

HOSPITAL-ACQUIRED INFECTIONS RELATED TO CENTRAL VENOUS CATHETERS: PREVENTIVE STRATEGIES AND THE NURSE'S ROLE

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ABSTRACT

Hospital-acquired infections (HAIs) pose a significant challenge in healthcare, particularly those associated with the use of central venous catheters (CVCs), due to their high morbidity and mortality. This review article examines the main aspects of HAIs, focusing on the pathophysiology of CVC infections, preventive techniques, patient safety policies, and the nurse's role. Literature highlights that strategies such as hand hygiene, the use of bundles, and standardized protocols are essential to reduce infections. Nurses play a crucial role in supervising and implementing these practices, ensuring patient safety.

Keywords: Hospital-Acquired Infection. Central Venous Catheter. Nursing. Patient Safety. Prevention.

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INTRODUCTION

Central venous catheters used in hospital settings aim to efficiently and effectively support the comprehensive treatment of critically ill patients, ensuring they receive the utmost care and attention necessary for their recovery and well-being. (Smith & Nolan, 2013)(Wang et al., 2024). However, it is vital to acknowledge that this medical device, although highly valuable, can, unfortunately, lead to potentially life-threatening bloodstream infections and adverse health reactions that may compromise the patient's overall condition and delay their recuperation process(Chelazzi et al., 2011)(Mayorga et al., 2023). Therefore, it becomes indispensable for healthcare professionals to monitor and manage central venous catheters meticulously, implementing stringent infection prevention protocols and providing proper care to mitigate the risks and ensure the safety and optimal health outcomes for patients(Jamshidi, 2019)("Practical Guide for Safe Central Venous Catheterization and Management 2017," 2019).

Since the 1970s, central venous catheters have undergone significant evolution. They started as simple devices with limited features and have become sophisticated tools with many capabilities. Initially developed as an alternative for vascular access, they are now widely used in patients admitted to ICUs. Over the years, there have been continuous advancements in their design and capabilities, resulting in their increased effectiveness and functionality. These catheters have transitioned from essential devices to sophisticated tools, offering various features and benefits. With the ever-growing needs of patients requiring vascular access, central venous catheters have become integral to medical care. They provide healthcare professionals with a reliable and practical means of administering medication and fluids, monitoring vital signs, and facilitating various medical procedures. The utilization of central venous catheters in ICUs has proven to be instrumental in improving patient outcomes and overall healthcare delivery. As new technologies and innovations emerge, central venous catheters will likely continue to evolve, ensuring even better patient care and treatment outcomes.

Central venous catheters (CVCs) are indispensable in the care of critically ill patients, providing a means of administering medications, intravenous hydration, blood product transfusions, parenteral nutrition, and hemodynamic monitoring. Their prolonged use significantly reduces the need for peripheral punctures, thereby minimizing patient discomfort and potential complications. These catheters are vital conduits for delivering

essential therapies and monitoring critically ill patients, making them indispensable tools in modern healthcare practices.(Chopra et al., 2012)

While the benefits of central venous catheters are undeniable, it is important to recognize the associated risks and potential complications that can arise from their usage. (Jamshidi, 2019) The Brazilian Health Regulatory Agency (ANVISA) defines CVCs as short-term or long-term devices. They can also be categorized as semi-implantable or fully implantable (William et al., 2013)(Rezer & Faustino, 2019). Short-term semi-implantable catheters lack structural barriers to prevent extraluminal colonization. In contrast, long-term catheters feature a subcutaneous pathway with a Dacron cuff that promotes per-catheter fibrosis, reducing infection risks. Fully implantable CVCs, with no external parts, further minimize contamination risks(Crisi et al., 2022)(Hafeez et al., 2022) (JUNIOR et al., 2010).

The correct practices in inserting and maintaining central venous catheters are crucial in reducing the risk of healthcare-associated infections.(SAFDAR et al., 2023)Implementing comprehensive preventive measures, such as proper aseptic techniques during CVC insertion and maintenance, regular monitoring, and timely interventions, is essential to reduce infection rates and improve healthcare quality. By adopting evidence-based best practices, healthcare professionals can significantly mitigate the risks associated with these invasive devices and contribute to better patient outcomes.

PATHOPHYSIOLOGY OF CENTRAL VENOUS CATHETER INFECTIONS

The pathophysiology of central venous catheter infections involves two primary mechanisms: extraluminal colonization and intraluminal colonization(The Incidence of Infectious Complications of Central Venous ..., 2023). Extraluminal colonization occurs when skin microbiota, which is the normal flora of the skin, penetrates the catheter area during insertion or after extended device use. Intraluminal colonization occurs when bacteria or fungi enter the bloodstream through pre-existing infections or contaminated infusions. The former occurs when skin microbiota penetrates the catheter area during insertion or after extended device use. The latter occurs when bacteria enter the bloodstream through pre-existing infections or contaminated infusions(Nye et al., 2024)(Wang et al., 2024)(Kadirvelu et al., 2024).

It's crucial to remember that the bloodstream infections associated with CVCs are largely preventable. They can result from catheter contamination during insertion by skin flora, contaminated solutions, or improper hand hygiene during handling by healthcare

staff.(Hanauer et al., 2020)Understanding the complexity of CVC infection pathophysiology, which involves multiple risk factors, empowers us to take proactive measures. Pathogens can access intravascular devices through extraluminal routes, such as adherence of microbiota to the catheter's percutaneous tract, or intraluminal routes, such as contamination during device handling or medication infusion.(SAFDAR et al., 2023)

The percutaneously inserted catheters carry higher infection risks due to microorganism migration from the skin microbiota along the catheter surface into the bloodstream, a process known as extraluminal infection. Intraluminal infections arise from bacteria or fungi entering the bloodstream via contaminated infusions or improper handling of the device. Subcutaneously implanted catheters, however, carry significantly lower infection risks. The most common pathogens associated with CVC-related bloodstream infections are *Staphylococcus* species, particularly coagulase-negative *Staphylococcus* (35-60% of cases) and *Staphylococcus aureus* (12-24% of cases). (Nye et al., 2024)(Chopra, 2024)(Advani et al., 2024) These microorganisms are part of the normal skin flora and can migrate along the catheter's external surface, leading to infection. (Hoppe, 1995) (Esposito et al., 2013)

Primary bloodstream infections (PBIs) occur more than 48 hours after CVC insertion without evidence of a pre-existing infection focus. PBIs associated with CVCs occur in patients using these devices for over two days. Day 1 of insertion marks the beginning of the observation period, and infection diagnosis can be made during CVC use or after its removal. (William et al., 2013) The Prevention of CVC-related InfectionsThe prevention of CVC-related infections requires a multifaceted approach involving both healthcare workers and patients.(Buetti et al., 2022)(Vijayan & Boyce, 2022). diagnostic challenges of bloodstream infections in long-term CVC patients, as symptoms like fever and chills are nonspecific and occur in various conditions. Therefore, clinicians must remain vigilant and employ diagnostic tools like blood cultures to confirm CVC-related infections. (2023)

PREVENTIVE TECHNIQUES FOR INFECTIONS AND PATIENT SAFETY IN THE FACE OF ADVERSE HEALTH REACTIONS

Proper hand hygiene by healthcare professionals is not just a routine; it is a critical step in preventing the transmission of resistant microorganisms(Kavanagh et al., 2024). As frontline defenders against infections, healthcare professionals play a crucial role in this. It involves three key steps: using an antimicrobial topical agent, applying it correctly and for

the recommended duration, and using it consistently at appropriate times (McDonnell, 2017) (Williamson et al., 2017). Of these, the use of antimicrobial soap or alcohol-based hand rubs is particularly effective in infection prevention. Aseptic techniques for connection wound dressings, as well as sterile materials, are also essential. What's more, these techniques are not just good practices, but they are backed by evidence, making them even more effective (Tartari et al., 2024) (Svenšek et al., 2024). Antisepsis of catheter hubs, involving the application of an antiseptic solution like chlorhexidine or povidone-iodine, is crucial to prevent infections related to central venous catheters and should be done before and after handling and infusions. (O'Grady et al., 2011)

Research has shown that improvements in the care of intravenous devices can be achieved through bundles - structured strategies designed to enhance care processes and boost patient recovery rates, as recommended by the Institute for Healthcare Improvement (Boyd et al., 2010). Similarly, various strategies have been developed to minimize the risk of catheter-related bloodstream infections, with guidelines provided by the Centers for Disease Control and Prevention being implemented through intervention protocols grouped under "bundles," which have become crucial for ensuring patient safety in healthcare settings (2024) (Chopra, 2024).

Before central catheter insertion, strict precautions are necessary. These include thorough hand antisepsis using solutions such as PVP-I 10% or chlorhexidine 2%, which should not be skipped even when gloves are used ("Practical Guide for Safe Central Venous Catheterization and Management 2017," 2019) (O'Grady et al., 2011). The patient's skin must be disinfected with solutions like 2% chlorhexidine alcohol, 70% alcohol, or 10% PVP-I in the absence of alternatives. However, one of the most crucial precautions is using completely sterile attire, including gloves, masks, caps, gowns, and sterile drapes. (2024)

Daily checklists help ensure adherence to catheter insertion protocols, reducing the incidence of 'adverse events and infections' such as catheter-related bloodstream infections and local site infections. Evidence-based measures such as preparing the skin with 0.5% chlorhexidine gluconate before catheter insertion are recommended to minimize infection risk (2019). Daily hygiene using 2% chlorhexidine and applying chlorhexidine-soaked sponges near the insertion site are also beneficial (O'Grady et al., 2011). Preventive infection measures include comprehensive training programs that cover correct hand hygiene, proper use of personal protective equipment, safe administration of injectable medications, and aseptic device insertion techniques (Guidelines for the Prevention of Intravascular

Catheter-Related Infections, 2023). These educational initiatives equip healthcare teams with the knowledge and skills to uphold rigorous aseptic practices and the importance of multidisciplinary and practical vascular access surveillance to prevent complications(Alexandrou et al., 2015).

