–4.
22. Boucher HW, Talbot GH, Bradley JS, Edwards JE, Gilbert D, Rice LB, et al. Bad bugs, no drugs: no ESKAPE! An update from the Infectious Diseases Society of America. Clin Infect Dis. 2009;48(1):1–12.
23. Anderson DJ, Sexton DJ, Kanafani ZA, Auten G, Kaye KS. Severe surgical site infection in community hospitals: epidemiology, key procedures, and the changing prevalence of methicillin-resistant Staphylococcus aureus. Infect Control Hosp Epidemiol. 2007;28(9):1047–53.
24. Centers for Disease C. Management of multidrug-resistant organisms in healthcare settings. 2006.
25. Centers for Disease C. Public health focus: surveillance, prevention, and control of nosocomial infections. MMWR Morb Mortal Wkly Rep. 1992;41(42):783–7.
26. Centers for Disease C. Antibiotic resistance threats in the United States. 2019.
27. Morgan DJ, Lomotan LL, Agnes K, McGrail L, Roghmann MC. Characteristics of healthcare-associated infections contributing to unexpected in-hospital deaths. Infect Control Hosp Epidemiol. 2010;31(8):864–6.
28. Barrasa-Villar JI, Aibar-Remon C, Prieto-Andres P, Mareca-Donate R, Moliner-Lahoz J. Impact on morbidity, mortality, and length of stay of hospital-acquired infections by resistant microorganisms. Clin Infect Dis. 2017;65(4):644–52.
29. Guideline for prevention of nosocomial pneumonia. Centers for Disease Control and Prevention. Respir Care. 1994;39(12):1191–236.
30. Organization WH. Antimicrobial resistance: global report on surveillance. Geneva: World Health Organization; 2014. p. 2014.
31. Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV. Hand hygiene among physicians: performance, beliefs, and perceptions. Ann Intern Med. 2004;141(1):1–8.
32. Fernandez PG, Loftus RW, Dodds TM, Koff MD, Reddy S, Heard SO, et al. Hand hygiene knowledge and perceptions among anesthesia providers. Anesth Analg. 2015;120(4):837–43.
33. Birnbach DJ, Rosen LF, Fitzpatrick M, Carling P, Munoz-Price LS. The use of a novel technology to study dynamics of pathogen transmission in the operating room. Anesth Analg. 2015;120(4):844–7.

34. Loftus RW, Koff MD, Burchman CC, Schwartzman JD, Thorum V, Read ME, et al. Transmission of pathogenic bacterial organisms in the anesthesia work area. Anesthesiology. 2008;109(3):399–407.
35. Rowlands J, Yeager MP, Beach M, Patel HM, Huysman BC, Loftus RW. Video observation to map hand contact and bacterial transmission in operating rooms. Am J Infect Control. 2014;42(7):698–701.
36. Biddle C, Shah J. Quantification of anesthesia providers' hand hygiene in a busy metropolitan operating room: what would Semmelweis think? Am J Infect Control. 2012;40(8):756–9.
37. Koff MD, Brown JR, Marshall EJ, O'Malley AJ, Jensen JT, Heard SO, et al. Frequency of hand decontamination of intraoperative providers and reduction of postoperative healthcare-associated infections: a randomized clinical trial of a novel hand hygiene system. Infect Control Hosp Epidemiol. 2016;37(8):888–95.
38. Munoz-Price LS, Patel Z, Banks S, Arheart K, Eber S, Lubarsky DA, et al. Randomized crossover study evaluating the effect of a hand sanitizer dispenser on the frequency of hand hygiene among anesthesiology staff in the operating room. Infect Control Hosp Epidemiol. 2014;35(6):717–20.
39. Koff MD, Loftus RW, Burchman CC, Schwartzman JD, Read ME, Henry ES, et al. Reduction in intraoperative bacterial contamination of peripheral intravenous tubing through the use of a novel device. Anesthesiology. 2009;110(5):978–85.
40. Koff MD, Corwin HL, Beach ML, Surgenor SD, Loftus RW. Reduction in ventilator associated pneumonia in a mixed intensive care unit after initiation of a novel hand hygiene program. J Crit Care. 2011;26(5):489–95.
41. Birnbach DJ, Rosen LF, Fitzpatrick M, Carling P, Arheart KL, Munoz-Price LS. Double gloves: a randomized trial to evaluate a simple strategy to reduce contamination in the operating room. Anesth Analg. 2015;120(4):848–52.
42. Loftus RW. Infection control in the operating room: is it more than a clean dish? Curr Opin Anaesthesiol. 2016;29(2):192–7.
43. Scott R. The direct medical costs of healthcare-associated infections in US hospitals and the benefits of prevention. . Centers for Disease Control and Prevention; 2009.
44. Chen YC, Sheng WH, Wang JT, Chang SC, Lin HC, Tien KL, et al. Effectiveness and limitations of hand hygiene promotion on decreasing healthcare-associated infections. PLoS ONE. 2011;6(11): e27163.
45. Cummings KL, Anderson DJ, Kaye KS. Hand hygiene noncompliance and the cost of hospital-acquired methicillin-resistant Staphylococcus aureus infection. Infect Control Hosp Epidemiol. 2010;31(4):357–64.
46. Badia JM, Casey AL, Petrosillo N, Hudson PM, Mitchell SA, Crosby C. Impact of surgical site infection on healthcare costs and patient outcomes: a systematic review in six European countries. J Hosp Infect. 2017;96(1):1–15.
47. Shepard J, Ward W, Milstone A, Carlson T, Frederick J, Hadhazy E, et al. Financial impact of surgical site infections on hospitals: the hospital management perspective. JAMA Surg. 2013;148(10):907–14.
48. Hart A, Furkert C, Clifford K, Woodfield JC. Impact of incisional surgical site infections on quality of life and patient satisfaction after general surgery: a case controlled study. Surg Infect (Larchmt). 2021;22(10):1039–46.
49. Peasah SK, McKay NL, Harman JS, Al-Amin M, Cook RL. Medicare non-payment of hospital-acquired infections: infection rates three years post implementation. Medicare Medicaid Res Rev. 2013;3(3).
50. Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, Fry DE, et al. American College of Surgeons and Surgical Infection Society: surgical site infection guidelines, 2016 update. J Am Coll Surg. 2017;224(1):59–74.
51. Zimlichman E, Henderson D, Tamir O, Franz C, Song P, Yamin CK, et al. Health care-associated infections: a meta-analysis of costs and financial impact on the US health care system. JAMA Intern Med. 2013;173(22):2039–46.
52. Mestre G, Berbel C, Tortajada P, Alarcia M, Coca R, Gallemi G, et al. "The 3/3 strategy": a successful multifaceted hospital wide hand hygiene intervention based on WHO and continuous quality improvement methodology. PLoS ONE. 2012;7(10): e47200.

53. Magill SS, O'Leary E, Janelle SJ, Thompson DL, Dumyati G, Nadle J, et al. Changes in prevalence of health care-associated infections in U.S. hospitals. N Engl J Med. 2018;379(18):1732–44.
54. German RR, Lee LM, Horan JM, Milstein RL, Pertowski CA, Waller MN, et al. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. MMWR Recomm Rep. 2001;50(RR-13):1–35 (quiz CE1-7).
55. Owens CD, Stoessel K. Surgical site infections: epidemiology, microbiology and prevention. J Hosp Infect. 2008;70(Suppl 2):3–10.
56. Loftus RW, Brown JR, Koff MD, Reddy S, Heard SO, Patel HM, et al. Multiple reservoirs contribute to intraoperative bacterial transmission. Anesth Analg. 2012;114(6):1236–48.
57. Clark C, Taenzer A, Charette K, Whitty M. Decreasing contamination of the anesthesia environment. Am J Infect Control. 2014;42(11):1223–5.
58. Wilson AP, Smyth D, Moore G, Singleton J, Jackson R, Gant V, et al. The impact of enhanced cleaning within the intensive care unit on contamination of the near-patient environment with hospital pathogens: a randomized crossover study in critical care units in two hospitals. Crit Care Med. 2011;39(4):651–8.
59. Loftus RW, Brindeiro BS, Kispert DP, Patel HM, Koff MD, Jensen JT, et al. Reduction in intraoperative bacterial contamination of peripheral intravenous tubing through the use of a passive catheter care system. Anesth Analg. 2012;115(6):1315–23.
60. Phillips M, Rosenberg A, Shopsin B, Cuff G, Skeete F, Foti A, et al. Preventing surgical site infections: a randomized, open-label trial of nasal mupirocin ointment and nasal povidone-iodine solution. Infect Control Hosp Epidemiol. 2014;35(7):826–32.
61. Anderson DJ, Chen LF, Weber DJ, Moehring RW, Lewis SS, Triplett PF, et al. Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and Clostridium difficile (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomised, multicentre, crossover study. Lancet. 2017;389(10071):805–14.
62. Robinson ADM, Dexter F, Renkor V, Reddy S, Loftus RW. Operating room PathTrac analysis of current intraoperative Staphylococcus aureus transmission dynamics. Am J Infect Control. 2019;47(10):1240–7.
63. Organization WH. WHO guidelines on hand hygiene in health care. Geneva, Switzerland: World Health Organization and WHO Patient Safety; 2009.
64. Hebl JR. The importance and implications of aseptic techniques during regional anesthesia. Reg Anesth Pain Med. 2006;31(4):311–23.
65. Parks CL, Schroeder KM, Galgon RE. Personal hand gel for improved hand hygiene compliance on the regional anesthesia team. J Anesth. 2015;29(6):899–903.
66. Siddiqui N, Friedman Z, McGeer A, Yousefzadeh A, Carvalho JC, Davies S. Optimal hand washing technique to minimize bacterial contamination before neuraxial anesthesia: a randomized control trial. Int J Obstet Anesth. 2017;29:39–44.
67. Neuburger M, Buttner J, Blumenthal S, Breitbarth J, Borgeat A. Inflammation and infection complications of 2285 perineural catheters: a prospective study. Acta Anaesthesiol Scand. 2007;51(1):108–14.
68. Capdevila X, Bringuier S, Borgeat A. Infectious risk of continuous peripheral nerve blocks. Anesthesiology. 2009;110(1):182–8