Nurses, as pivotal members of the healthcare team, play a crucial role in supervising and educating teams about standardized and rigorous aseptic techniques, ensuring adherence to evidence-based protocols, and fostering a patient safety culture.(Harpel, 2012)(Woody & Davis, 2013). Daily dressing changes are needed for semi-implantable catheters until the skin has healed; after that, dressing is not required unless the catheter is in use(Stevens et al., 2018). Long-term implantable catheters necessitate flushing with 0.9% saline solution after medication administration, and antimicrobial ointments are not recommended due to potential material deterioration and the risk of antimicrobial resistance.(SAFDAR et al., 2023) Transparent film dressings are cost-effective as they allow observation of the insertion site and can remain in place for up to seven days without visible discharge. In contrast, sterile gauze dressings require more frequent changes, every two days or when moist, leading to higher costs.(Chico-Padrón et al., 2011)(Kadirvelu et al., 2024)

Hand hygiene, a practice recognized as important since the 19th century, remains the primary measure to prevent healthcare-associated infections(Tartari et al., 2024). The consequences of poor hand hygiene, such as increased risk of patient infections and the spread of antimicrobial resistance, underscore the critical importance of this practice. Continuous education and training are crucial, as demonstrated by the reduced infection rates following improved hand hygiene compliance and proper skin antisepsis.(2009)(Svenšek et al., 2024)

Essential nursing practices to prevent infections include sanitizing connections with 70% alcohol, ensuring closed unused connections, using aseptic techniques during solution preparation, and prioritizing closed infusion systems("Guideline Summary: Hand Hygiene," 2017). Peripheral components like burettes and extensions should be replaced every 72 hours or after blood reflux, while parenteral nutrition systems require daily replacement. Healthcare professionals must also strictly adhere to aseptic protocols during device handling, including regularly replacing dressings, protecting the catheter during bathing, and closely observing patient safety protocols(New Guidance Aims to Reduce Bloodstream Infections from Catheter Use, 2024). Unfortunately,the poor adherence to hand hygiene,

particularly among those who prioritize glove use, with only 14.8% of healthcare workers washing their hands before donning gloves(Armstrong-Novak et al., 2023). Continuous education and training are critical to reinforce the importance of these preventive measures and ensure healthcare teams uphold rigorous aseptic practices.(Armstrong-Novak et al., 2023)(Svenšek et al., 2024)

A multifaceted approach is crucial to effectively prevent infections associated with central venous catheters and ensure patient safety in healthcare settings. Proper CVC management by knowledgeable and well-trained nursing staff is of paramount importance. Nurses are pivotal in adhering to up-to-date, evidence-based CVC insertion, maintenance, and removal protocols(Rezer & Faustino, 2019)(Gibson & Bodenham, 2013)(Vizcarra et al., 2014). This process includes strict hand hygiene adherence, proper personal protective equipment use, and meticulous aseptic techniques.(Aydogdu & Akgün, 2020) Furthermore, the importance of continuous education and training programs for healthcare teams, facilitated by infection control committees, cannot be overstated. These initiatives are essential to reinforce the significance of preventive measures and foster a culture of patient safety. By upholding rigorous aseptic practices and staying current with the latest guidelines, nurses can significantly contribute to reducing the incidence of CVC-related infections and promoting positive patient outcomes(Teja, 2024)(Prevent Catheter-Related Bloodstream Infections, 2024).

PATIENT SAFETY POLICY

The World Health Organization has been striving to incorporate quality care in the context of patient safety, with manuals serving as an essential pathway for improving the performance of professionals responsible for patient care. (Primary Health Care and Patient Participation in the Quality and Safety of Care, 2024)(Patient Safety, 2019). The National Patient Safety Program, a significant initiative, was established to enhance healthcare quality across all healthcare facilities in the country. (Kohn et al., 2000)(Stewart et al., 2024) Patient safety, one of the six attributes of quality care, has gained significant global importance among patients, families, managers, and healthcare professionals.(El-Jardali & Fadlallah, 2017) Its primary aim is to provide safe care, focusing on patients as the central concern for professionals and leadership in health services.

When patients are engaged and invited to participate in their care and treatment actively, they move from being passive recipients to contributing to safer care, aware of

their role as citizens and healthcare consumers (Menichetti et al., 2014)(McDonald et al., 2024)(Haggstrom et al., 2024). The National Patient Safety Program (PNSP) plays a pivotal role in enhancing healthcare across all healthcare facilities in the country, demonstrating its commitment to patient safety(The Patient Safety Act, 2023)(Primary Health Care and Patient Participation in the Quality and Safety of Care, 2024)(Gallagher & Kachalia, 2024). Patient safety, one of the six attributes of quality care, has gained significant global importance among patients, families, managers, and healthcare professionals. Its primary aim is to provide safe care, focusing on patients as the central concern for professionals and leadership in health services(Allen-Duck et al., 2017)(Rahman et al., 2023). When patients are engaged and invited to participate actively in their care and treatment, they move from being passive recipients to contributing to safer care, aware of their role as citizens and healthcare consumers (2016).

The PNSP was launched in Brazil in 2013 to promote quality health care nationwide. (Behrens, 2019)(Silva & Santos, 2024) One of its specific goals is to involve patients and their families in patient safety actions. This approach demands a cultural shift within healthcare services, encouraging professionals to support and foster an active attitude among service users. Patients are regarded as partners, assuming responsibility for their health and care(Sahlström et al., 2018)(Listiowati et al., 2023). Patient safety measures aim to reduce risks and prevent adverse events, which are unexpected incidents that cause harm to patients.(Vaismoradi et al., 2014)(Saut et al., 2023) Risk managers play a vital role in achieving patient safety goals identifying, classifying, and minimizing potential risks. ANVISA emphasizes that risk managers manage health and hospital risks within healthcare services, integrating care across pharmacology, techno-vigilance, and hemovigilance.

Ordinance No. 529/2013, established in 2013, formalized the PNSP to prevent risks and adverse events in patients within hospital institutions nationwide.(Araújo et al., 2024)(Silva & Santos, 2024) It promotes actions to control the rise of health-related infections. Furthermore, Resolution RDC No. 36, dated July 25, 2013, mandated establishing a Patient Safety Core (NSP) within hospital networks to reduce adverse event incidences during patient care, enhancing the quality of care provided(Galadanci, 2013).

The patient safety guidelines were intensified in 2007 with the introduction of solutions for patient safety. (Maamoun, 2009)(Facey et al., 2024). They emphasized the importance of visible alcohol-based sanitizers, potable water faucets for hand hygiene, and informational materials demonstrating proper handwashing techniques. In response,

ANVISA joined the global challenge for patient safety, defining the five moments of hand hygiene. (WHO Guidelines on Hand Hygiene in Health Care: A Summary First Global Patient Safety Challenge Clean Care Is Safer Care WHO Guidelines on Hand Hygiene in Health Care: A Summary, 2023)(Vaughan & Sandora, 2020)

According to this management, implementing patient safety solutions is a preventive measure in areas with patient safety concerns. These solutions encompassed nine steps(WHO Guidelines on Hand Hygiene in Health Care: A Summary, 2023)(Tartari et al., 2024)(Dunlop et al., 2024):

1. Managing look-alike medications.
2. Correctly identifying patients.
3. Clarifying care procedures.
4. Avoiding incorrect surgical procedures.
5. Enhancing the safety of high-alert medications.
6. Preventing medication interactions.
7. Avoiding errors with materials such as catheters and tubes.
8. Using a single injectable device.
9. Reducing infection risks through improved hand hygiene.

Patient and family involvement is crucial at every stage, ensuring these measures effectively prevent severe events and serve as a standard for professionals and institutions delivering patient care. (WHO Best Practices for Injections and Related Procedures Toolkit, 2023)(Healthcare-Associated Infections: Prevention and Control in Primary and Community Care, 2023). The '5 Million Lives Campaign' by the Institute for Healthcare Improvement, which included initiatives like the '100,000 Lives Campaign', focused on preventing bloodstream infections related to central venous catheters. The campaign emphasized the implementation of evidence-based central venous catheter care bundles, which have been shown to significantly reduce the risk of catheter-related bloodstream infections when applied consistently by healthcare teams. However, the campaign's impact goes beyond the initial implementation of these bundles. It also stresses the importance of continuous monitoring, evaluation, and feedback to healthcare teams to ensure the sustained effectiveness of these preventive strategies.

Some patient safety initiatives can be traced back to 1987 in Australia, with the establishment of the Australian Patient Safety Foundation. A watershed moment came in 1999, when the U.S. Institute of Medicine's report "To Err is Human" opened new frontiers

in healthcare quality. Patient safety gained prominence in the early 20th century when the WHO identified a global rise in adverse events, many of which were preventable, empowering healthcare professionals to take responsibility for patient safety. This process led to improvements in healthcare quality standards. A notable incident in Brazil was the 1984 death of President-elect Tancredo Neves due to a surgical infection, which spurred hospital infection control measures and professional training to reduce adverse events.(Araújo et al., 2024)This historical context underscores the legacy of progress and improvement in patient safety, to which all healthcare professionals are contributing.

In 2005, WHO launched the Global Challenge Clean Care is Safer Care, advocating hand hygiene practices worldwide through educational initiatives and manuals to ensure quality patient care(Pittet & Donaldson, 2005)(Infection Prevention and Control and Water, Sanitation and Hygiene Measures in HealthcareHealthcare Settings and Shelters/Congregate Settings in Gaza, 2024) (Belela-Anacleto et al., 2017). Since 2004, ANVISA has systematically advanced patient safety initiatives, culminating in the 2013 PNSP directives. A core principle of PNSP, aligned with WHO recommendations, is the "Involvement of Citizens in Their Safety," recognizing patients, families, and caregivers as partners in preventing errors and harm in healthcare services (Brasil, 2017). (2019)

Patients, their families, and caregivers are crucial in ensuring patient safety. (Samri & St-Germain, 2018). They must actively engage in their care, comprehend their rights and responsibilities, supply accurate health data, and follow the agreed-upon treatment plans(Listiowati et al., 2023). Additionally, they are urged to report any adverse events to ANVISA when such incidents arise. Accurate patient identification is essential to guaranteeing patients receive the appropriate procedures and treatments preventing errors in medication administration and blood transfusions. This identification process is typically conducted upon admission and maintained through wristbands throughout the patient's care period.(Hoffmeister & Moura, 2015)(Tartari et al., 2024)

Addressing the multifactorial causes of errors and adverse events in healthcare requires recognizing that professionals are susceptible to such occurrences in complex, poorly planned technical and organizational processes (Capucho et al., 2013). In conclusion, recognizing that healthcare healthcare professionals are susceptible to errors and adverse events due to the complex, poorly planned technical and organizational processes within the healthcare healthcare system is crucial. Addressing the multifactorial causes of these incidents requires a comprehensive approach that empowers

professionals, engages patients and families, and fosters a culture of safety throughout the healthcare organization.