تعزيز الامتثال لبروتوكولات نظافة اليدين والتعقيم في إدارة التخدير: مراجعة شاملة للممارسات والاستراتيجيات الحالية

الملخص

الخلفية :إن الزيادة في حالات العدوى المرتبطة بالرعاية الصحية (HAIs) تشكل تحديات كبيرة لسلامة المرضى وجودة الرعاية الصحية، لا سيما في مجال إدارة التخدير. إن الالتزام بممارسات نظافة اليدين والتعقيم الصارمة أمر بالغ الأهمية في التخفيف من انتقال العوامل المعدية أثناء الإجراءات الجراحية.

الطرق :تستعرض هذه المراجعة الأدبيات الحالية حول امتثال نظافة اليدين وممارسات التعقيم بين مقدمي خدمات التخدير. كما تفحص الدراسات الكمية التي تقيم معدلات العدوى المتعلقة بالعدوى في مواقع الجراحة (SSIs) وفعالية تدخلات نظافة اليدين المختلفة. بالإضافة إلى ذلك، تقيم استراتيجيات الوقاية من العدوى متعددة الوسائط التي تم تنفيذها ضمن فرق رعاية التخدير.

النتائج :تشير الأدلة إلى أن معدلات الامتثال لبروتوكولات نظافة اليدين بين مقدمي خدمات التخدير منخفضة بشكل مقلق، وغالبًا ما تكون أقل من 50%. علاوة على ذلك، فإن التدخلات مثل استخدام مطهرات اليد المعتمدة على الكحول وأجهزة التعقيم القابلة للارتداء تعزز بشكل كبير من الامتثال، مما يؤدي إلى تقليل ملحوظ في انتقال البكتيريا ومعدلات العدوى بعد الجراحة. لقد أثبت تنفيذ حزم التحكم في العدوى المنظمة فعاليتها في خفض معدلات العدوى في مواقع الجراحة، حيث أظهرت الدراسات انخفاضًا يصل إلى 30% في معدلات العدوى.

الخاتمة :إن اعتماد نهج شامل قائم على الأدلة لممارسات نظافة اليدين والتعقيم أمر ضروري لفريق رعاية التخدير لتقليل العدوى المرتبطة بالرعاية الصحية وتحسين نتائج المرضى. التعليم المستمر، والمراقبة، ودمج تقنيات النظافة المبتكرة ضرورية لتعزيز ثقافة الامتثال وضمان سلامة المرضى الجراحيين.

الكلمات المفتاحية :نظافة اليدين، العدوى المرتبطة بالرعاية الصحية، التخدير، العدوى في مواقع الجراحة، مكافحة العدوى.