REFERENCES

1. Advani, S., Cawcutt, K., Klompas, M., Marschall, J., Meddings, J., & Patel, P. (2024). The next frontier of healthcare-associated infection (HAI) surveillance metrics: Beyond device-associated infections. In S. Advani, K. Cawcutt, M. Klompas, J. Marschall, J. Meddings, & P. Patel, *Infection Control and Hospital Epidemiology* (Vol. 45, Issue 6, p. 693). Cambridge University Press. <https://doi.org/10.1017/ice.2023.283>
2. Alexandrou, E., Ray-Barruel, G., Carr, P. J., Frost, S. A., Inwood, S., Higgins, N., Lin, F., Alberto, L., Mermel, L. A., & Rickard, C. M. (2015). International prevalence of the use of peripheral intravenous catheters. In E. Alexandrou, G. Ray-Barruel, P. J. Carr, S. A. Frost, S. Inwood, N. Higgins, F. Lin, L. Alberto, L. A. Mermel, & C. M. Rickard, *Journal of Hospital Medicine* (Vol. 10, Issue 8, p. 530). Wiley. <https://doi.org/10.1002/jhm.2389>
3. Armstrong-Novak, J., Juan, H. Y., Cooper, K., & Bailey, P. (2023). Healthcare Personnel Hand Hygiene Compliance: Are We There Yet? [Review of Healthcare Personnel Hand Hygiene Compliance: Are We There Yet?]. *Current Infectious Disease Reports*, 25(7), 123. Springer Science+Business Media. <https://doi.org/10.1007/s11908-023-00806-8>
4. Aydogdu, S., & Akgün, M. (2020). Determination of knowledge levels of nurses and the factors affecting the level of knowledge in central venous catheter care. In S. Aydogdu & M. Akgün, *Clinical Nursing Studies* (Vol. 8, Issue 2, p. 1). Sciedu Press. <https://doi.org/10.5430/cns.v8n2p1>
5. B Allegranzi, World Health Organization, Geneva, Switzerland, allegranzi@who.int, D Pittet, World Health Organization, Geneva, Switzerland. (2009). Role of hand hygiene in healthcare-associated infection prevention. <https://journalofhospitalinfection.com/retrieve/pii/S0195670109001868>
6. Bahl, A., Haddad, L., Hoerauf, K., Mares, A., & Alsbrooks, K. (2023). The Clinical and Economic Burdens of Infiltration and Extravasation with Peripheral Intravenous Catheters: A Contemporary Narrative Review. In A. Bahl, L. Haddad, K. Hoerauf, A. Mares, & K. Alsbrooks, *International Journal of Nursing and Health Care Research* (Vol. 6, Issue 6). <https://doi.org/10.29011/2688-9501.101436>
7. Boyd, S. E., Aggarwal, I., Davey, P., Logan, M., & Nathwani, D. (2010). Peripheral intravenous catheters: the road to quality improvement and safer patient care. In S. E. Boyd, I. Aggarwal, P. Davey, M. Logan, & D. Nathwani, *Journal of Hospital Infection* (Vol. 77, Issue 1, p. 37). Elsevier BV. <https://doi.org/10.1016/j.jhin.2010.09.011>
8. Buetti, N., Marschall, J., Drees, M., Fakih, M. G., Hadaway, L., Maragakis, L. L., Monsees, E., Novosad, S., O'Grady, N. P., Rupp, M. E., Wolf, J., Yokoe, D. S., & Mermel, L. A. (2022). Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update. In N. Buetti, J. Marschall, M. Drees, M. G. Fakih, L. Hadaway, L. L. Maragakis, E. Monsees, S. Novosad, N. P. O'Grady, M. E. Rupp, J. Wolf, D. S. Yokoe, & L. A. Mermel, *Infection Control and Hospital Epidemiology* (Vol. 43, Issue 5, p. 553). Cambridge University Press. <https://doi.org/10.1017/ice.2022.87>

9. Chelazzi, C., Selmi, V., Vitali, L., & Gaudio, A. R. D. (2011). Infections of Cardiac Implantable Electronic Devices: Etiology, Prevention and Treatment. In C. Chelazzi, V. Selmi, L. Vitali, & A. R. D. Gaudio, InTech eBooks. <https://doi.org/10.5772/23360>
10. Chico-Padrón, R. M., Carrión-García, L., Delle-Vedove-Rosales, L., González-Vargas, C. S., Marrero-Perera, M., Medina-Chico, S., Rodríguez-Díaz, M. P., Alonso-Díaz, M., & Jiménez, A. (2011). Comparative Safety and Costs of Transparent Versus Gauze Wound Dressings in Intravenous Catheterization. In R. M. Chico-Padrón, L. Carrión-García, L. Delle-Vedove-Rosales, C. S. González-Vargas, M. Marrero-Perera, S. Medina-Chico, M. P. Rodríguez-Díaz, M. Alonso-Díaz, & A. Jiménez, *Journal of Nursing Care Quality* (Vol. 26, Issue 4, p. 371). Lippincott Williams & Wilkins. <https://doi.org/10.1097/ncq.0b013e318210741b>
11. Chopra, V. (2024, February 13). Finding the Middle Ground for Intravenous Therapy. In V. Chopra, *JAMA Network Open* (Vol. 7, Issue 2). American Medical Association. <https://doi.org/10.1001/jamanetworkopen.2023.55724>
12. Chopra, V., Flanders, S. A., & Saint, S. (2012). The Problem With Peripherally Inserted Central Catheters. In V. Chopra, S. A. Flanders, & S. Saint, *JAMA* (Vol. 308, Issue 15, p. 1527). American Medical Association. <https://doi.org/10.1001/jama.2012.12704>
13. Crisi, P. E., Santis, F. D., Aste, G., Tiscar, P. G., Mosca, F., Gasparini, A., Felici, A., Ferroni, L., Miglio, A., Tommaso, M. D., & Luciani, A. (2022). Inflammatory, Mechanical and Infectious Complications Associated with Peripheral Intravenous Catheters in Dogs and Cats: A Risk Factor Analysis. In P. E. Crisi, F. D. Santis, G. Aste, P. G. Tiscar, F. Mosca, A. Gasparini, A. Felici, L. Ferroni, A. Miglio, M. D. Tommaso, & A. Luciani, *Veterinary Sciences* (Vol. 9, Issue 3, p. 118). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/vetsci9030118>
14. David E Clarke; Thomas A Raffin. (2023). Infectious Complications of Indwelling Long-term Central Venous Catheters. [https://journal.chestnet.org/article/S0012-3692\(16\)35072-3/fulltext](https://journal.chestnet.org/article/S0012-3692(16)35072-3/fulltext)
15. Esposito, S., Purrello, S., Bonnet, É., Novelli, A., Tripodi, F., Pascale, R., Ünal, S., & Milkovich, G. (2013). Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant *Staphylococcus aureus* [Review of Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant *Staphylococcus aureus*]. *Journal of Global Antimicrobial Resistance*, 1(2), 71. Elsevier BV. <https://doi.org/10.1016/j.jgar.2013.03.002>
16. Gibson, F., & Bodenham, A. (2013). Misplaced central venous catheters: applied anatomy and practical management [Review of Misplaced central venous catheters: applied anatomy and practical management]. *British Journal of Anaesthesia*, 110(3), 333. Elsevier BV. <https://doi.org/10.1093/bja/aes497>
17. Guideline Summary: Hand Hygiene. (2017). In *AORN Journal* (Vol. 105, Issue 2, p. 213). Wiley. <https://doi.org/10.1016/j.aorn.2016.12.003>

18. Guidelines for the Prevention of Intravascular Catheter-Related Infections. (2023). <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5110a1.htm>
19. Hafeez, S. B., Ahmed, A., Akhtar, A., Ishtiaq, W., Javed, N. U. S., Abbas, K., Khan, M., Zafar, H., & Jawed, A. (2022). Catheter-Related Bloodstream Infection With Femoral Central Access Versus Internal Jugular Access in Patients Admitting to Medical Intensive Care Unit. In S. B. Hafeez, A. Ahmed, A. Akhtar, W. Ishtiaq, N. U. S. Javed, K. Abbas, M. Khan, H. Zafar, & A. Jawed, Cureus. Cureus, Inc. <https://doi.org/10.7759/cureus.29416>
20. Hanauer, L. P. T., Comerlato, P. H., Papke, A., Butzke, M., Daga, A., Hoffmeister, M. C., Boniatti, M. M., John, J. F., Schaan, B. D., & Rados, D. R. V. (2020). Reducing central vein catheterization complications with a focused educational program: a retrospective cohort study. In L. P. T. Hanauer, P. H. Comerlato, A. Papke, M. Butzke, A. Daga, M. C. Hoffmeister, M. M. Boniatti, J. F. John, B. D. Schaan, & D. R. V. Rados, Scientific Reports (Vol. 10, Issue 1). Nature Portfolio. <https://doi.org/10.1038/s41598-020-74395-0>
21. Harpel, J. (2012). Best Practices for Vascular Resource Teams. In J. Harpel, Journal of Infusion Nursing (Vol. 36, Issue 1, p. 46). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0b013e3182798862>
22. Hoppe, B. O. (1995). Central venous catheter-related infections: Pathogenesis, predictors, and prevention [Review of Central venous catheter-related infections: Pathogenesis, predictors, and prevention]. Heart & Lung, 24(4), 333. Elsevier BV. [https://doi.org/10.1016/s0147-9563\(05\)80079-2](https://doi.org/10.1016/s0147-9563(05)80079-2)
23. Jamshidi, R. (2019). Central venous catheters: Indications, techniques, and complications [Review of Central venous catheters: Indications, techniques, and complications]. Seminars in Pediatric Surgery, 28(1), 26. Elsevier BV. <https://doi.org/10.1053/j.sempedsurg.2019.01.005>
24. Jérémy Guenezan, Bertrand Drugeon, Rodérick O'Neill, Diane Caillaud, Clément Sénamaud, Catherine Pouzet, Sabrina Seguin, Denis Frasca, Olivier Mimos. (2019). Skin antisepsis with chlorhexidine–alcohol versus povidone iodine–alcohol, combined or not with use of a bundle of new devices, for prevention of short-term peripheral venous catheter-related infectious complications and catheter failure: an open-label, single-centre, randomised, four-parallel group. <https://bmjopen.bmj.com/content/bmjopen/9/4/e028549.full.pdf>
25. Kadirvelu, L., Sivaramalingam, S. S., Jothivel, D., Chithiraiselvan, D. D., Govindarajan, D. K., & Kandaswamy, K. (2024). A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants [Review of A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants]. Current Research in Microbial Sciences, 6, 100231. Elsevier BV. <https://doi.org/10.1016/j.crmicr.2024.100231>
26. Kaur, P., Rickard, C. M., Domer, G. S., & Glover, K. R. (2019). Dangers of Peripheral Intravenous Catheterization: The Forgotten Tourniquet and Other Patient Safety

- Considerations. In P. Kaur, C. M. Rickard, G. S. Domer, & K. R. Glover, IntechOpen eBooks. IntechOpen. <https://doi.org/10.5772/intechopen.83854>
27. Kavanagh, K. T., Maiwald, M., & Cormier, L. E. (2024). Viewpoint: The impending pandemic of resistant organisms – a paradigm shift towards source control is needed. In K. T. Kavanagh, M. Maiwald, & L. E. Cormier, *Medicine* (Vol. 103, Issue 31). Wolters Kluwer. <https://doi.org/10.1097/md.00000000000039200>
 28. Liang, R., & Landry, I. (2022). Endovascular Endocarditis Within the Superior Vena Cava of a Patient With a Tunneled Catheter for Hemodialysis. In R. Liang & I. Landry, *Cureus*. Cureus, Inc. <https://doi.org/10.7759/cureus.23027>
 29. Mayorga, D. E. S., García, S. T., Delgado, M. A. F., & Zúñiga-Gazcón, H. (2023). Cardiovascular Complications Related to the Use of ECMO in Cardiac Surgery. In D. E. S. Mayorga, S. T.- García, M. A. F. Delgado, & H. Zúñiga-Gazcón, *International Journal of Medical Science and Clinical Research Studies* (Vol. 3, Issue 5). <https://doi.org/10.47191/ijmscrs/v3-i5-23>
 30. McDonnell, G. (2017). Antiseptics and Antisepsis. In G. McDonnell, *ASM Press eBooks* (p. 149). <https://doi.org/10.1128/9781555819682.ch4>
 31. New guidance aims to reduce bloodstream infections from catheter use. (2024). <https://www.who.int/news/item/09-05-2024-new-guidance-aims-to-reduce-bloodstream-infections-from-catheter-use>
 32. Nye, T. M., Zou, Z., Obernuefemann, C. L. P., Pinkner, J. S., Lowry, E., Kleinschmidt, K., Bergeron, K., Klim, A., Dodson, K., Flores-Mireles, A. L., Walker, J. N., Wong, D., Desai, A., Caparon, M. G., & Hultgren, S. J. (2024). Microbial co-occurrences on catheters from long-term catheterized patients. In T. M. Nye, Z. Zou, C. L. P. Obernuefemann, J. S. Pinkner, E. Lowry, K. Kleinschmidt, K. Bergeron, A. Klim, K. Dodson, A. L. Flores-Mireles, J. N. Walker, D. Wong, A. Desai, M. G. Caparon, & S. J. Hultgren, *Nature Communications* (Vol. 15, Issue 1). *Nature Portfolio*. <https://doi.org/10.1038/s41467-023-44095-0>
 33. O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P. A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I., Randolph, A. G., Rupp, M. E., & Saint, S. (2011). Guidelines for the Prevention of Intravascular Catheter-related Infections. In N. P. O'Grady, M. Alexander, L. A. Burns, E. P. Dellinger, J. Garland, S. O. Heard, P. A. Lipsett, H. Masur, L. A. Mermel, M. L. Pearson, I. Raad, A. G. Randolph, M. E. Rupp, & S. Saint, *Clinical Infectious Diseases* (Vol. 52, Issue 9). Oxford University Press. <https://doi.org/10.1093/cid/cir257>
 34. O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P. A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I., Randolph, A. G., Rupp, M. E., & Saint, S. (2011). Summary of Recommendations: Guidelines for the Prevention of Intravascular Catheter-related Infections. In N. P. O'Grady, M. Alexander, L. A. Burns, E. P. Dellinger, J. Garland, S. O. Heard, P. A. Lipsett, H. Masur, L. A. Mermel, M. L. Pearson, I. Raad, A. G. Randolph, M. E. Rupp, & S. Saint, *Clinical Infectious Diseases* (Vol. 52, Issue 9, p. 1087). Oxford University Press. <https://doi.org/10.1093/cid/cir138>

35. Parás-Bravo, P., Paz-Zulueta, M., Lavín, R. S., Amo-Setién, F. J., Herrero-Montes, M., Olavarria-Beivide, E., Rodríguez-Rodríguez, M., Torres-Manrique, B., Vega, C. R. la, Caso-Álvarez, V., González-Parralo, L., & Antolín-Juárez, F. M. (2016). Complications of Peripherally Inserted Central Venous Catheters: A Retrospective Cohort Study. In P. Parás-Bravo, M. Paz-Zulueta, R. S. Lavín, F. J. Amo-Setién, M. Herrero-Montes, E. Olavarria-Beivide, M. Rodríguez-Rodríguez, B. Torres-Manrique, C. R. la Vega, V. Caso-Álvarez, L. González-Parralo, & F. M. Antolín-Juárez, PLoS ONE (Vol. 11, Issue 9). Public Library of Science. <https://doi.org/10.1371/journal.pone.0162479>
36. Practical guide for safe central venous catheterization and management 2017. (2019). Journal of Anesthesia, 34(2), 167. Springer Science+Business Media. <https://doi.org/10.1007/s00540-019-02702-9>
37. Prevent Catheter-Related Bloodstream Infections. (2024). <https://www.cidrap.umn.edu/antimicrobial-stewardship/who-issues-guidance-prevent-catheter-related-bloodstream-infections>
38. Ramin Jamshidi. (2019). Central venous catheters: Indications, techniques, and complications. <https://www.sciencedirect.com/science/article/pii/S1055858619300058>
39. Rezer, F., & Faustino, W. R. (2019). NURSES' KNOWLEDGE OF INTENSIVE CARE UNIT ON CENTRAL VENOUS CATHETER DRESSING. In F. Rezer & W. R. Faustino, Revista Prevenção de Infecção e Saúde (Vol. 5). Universidade Federal do Piauí. <https://doi.org/10.26694/repis.v5i0.8113>
40. Robert W Taylor, taylrw@stlo.smhs.com, Ashok V Palagiri. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
41. SAFDAR, N., KLUGER, D., & MAKI, D. (2023). A Review of Risk Factors for Catheter-Related Bloodstream... https://journals.lww.com/md-journal/fulltext/2002/11000/a_review_of_risk_factors_for_catheter_related.7.aspx
42. Smith, R. N., & Nolan, J. P. (2013). Central venous catheters [Review of Central venous catheters]. BMJ, 347. <https://doi.org/10.1136/bmj.f6570>
43. Stevens, C., Milner, K. A., & Trudeau, J. (2018). Routine Versus Clinically Indicated Short Peripheral Catheter Replacement: An Evidence-based Practice Project. <https://journals.lww.com/00129804-201805000-00008>
44. Svenšek, A., Muršec, D., & Fijačko, N. (2024). Assessing the incorporation of the “Five Moments for Hand Hygiene” into nursing procedure textbooks. In A. Svenšek, D. Muršec, & N. Fijačko, Nurse Education in Practice (Vol. 79, p. 104044). Elsevier BV. <https://doi.org/10.1016/j.nepr.2024.104044>
45. Tartari, E., Bellissimo-Rodrigues, F., Pires, D., Fankhauser, C., Lotfinejad, N., Saito, H., Suchomel, M., Krämer, A., Allegranzi, B., Boyce, J. M., Sax, H., Stewardson, A. J., Pittet,

- D., Rodin, A., Yuichi, K., Benjamin, A., Pamela, L., Tingxu, L., Jim, A., ... Walter, Z. (2024).
46. Updates and future directions regarding hand hygiene in the healthcare setting: insights from the 3rd ICPIIC alcohol-based handrub (ABHR) task force. In E. Tartari, F. Bellissimo-Rodrigues, D. Pires, C. Fankhauser, N. Lotfinejad, H. Saito, M. Suchomel, A. Krämer, B. Allegranzi, J. M. Boyce, H. Sax, A. J. Stewardson, D. Pittet, A. Rodin, K. Yuichi, A. Benjamin, L. Pamela, L. Tingxu, A. Jim, ... Z. Walter, *Antimicrobial Resistance and Infection Control* (Vol. 13, Issue 1). BioMed Central. <https://doi.org/10.1186/s13756-024-01374-9>
 47. Taylor, R. W., & Palagiri, A. V. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
 48. Teja, B. (2024). Complication Rates of Central Venous Catheters. https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2815818?guestAccessKey=c299df71-e47a-46f2-94a1-446080918e44&utm_source=twitter&utm_medium=social_jamaim&utm_term=12802215500&utm_campaign=article_alert&linkId=346773145
 49. The incidence of infectious complications of central venous ... (2023). https://journals.lww.com/ccmjjournal/abstract/2005/01000/the_incidence_of_infectious_complications_of.3.aspx
 50. Username. (2024). Bundle care approach to reduce device associated infections in post-living-donor-liver transplantation in a tertiary care hospital, Egypt - PubMed. <https://pubmed.ncbi.nlm.nih.gov/38969966/>
 51. Vijayan, A., & Boyce, J. M. (2022). 100% Use of Infection Control Procedures in Hemodialysis. <https://journals.lww.com/cjasn/pages/articleviewer.aspx?year=2018&issue=04000&article=00026&type=Fulltext>
 52. Vizcarra, C., Cassutt, C., Corbitt, N., Richardson, D., Runde, D., & Stafford, K. (2014). Recommendations for Improving Safety Practices With Short Peripheral Catheters. In C. Vizcarra, C. Cassutt, N. Corbitt, D. Richardson, D. Runde, & K. Stafford, *Journal of Infusion Nursing* (Vol. 37, Issue 2, p. 121). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0000000000000028>
 53. Wang, H., He, L.-H., Han, C., & Wan, J. (2024). Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients [Review of Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients]. *BMC Anesthesiology*, 24(1). BioMed Central. <https://doi.org/10.1186/s12871-024-02458-0>
 54. Willet V, Dixit D, Fisher D, Bausch D G, Ogunisola F, Khabsa J et al. (2024). Summary of WHO infection prevention and control guideline for Ebola and Marburg disease: a call for evidence based practice. <https://www.bmj.com/content/384/bmj.p2811>

55. William, B. M., Bongu, N. R., Bast, M., Bociek, R. G., Bierman, P. J., Vose, J. M., & Armitage, J. O. (2013). Adverse events and technical complaints related to central venous catheters marketed in Brazil. In B. M. William, N. R. Bongu, M. Bast, R. G. Bociek, P. J. Bierman, J. M. Vose, & J. O. Armitage, *Revista Brasileira de Hematologia e Hemoterapia*. Elsevier BV. <https://doi.org/10.5581/1516-8484.20130055>
56. Williamson, D. A., Carter, G. P., & Howden, B. P. (2017). Current and Emerging Topical Antibacterials and Antiseptics: Agents, Action, and Resistance Patterns [Review of Current and Emerging Topical Antibacterials and Antiseptics: Agents, Action, and Resistance Patterns]. *Clinical Microbiology Reviews*, 30(3), 827. American Society for Microbiology. <https://doi.org/10.1128/cmr.00112-16>
57. Woody, G., & Davis, B. (2013). Increasing Nurse Competence in Peripheral Intravenous Therapy. In G. Woody & B. Davis, *Journal of Infusion Nursing* (Vol. 36, Issue 6, p. 413). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0000000000000013>
58. Advani, S., Cawcutt, K., Klompas, M., Marschall, J., Meddings, J., & Patel, P. (2024). The next frontier of healthcare-associated infection (HAI) surveillance metrics: Beyond device-associated infections. In S. Advani, K. Cawcutt, M. Klompas, J. Marschall, J. Meddings, & P. Patel, *Infection Control and Hospital Epidemiology* (Vol. 45, Issue 6, p. 693). Cambridge University Press. <https://doi.org/10.1017/ice.2023.283>
59. Aydogdu, S., & Akgün, M. (2020). Determination of knowledge levels of nurses and the factors affecting the level of knowledge in central venous catheter care. In S. Aydogdu & M. Akgün, *Clinical Nursing Studies* (Vol. 8, Issue 2, p. 1). Sciedu Press. <https://doi.org/10.5430/cns.v8n2p1>
60. Bahl, A., Haddad, L., Hoerauf, K., Mares, A., & Alsbrooks, K. (2023). The Clinical and Economic Burdens of Infiltration and Extravasation with Peripheral Intravenous Catheters: A Contemporary Narrative Review. In A. Bahl, L. Haddad, K. Hoerauf, A. Mares, & K. Alsbrooks, *International Journal of Nursing and Health Care Research* (Vol. 6, Issue 6). <https://doi.org/10.29011/2688-9501.101436>
61. Buetti, N., Marschall, J., Drees, M., Fakih, M. G., Hadaway, L., Maragakis, L. L., Monsees, E., Novosad, S., O'Grady, N. P., Rupp, M. E., Wolf, J., Yokoe, D. S., & Mermel, L. A. (2022). Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update. In N. Buetti, J. Marschall, M. Drees, M. G. Fakih, L. Hadaway, L. L. Maragakis, E. Monsees, S. Novosad, N. P. O'Grady, M. E. Rupp, J. Wolf, D. S. Yokoe, & L. A. Mermel, *Infection Control and Hospital Epidemiology* (Vol. 43, Issue 5, p. 553). Cambridge University Press. <https://doi.org/10.1017/ice.2022.87>
62. Chelazzi, C., Selmi, V., Vitali, L., & Gaudio, A. R. D. (2011). Infections of Cardiac Implantable Electronic Devices: Etiology, Prevention and Treatment. In C. Chelazzi, V. Selmi, L. Vitali, & A. R. D. Gaudio, *InTech eBooks*. <https://doi.org/10.5772/23360>
63. Chopra, V. (2024, February 13). Finding the Middle Ground for Intravenous Therapy. In V. Chopra, *JAMA Network Open* (Vol. 7, Issue 2). American Medical Association. <https://doi.org/10.1001/jamanetworkopen.2023.55724>

64. Chopra, V., Flanders, S. A., & Saint, S. (2012). The Problem With Peripherally Inserted Central Catheters. In V. Chopra, S. A. Flanders, & S. Saint, JAMA (Vol. 308, Issue 15, p. 1527). American Medical Association. <https://doi.org/10.1001/jama.2012.12704>
65. Crisi, P. E., Santis, F. D., Aste, G., Tiscar, P. G., Mosca, F., Gasparini, A., Felici, A., Ferroni, L., Miglio, A., Tommaso, M. D., & Luciani, A. (2022). Inflammatory, Mechanical and Infectious Complications Associated with Peripheral Intravenous Catheters in Dogs and Cats: A Risk Factor Analysis. In P. E. Crisi, F. D. Santis, G. Aste, P. G. Tiscar, F. Mosca, A. Gasparini, A. Felici, L. Ferroni, A. Miglio, M. D. Tommaso, & A. Luciani, Veterinary Sciences (Vol. 9, Issue 3, p. 118). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/vetsci9030118>
66. David E Clarke; Thomas A Raffin. (2023). Infectious Complications of Indwelling Long-term Central Venous Catheters. [https://journal.chestnet.org/article/S0012-3692\(16\)35072-3/fulltext](https://journal.chestnet.org/article/S0012-3692(16)35072-3/fulltext)
67. Esposito, S., Purrello, S., Bonnet, É., Novelli, A., Tripodi, F., Pascale, R., Ünal, S., & Milkovich, G. (2013). Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant Staphylococcus aureus [Review of Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant Staphylococcus aureus]. Journal of Global Antimicrobial Resistance, 1(2), 71. Elsevier BV. <https://doi.org/10.1016/j.jgar.2013.03.002>
68. Hafeez, S. B., Ahmed, A., Akhtar, A., Ishtiaq, W., Javed, N. U. S., Abbas, K., Khan, M., Zafar, H., & Jawed, A. (2022). Catheter-Related Bloodstream Infection With Femoral Central Access Versus Internal Jugular Access in Patients Admitting to Medical Intensive Care Unit. In S. B. Hafeez, A. Ahmed, A. Akhtar, W. Ishtiaq, N. U. S. Javed, K. Abbas, M. Khan, H. Zafar, & A. Jawed, Cureus. Cureus, Inc. <https://doi.org/10.7759/cureus.29416>
69. Hanauer, L. P. T., Comerlato, P. H., Papke, A., Butzke, M., Daga, A., Hoffmeister, M. C., Boniatti, M. M., John, J. F., Schaan, B. D., & Rados, D. R. V. (2020). Reducing central vein catheterization complications with a focused educational program: a retrospective cohort study. In L. P. T. Hanauer, P. H. Comerlato, A. Papke, M. Butzke, A. Daga, M. C. Hoffmeister, M. M. Boniatti, J. F. John, B. D. Schaan, & D. R. V. Rados, Scientific Reports (Vol. 10, Issue 1). Nature Portfolio. <https://doi.org/10.1038/s41598-020-74395-0>
70. Hoppe, B. O. (1995). Central venous catheter-related infections: Pathogenesis, predictors, and prevention [Review of Central venous catheter-related infections: Pathogenesis, predictors, and prevention]. Heart & Lung, 24(4), 333. Elsevier BV. [https://doi.org/10.1016/s0147-9563\(05\)80079-2](https://doi.org/10.1016/s0147-9563(05)80079-2)
71. Jamshidi, R. (2019). Central venous catheters: Indications, techniques, and complications [Review of Central venous catheters: Indications, techniques, and complications]. Seminars in Pediatric Surgery, 28(1), 26. Elsevier BV. <https://doi.org/10.1053/j.sempedsurg.2019.01.005>

72. Kadirvelu, L., Sivaramalingam, S. S., Jothivel, D., Chithiraiselvan, D. D., Govindarajan, D. K., & Kandaswamy, K. (2024). A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants [Review of A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants]. *Current Research in Microbial Sciences*, 6, 100231. Elsevier BV. <https://doi.org/10.1016/j.crmicr.2024.100231>
73. Kaur, P., Rickard, C. M., Domer, G. S., & Glover, K. R. (2019). Dangers of Peripheral Intravenous Catheterization: The Forgotten Tourniquet and Other Patient Safety Considerations. In P. Kaur, C. M. Rickard, G. S. Domer, & K. R. Glover, *IntechOpen eBooks*. IntechOpen. <https://doi.org/10.5772/intechopen.83854>
74. Liang, R., & Landry, I. (2022). Endovascular Endocarditis Within the Superior Vena Cava of a Patient With a Tunneled Catheter for Hemodialysis. In R. Liang & I. Landry, *Cureus*. Cureus, Inc. <https://doi.org/10.7759/cureus.23027>
75. Mayorga, D. E. S., García, S. T., Delgado, M. A. F., & Zúñiga-Gazcón, H. (2023). Cardiovascular Complications Related to the Use of ECMO in Cardiac Surgery. In D. E. S. Mayorga, S. T.- García, M. A. F. Delgado, & H. Zúñiga-Gazcón, *International Journal of Medical Science and Clinical Research Studies* (Vol. 3, Issue 5). <https://doi.org/10.47191/ijmscrs/v3-i5-23>
76. Nye, T. M., Zou, Z., Obernuefemann, C. L. P., Pinkner, J. S., Lowry, E., Kleinschmidt, K., Bergeron, K., Klim, A., Dodson, K., Flores-Mireles, A. L., Walker, J. N., Wong, D., Desai, A., Caparon, M. G., & Hultgren, S. J. (2024). Microbial co-occurrences on catheters from long-term catheterized patients. In T. M. Nye, Z. Zou, C. L. P. Obernuefemann, J. S. Pinkner, E. Lowry, K. Kleinschmidt, K. Bergeron, A. Klim, K. Dodson, A. L. Flores-Mireles, J. N. Walker, D. Wong, A. Desai, M. G. Caparon, & S. J. Hultgren, *Nature Communications* (Vol. 15, Issue 1). *Nature Portfolio*. <https://doi.org/10.1038/s41467-023-44095-0>
77. Parás-Bravo, P., Paz-Zulueta, M., Lavín, R. S., Amo-Setién, F. J., Herrero-Montes, M., Olavarria-Beivide, E., Rodríguez-Rodríguez, M., Torres-Manrique, B., Vega, C. R. la, Caso-Álvarez, V., González-Parralo, L., & Antolín-Juárez, F. M. (2016). Complications of Peripherally Inserted Central Venous Catheters: A Retrospective Cohort Study. In P. Parás-Bravo, M. Paz-Zulueta, R. S. Lavín, F. J. Amo-Setién, M. Herrero-Montes, E. Olavarria-Beivide, M. Rodríguez-Rodríguez, B. Torres-Manrique, C. R. la Vega, V. Caso-Álvarez, L. González-Parralo, & F. M. Antolín-Juárez, *PLoS ONE* (Vol. 11, Issue 9). *Public Library of Science*. <https://doi.org/10.1371/journal.pone.0162479>
78. Practical guide for safe central venous catheterization and management 2017. (2019). *Journal of Anesthesia*, 34(2), 167. Springer Science+Business Media. <https://doi.org/10.1007/s00540-019-02702-9>
79. Ramin Jamshidi. (2019). Central venous catheters: Indications, techniques, and complications. <https://www.sciencedirect.com/science/article/pii/S1055858619300058>
80. Rezer, F., & Faustino, W. R. (2019). NURSES' KNOWLEDGE OF INTENSIVE CARE UNIT ON CENTRAL VENOUS CATHETER DRESSING. In F. Rezer & W. R. Faustino,

Revista Prevenção de Infecção e Saúde (Vol. 5). Universidade Federal do Piauí.
<https://doi.org/10.26694/repis.v5i0.8113>

81. Robert W Taylor, taylrw@stlo.smhs.com, Ashok V Palagiri. (2023). Central venous catheterization.
https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
82. SAFDAR, N., KLUGER, D., & MAKI, D. (2023). A Review of Risk Factors for Catheter-Related Bloodstream...
https://journals.lww.com/md-journal/fulltext/2002/11000/a_review_of_risk_factors_for_catheter_related.7.aspx
83. Smith, R. N., & Nolan, J. P. (2013). Central venous catheters [Review of Central venous catheters]. *BMJ*, 347. <https://doi.org/10.1136/bmj.f6570>
84. Taylor, R. W., & Palagiri, A. V. (2023). Central venous catheterization.
https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
85. Teja, B. (2024). Complication Rates of Central Venous Catheters.
https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2815818?guestAccessKey=c299df71-e47a-46f2-94a1-446080918e44&utm_source=twitter&utm_medium=social_jamaim&utm_term=12802215500&utm_campaign=article_alert&linkId=346773145
86. The incidence of infectious complications of central venous ... (2023).
https://journals.lww.com/ccmjjournal/abstract/2005/01000/the_incidence_of_infectious_complications_of.3.aspx
87. Vijayan, A., & Boyce, J. M. (2022). 100% Use of Infection Control Procedures in Hemodialysis.
<https://journals.lww.com/cjasn/pages/articleviewer.aspx?year=2018&issue=04000&article=00026&type=Fulltext>
88. Wang, H., He, L.-H., Han, C., & Wan, J. (2024). Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients [Review of Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients]. *BMC Anesthesiology*, 24(1). BioMed Central. <https://doi.org/10.1186/s12871-024-02458-0>
89. William, B. M., Bongu, N. R., Bast, M., Bociek, R. G., Bierman, P. J., Vose, J. M., & Armitage, J. O. (2013). Adverse events and technical complaints related to central venous catheters marketed in Brazil. In B. M. William, N. R. Bongu, M. Bast, R. G. Bociek, P. J. Bierman, J. M. Vose, & J. O. Armitage, *Revista Brasileira de Hematologia e Hemoterapia*. Elsevier BV. <https://doi.org/10.5581/1516-8484.20130055>
90. Bahl, A., Haddad, L., Hoerauf, K., Mares, A., & Alsbrooks, K. (2023). The Clinical and Economic Burdens of Infiltration and Extravasation with Peripheral Intravenous Catheters: A Contemporary Narrative Review. In A. Bahl, L. Haddad, K. Hoerauf, A.

- Mares, & K. Alsbrooks, *International Journal of Nursing and Health Care Research* (Vol. 6, Issue 6). <https://doi.org/10.29011/2688-9501.101436>
91. Chelazzi, C., Selmi, V., Vitali, L., & Gaudio, A. R. D. (2011). Infections of Cardiac Implantable Electronic Devices: Etiology, Prevention and Treatment. In C. Chelazzi, V. Selmi, L. Vitali, & A. R. D. Gaudio, *InTech eBooks*. <https://doi.org/10.5772/23360>
 92. Chopra, V. (2024, February 13). Finding the Middle Ground for Intravenous Therapy. In V. Chopra, *JAMA Network Open* (Vol. 7, Issue 2). American Medical Association. <https://doi.org/10.1001/jamanetworkopen.2023.55724>
 93. Chopra, V., Flanders, S. A., & Saint, S. (2012). The Problem With Peripherally Inserted Central Catheters. In V. Chopra, S. A. Flanders, & S. Saint, *JAMA* (Vol. 308, Issue 15, p. 1527). American Medical Association. <https://doi.org/10.1001/jama.2012.12704>
 94. Crisi, P. E., Santis, F. D., Aste, G., Tiscar, P. G., Mosca, F., Gasparini, A., Felici, A., Ferroni, L., Miglio, A., Tommaso, M. D., & Luciani, A. (2022). Inflammatory, Mechanical and Infectious Complications Associated with Peripheral Intravenous Catheters in Dogs and Cats: A Risk Factor Analysis. In P. E. Crisi, F. D. Santis, G. Aste, P. G. Tiscar, F. Mosca, A. Gasparini, A. Felici, L. Ferroni, A. Miglio, M. D. Tommaso, & A. Luciani, *Veterinary Sciences* (Vol. 9, Issue 3, p. 118). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/vetsci9030118>
 95. Hafeez, S. B., Ahmed, A., Akhtar, A., Ishtiaq, W., Javed, N. U. S., Abbas, K., Khan, M., Zafar, H., & Jawed, A. (2022). Catheter-Related Bloodstream Infection With Femoral Central Access Versus Internal Jugular Access in Patients Admitting to Medical Intensive Care Unit. In S. B. Hafeez, A. Ahmed, A. Akhtar, W. Ishtiaq, N. U. S. Javed, K. Abbas, M. Khan, H. Zafar, & A. Jawed, *Cureus*. Cureus, Inc. <https://doi.org/10.7759/cureus.29416>
 96. Jamshidi, R. (2019). Central venous catheters: Indications, techniques, and complications [Review of Central venous catheters: Indications, techniques, and complications]. *Seminars in Pediatric Surgery*, 28(1), 26. Elsevier BV. <https://doi.org/10.1053/j.sempedsurg.2019.01.005>
 97. Kaur, P., Rickard, C. M., Domer, G. S., & Glover, K. R. (2019). Dangers of Peripheral Intravenous Catheterization: The Forgotten Tourniquet and Other Patient Safety Considerations. In P. Kaur, C. M. Rickard, G. S. Domer, & K. R. Glover, *IntechOpen eBooks*. IntechOpen. <https://doi.org/10.5772/intechopen.83854>
 98. Mayorga, D. E. S., García, S. T., Delgado, M. A. F., & Zúñiga-Gazcón, H. (2023). Cardiovascular Complications Related to the Use of ECMO in Cardiac Surgery. In D. E. S. Mayorga, S. T.- García, M. A. F. Delgado, & H. Zúñiga-Gazcón, *International Journal of Medical Science and Clinical Research Studies* (Vol. 3, Issue 5). <https://doi.org/10.47191/ijmscrs/v3-i5-23>
 99. Parás-Bravo, P., Paz-Zulueta, M., Lavín, R. S., Amo-Setién, F. J., Herrero-Montes, M., Olavarria-Beivide, E., Rodríguez-Rodríguez, M., Torres-Manrique, B., Vega, C. R. la, Caso-Álvarez, V., González-Parralo, L., & Antolín-Juárez, F. M. (2016). Complications

- of Peripherally Inserted Central Venous Catheters: A Retrospective Cohort Study. In P. Parás-Bravo, M. Paz-Zulueta, R. S. Lavín, F. J. Amo-Setién, M. Herrero-Montes, E. Olavarria-Beivide, M. Rodríguez-Rodríguez, B. Torres-Manrique, C. R. la Vega, V. Caso-Álvarez, L. González-Parralo, & F. M. Antolín-Juárez, PLoS ONE (Vol. 11, Issue 9). Public Library of Science. <https://doi.org/10.1371/journal.pone.0162479>
100. Practical guide for safe central venous catheterization and management 2017. (2019). *Journal of Anesthesia*, 34(2), 167. Springer Science+Business Media. <https://doi.org/10.1007/s00540-019-02702-9>
 101. Ramin Jamshidi. (2019). Central venous catheters: Indications, techniques, and complications. <https://www.sciencedirect.com/science/article/pii/S1055858619300058>
 102. Rezer, F., & Faustino, W. R. (2019). NURSES' KNOWLEDGE OF INTENSIVE CARE UNIT ON CENTRAL VENOUS CATHETER DRESSING. In F. Rezer & W. R. Faustino, *Revista Prevenção de Infecção e Saúde* (Vol. 5). Universidade Federal do Piauí. <https://doi.org/10.26694/repis.v5i0.8113>
 103. Robert W Taylor, taylrw@stlo.smhs.com, Ashok V Palagiri. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
 104. SAFDAR, N., KLUGER, D., & MAKI, D. (2023). A Review of Risk Factors for Catheter-Related Bloodstream... https://journals.lww.com/md-journal/fulltext/2002/11000/a_review_of_risk_factors_for_catheter_related.7.aspx
 105. Smith, R. N., & Nolan, J. P. (2013). Central venous catheters [Review of Central venous catheters]. *BMJ*, 347. <https://doi.org/10.1136/bmj.f6570>
 106. Taylor, R. W., & Palagiri, A. V. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
 107. Teja, B. (2024). Complication Rates of Central Venous Catheters. https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2815818?guestAccessKey=c299df71-e47a-46f2-94a1-446080918e44&utm_source=twitter&utm_medium=social_jamaim&utm_term=12802215500&utm_campaign=article_alert&linkId=346773145
 108. Wang, H., He, L.-H., Han, C., & Wan, J. (2024). Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients [Review of Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients]. *BMC Anesthesiology*, 24(1). BioMed Central. <https://doi.org/10.1186/s12871-024-02458-0>
 109. William, B. M., Bongu, N. R., Bast, M., Bociek, R. G., Bierman, P. J., Vose, J. M., & Armitage, J. O. (2013). Adverse events and technical complaints related to central venous catheters marketed in Brazil. In B. M. William, N. R. Bongu, M. Bast, R. G.

Bociek, P. J. Bierman, J. M. Vose, & J. O. Armitage, *Revista Brasileira de Hematologia e Hemoterapia*. Elsevier BV. <https://doi.org/10.5581/1516-8484.20130055>

110. BELELA-ANACLETO, A. S. C. P. P. Higienização das mãos como prática do cuidar: reflexão acerca da responsabilidade profissional. *Revista Brasileira de Enfermagem*, v. 2, n. 70, p. 461-464, mar./abr, 2017. Acessado em 02 de abril de 2018. Disponível em <http://dx.doi.org/10.1590/0034-7167-2016-0189>.
111. BRASIL. Agência Nacional de Vigilância Sanitária. Critérios diagnósticos de infecções relacionadas à assistência à saúde. Brasília (DF): Agência Nacional de Vigilância Sanitária, 2017:1-86. Acessado em 28 de março de 2018. Disponível em file:///C:/Users/2246645/Downloads/CRITERIOS_DIAGNOSTICOS_IRAS_03%20(3).pdf>.
112. ,. (2024). Safety of Midline vs Peripherally Inserted Central Catheters. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2814994>
113. Advani, S., Cawcutt, K., Klompas, M., Marschall, J., Meddings, J., & Patel, P. (2024). The next frontier of healthcare-associated infection (HAI) surveillance metrics: Beyond device-associated infections. In S. Advani, K. Cawcutt, M. Klompas, J. Marschall, J. Meddings, & P. Patel, *Infection Control and Hospital Epidemiology* (Vol. 45, Issue 6, p. 693). Cambridge University Press. <https://doi.org/10.1017/ice.2023.283>
114. Alexandrou, E., Ray-Barruel, G., Carr, P. J., Frost, S. A., Inwood, S., Higgins, N., Lin, F., Alberto, L., Mermel, L. A., & Rickard, C. M. (2015). International prevalence of the use of peripheral intravenous catheters. In E. Alexandrou, G. Ray-Barruel, P. J. Carr, S. A. Frost, S. Inwood, N. Higgins, F. Lin, L. Alberto, L. A. Mermel, & C. M. Rickard, *Journal of Hospital Medicine* (Vol. 10, Issue 8, p. 530). Wiley. <https://doi.org/10.1002/jhm.2389>
115. Allen-Duck, A., Robinson, J. C., & Stewart, M. W. (2017). Healthcare Quality: A Concept Analysis. In A. Allen-Duck, J. C. Robinson, & M. W. Stewart, *Nursing Forum* (Vol. 52, Issue 4, p. 377). Wiley. <https://doi.org/10.1111/nuf.12207>
116. Araújo, A. J. de, Silva, Í. de S., Figueirêdo, R. C. de, Lopes, R. H., Silva, C. R. D. V., Bay, O. de G., Lester, R., & Uchôa, S. A. da C. (2024). Alignment and specifics of Brazilian health agencies in relation to the international premises for the implementation of digital health in primary health care: a rhetorical analysis. In A. J. de Araújo, Í. de S. Silva, R. C. de Figueirêdo, R. H. Lopes, C. R. D. V. Silva, O. de G. Bay, R. Lester, & S. A. da C. Uchôa, *Frontiers in Sociology* (Vol. 9). Frontiers Media. <https://doi.org/10.3389/fsoc.2024.1303295>
117. Armstrong-Novak, J., Juan, H. Y., Cooper, K., & Bailey, P. (2023). Healthcare Personnel Hand Hygiene Compliance: Are We There Yet? [Review of Healthcare Personnel Hand Hygiene Compliance: Are We There Yet?]. *Current Infectious Disease Reports*, 25(7), 123. Springer Science+Business Media. <https://doi.org/10.1007/s11908-023-00806-8>

118. Aydogdu, S., & Akgün, M. (2020). Determination of knowledge levels of nurses and the factors affecting the level of knowledge in central venous catheter care. In S. Aydogdu & M. Akgün, *Clinical Nursing Studies* (Vol. 8, Issue 2, p. 1). Sciedu Press. <https://doi.org/10.5430/cns.v8n2p1>
119. B Allegranzi, World Health Organization, Geneva, Switzerland, allegranzib@who.int, D Pittet, World Health Organization, Geneva, Switzerland. (2009). Role of hand hygiene in healthcare-associated infection prevention. <https://journalofhospitalinfection.com/retrieve/pii/S0195670109001868>
120. Bahl, A., Haddad, L., Hoerauf, K., Mares, A., & Alsbrooks, K. (2023). The Clinical and Economic Burdens of Infiltration and Extravasation with Peripheral Intravenous Catheters: A Contemporary Narrative Review. In A. Bahl, L. Haddad, K. Hoerauf, A. Mares, & K. Alsbrooks, *International Journal of Nursing and Health Care Research* (Vol. 6, Issue 6). <https://doi.org/10.29011/2688-9501.101436>
121. Behrens, R. (2019). Segurança do paciente e os direitos do usuário. In R. Behrens, *Revista Bioética* (Vol. 27, Issue 2, p. 253). Conselho Federal de Medicina. <https://doi.org/10.1590/1983-80422019272307>
122. Berwick, D. M., Calkins, D. R., Mccannon, C. J., & Hackbarth, A. D. (n.d.). The 100,000 Lives Campaign. Retrieved December 3, 2024, from <http://jama.jamanetwork.com/article.aspx?doi=10.1001/jama.295.3.324>
123. Bindra, A., Sameera, V., & Rath, G. (2021). Human errors and their prevention in healthcare [Review of Human errors and their prevention in healthcare]. *Journal of Anaesthesiology Clinical Pharmacology*, 37(3), 328. Medknow. https://doi.org/10.4103/joacp.joacp_364_19
124. Boyd, S. E., Aggarwal, I., Davey, P., Logan, M., & Nathwani, D. (2010). Peripheral intravenous catheters: the road to quality improvement and safer patient care. In S. E. Boyd, I. Aggarwal, P. Davey, M. Logan, & D. Nathwani, *Journal of Hospital Infection* (Vol. 77, Issue 1, p. 37). Elsevier BV. <https://doi.org/10.1016/j.jhin.2010.09.011>
125. Buetti, N., Marschall, J., Drees, M., Fakih, M. G., Hadaway, L., Maragakis, L. L., Monsees, E., Novosad, S., O'Grady, N. P., Rupp, M. E., Wolf, J., Yokoe, D. S., & Mermel, L. A. (2022). Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update. In N. Buetti, J. Marschall, M. Drees, M. G. Fakih, L. Hadaway, L. L. Maragakis, E. Monsees, S. Novosad, N. P. O'Grady, M. E. Rupp, J. Wolf, D. S. Yokoe, & L. A. Mermel, *Infection Control and Hospital Epidemiology* (Vol. 43, Issue 5, p. 553). Cambridge University Press. <https://doi.org/10.1017/ice.2022.87>
126. Chelazzi, C., Selmi, V., Vitali, L., & Gaudio, A. R. D. (2011). Infections of Cardiac Implantable Electronic Devices: Etiology, Prevention and Treatment. In C. Chelazzi, V. Selmi, L. Vitali, & A. R. D. Gaudio, *InTech eBooks*. <https://doi.org/10.5772/23360>
127. Chico-Padrón, R. M., Carrión-García, L., Delle-Vedove-Rosales, L., González-Vargas, C. S., Marrero-Perera, M., Medina-Chico, S., Rodríguez-Díaz, M. P., Alonso-Díaz, M.,

- & Jiménez, A. (2011). Comparative Safety and Costs of Transparent Versus Gauze Wound Dressings in Intravenous Catheterization. In R. M. Chico-Padrón, L. Carrión-García, L. Delle-Vedove-Rosales, C. S. González-Vargas, M. Marrero-Perera, S. Medina-Chico, M. P. Rodríguez-Díaz, M. Alonso-Díaz, & A. Jiménez, *Journal of Nursing Care Quality* (Vol. 26, Issue 4, p. 371). Lippincott Williams & Wilkins. <https://doi.org/10.1097/ncq.0b013e318210741b>
128. Chopra, V. (2024, February 13). Finding the Middle Ground for Intravenous Therapy. In V. Chopra, *JAMA Network Open* (Vol. 7, Issue 2). American Medical Association. <https://doi.org/10.1001/jamanetworkopen.2023.55724>
 129. Chopra, V., Flanders, S. A., & Saint, S. (2012). The Problem With Peripherally Inserted Central Catheters. In V. Chopra, S. A. Flanders, & S. Saint, *JAMA* (Vol. 308, Issue 15, p. 1527). American Medical Association. <https://doi.org/10.1001/jama.2012.12704>
 130. Crisi, P. E., Santis, F. D., Aste, G., Tiscar, P. G., Mosca, F., Gasparini, A., Felici, A., Ferroni, L., Miglio, A., Tommaso, M. D., & Luciani, A. (2022). Inflammatory, Mechanical and Infectious Complications Associated with Peripheral Intravenous Catheters in Dogs and Cats: A Risk Factor Analysis. In P. E. Crisi, F. D. Santis, G. Aste, P. G. Tiscar, F. Mosca, A. Gasparini, A. Felici, L. Ferroni, A. Miglio, M. D. Tommaso, & A. Luciani, *Veterinary Sciences* (Vol. 9, Issue 3, p. 118). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/vetsci9030118>
 131. David E Clarke; Thomas A Raffin. (2023). Infectious Complications of Indwelling Long-term Central Venous Catheters. [https://journal.chestnet.org/article/S0012-3692\(16\)35072-3/fulltext](https://journal.chestnet.org/article/S0012-3692(16)35072-3/fulltext)
 132. Dunlop, C., Kilpatrick, C., Jones, L., Bonet, M., Allegranzi, B., Brizuela, V., Graham, W., Thompson, A., Cheshire, J., & Lissauer, D. (2024). Adapting the WHO hand hygiene 'reminders in the workplace' to improve acceptability for healthcare workers in maternity settings worldwide: a mixed methods study. In C. Dunlop, C. Kilpatrick, L. Jones, M. Bonet, B. Allegranzi, V. Brizuela, W. Graham, A. Thompson, J. Cheshire, & D. Lissauer, *BMJ Open* (Vol. 14, Issue 9). BMJ. <https://doi.org/10.1136/bmjopen-2023-083132>
 133. Dunn, K. L., Moulden, A., Mcdougall, P., & Bowes, G. (2006). Patient safety: a view from Down Under. <https://www.sciencedirect.com/science/article/pii/S0031395506001076>
 134. El-Jardali, F., & Fadlallah, R. (2017). A review of national policies and strategies to improve quality of health care and patient safety: a case study from Lebanon and Jordan [Review of A review of national policies and strategies to improve quality of health care and patient safety: a case study from Lebanon and Jordan]. *BMC Health Services Research*, 17(1). BioMed Central. <https://doi.org/10.1186/s12913-017-2528-1>
 135. Esposito, S., Purrello, S., Bonnet, É., Novelli, A., Tripodi, F., Pascale, R., Ünal, S., & Milkovich, G. (2013). Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant *Staphylococcus aureus* [Review of Central venous catheter-related biofilm infections: An up-to-date focus on meticillin-resistant *Staphylococcus aureus*]. *Journal of Global Antimicrobial Resistance*, 1(2), 71. Elsevier BV. <https://doi.org/10.1016/j.jgar.2013.03.002>

136. Eva Marie Castro, KU Leuven, 3000, Leuven, Belgium, evamarie.castro@soc.kuleuven.be, Tine Van Regenmortel, University of Leuven, Leuven, Belgium, Belgium, Kris Vanhaecht, University of Leuven, Leuven, Belgium, Walter Sermeus, University of Leuven, Leuven, Belgium, Ann Van Hecke, Ghent University, Ghent, Belgium. (2016). Patient empowerment, patient participation and patient-centeredness in hospital care: A concept analysis based on a literature review. <https://www.sciencedirect.com/science/article/pii/S0738399116303214>
137. Facey, M., Baxter, N. N., Mobilio, M. H., Moulton, C., & Paradis, E. (2024). The ritualisation of the surgical safety checklist and its decoupling from patient safety goals. In M. Facey, N. N. Baxter, M. H. Mobilio, C. Moulton, & E. Paradis, *Sociology of Health & Illness* (Vol. 46, Issue 6, p. 1100). Wiley. <https://doi.org/10.1111/1467-9566.13746>
138. Galadanci, H. (2013). Protecting patient safety in resource-poor settings. In H. Galadanci, *Best Practice & Research Clinical Obstetrics & Gynaecology* (Vol. 27, Issue 4, p. 497). <https://doi.org/10.1016/j.bpobgyn.2013.03.006>
139. Gallagher, T. H., & Kachalia, A. (2024). Responding to Medical Errors — Implementing the Modern Ethical Paradigm. In T. H. Gallagher & A. Kachalia, *New England Journal of Medicine* (Vol. 390, Issue 3, p. 193). Massachusetts Medical Society. <https://doi.org/10.1056/nejmp2309554>
140. Gibson, F., & Bodenham, A. (2013). Misplaced central venous catheters: applied anatomy and practical management [Review of Misplaced central venous catheters: applied anatomy and practical management]. *British Journal of Anaesthesia*, 110(3), 333. Elsevier BV. <https://doi.org/10.1093/bja/aes497>
141. Guideline Summary: Hand Hygiene. (2017). In *AORN Journal* (Vol. 105, Issue 2, p. 213). Wiley. <https://doi.org/10.1016/j.aorn.2016.12.003>
142. Guidelines for the Prevention of Intravascular Catheter-Related Infections. (2023). <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5110a1.htm>
143. Hafeez, S. B., Ahmed, A., Akhtar, A., Ishtiaq, W., Javed, N. U. S., Abbas, K., Khan, M., Zafar, H., & Jawed, A. (2022). Catheter-Related Bloodstream Infection With Femoral Central Access Versus Internal Jugular Access in Patients Admitting to Medical Intensive Care Unit. In S. B. Hafeez, A. Ahmed, A. Akhtar, W. Ishtiaq, N. U. S. Javed, K. Abbas, M. Khan, H. Zafar, & A. Jawed, *Cureus*. Cureus, Inc. <https://doi.org/10.7759/cureus.29416>
144. Haggstrom, D. A., Gabbay, R. A., Miller, W. L., Howard, J., & Crabtree, B. F. (2024). Population health in primary care. In D. A. Haggstrom, R. A. Gabbay, W. L. Miller, J. Howard, & B. F. Crabtree, *Frontiers in Medicine* (Vol. 11). Frontiers Media. <https://doi.org/10.3389/fmed.2024.1369741>
145. Hanauer, L. P. T., Comerlato, P. H., Papke, A., Butzke, M., Daga, A., Hoffmeister, M. C., Boniatti, M. M., John, J. F., Schaan, B. D., & Rados, D. R. V. (2020). Reducing central vein catheterization complications with a focused educational program: a retrospective cohort study. In L. P. T. Hanauer, P. H. Comerlato, A. Papke, M. Butzke, A. Daga, M. C. Hoffmeister, M. M. Boniatti, J. F. John, B. D. Schaan, & D. R. V. Rados,

Scientific Reports (Vol. 10, Issue 1). Nature Portfolio. <https://doi.org/10.1038/s41598-020-74395-0>

146. Harpel, J. (2012). Best Practices for Vascular Resource Teams. In J. Harpel, *Journal of Infusion Nursing* (Vol. 36, Issue 1, p. 46). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0b013e3182798862>
147. Healthcare-associated infections: prevention and control in primary and community care. (2023). <https://www.nice.org.uk/guidance/cg139/chapter/Key-priorities-for-implementation#general-principles-for-management-of-vascular-access-devices>
148. Hoffmeister, L. V., & Moura, G. M. S. S. de. (2015). Use of identification wristbands among patients receiving inpatient treatment in a teaching hospital. In L. V. Hoffmeister & G. M. S. S. de Moura, *Revista Latino-Americana de Enfermagem* (Vol. 23, Issue 1, p. 36). University of São Paulo. <https://doi.org/10.1590/0104-1169.0144.2522>
149. Hoppe, B. O. (1995). Central venous catheter-related infections: Pathogenesis, predictors, and prevention [Review of Central venous catheter-related infections: Pathogenesis, predictors, and prevention]. *Heart & Lung*, 24(4), 333. Elsevier BV. [https://doi.org/10.1016/s0147-9563\(05\)80079-2](https://doi.org/10.1016/s0147-9563(05)80079-2)
150. Infection prevention and control and water, sanitation and hygiene measures in health-care settings and shelters/congregate settings in Gaza. (2024). <https://www.who.int/publications/i/item/infection-prevention-and-control-and-water-sanitation-and-hygiene-measures-in-health-care-settings-and-shelters-congregate-settings-in-gaza-technical-note--22-february-2024>
151. Jamshidi, R. (2019). Central venous catheters: Indications, techniques, and complications [Review of Central venous catheters: Indications, techniques, and complications]. *Seminars in Pediatric Surgery*, 28(1), 26. Elsevier BV. <https://doi.org/10.1053/j.sempedsurg.2019.01.005>
152. Jérémy Guenezan, Bertrand Drugeon, Rodérick O'Neill, Diane Caillaud, Clément Sénamaud, Catherine Pouzet, Sabrina Seguin, Denis Frasca, Olivier Mimos. (2019). Skin antisepsis with chlorhexidine–alcohol versus povidone iodine–alcohol, combined or not with use of a bundle of new devices, for prevention of short-term peripheral venous catheter-related infectious complications and catheter failure: an open-label, single-centre, randomised, four-parallel group. <https://bmjopen.bmj.com/content/bmjopen/9/4/e028549.full.pdf>
153. Joelle Baehrend. (2023). 100,000 Lives Campaign: Ten Years Later. <https://www.ihl.org/communities/blogs/100000-lives-campaign-ten-years-later>
154. Kadirvelu, L., Sivaramalingam, S. S., Jothivel, D., Chithiraiselvan, D. D., Govindarajan, D. K., & Kandaswamy, K. (2024). A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants [Review of A review on antimicrobial strategies in mitigating biofilm-associated infections on medical implants]. *Current Research in Microbial Sciences*, 6, 100231. Elsevier BV. <https://doi.org/10.1016/j.crmicr.2024.100231>

155. Kaur, P., Rickard, C. M., Domer, G. S., & Glover, K. R. (2019). Dangers of Peripheral Intravenous Catheterization: The Forgotten Tourniquet and Other Patient Safety Considerations. In P. Kaur, C. M. Rickard, G. S. Domer, & K. R. Glover, IntechOpen eBooks. IntechOpen. <https://doi.org/10.5772/intechopen.83854>
156. Kavanagh, K. T., Maiwald, M., & Cormier, L. E. (2024). Viewpoint: The impending pandemic of resistant organisms – a paradigm shift towards source control is needed. In K. T. Kavanagh, M. Maiwald, & L. E. Cormier, *Medicine* (Vol. 103, Issue 31). Wolters Kluwer. <https://doi.org/10.1097/md.00000000000039200>
157. Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (2000). A Comprehensive Approach to Improving Patient Safety. <https://www.ncbi.nlm.nih.gov/books/NBK225174/>
158. Liang, R., & Landry, I. (2022). Endovascular Endocarditis Within the Superior Vena Cava of a Patient With a Tunneled Catheter for Hemodialysis. In R. Liang & I. Landry, Cureus. Cureus, Inc. <https://doi.org/10.7759/cureus.23027>
159. Listiowati, E., Sjaaf, A. C., Achadi, A., Bachtiar, A., Arini, M., Rosa, E. M., & Pramayanti, Y. (2023). How to engage patients in achieving patient safety: A qualitative study from healthcare professionals' perspective. In E. Listiowati, A. C. Sjaaf, A. Achadi, A. Bachtiar, M. Arini, E. M. Rosa, & Y. Pramayanti, *Heliyon* (Vol. 9, Issue 2). Elsevier BV. <https://doi.org/10.1016/j.heliyon.2023.e13447>
160. Maamoun, J. (2009). An Introduction to Patient Safety. <http://jmirs.org/retrieve/pii/S1939865409000745>
161. Mayorga, D. E. S., García, S. T.-, Delgado, M. A. F., & Zúñiga-Gazcón, H. (2023). Cardiovascular Complications Related to the Use of ECMO in Cardiac Surgery. In D. E. S. Mayorga, S. T.- García, M. A. F. Delgado, & H. Zúñiga-Gazcón, *International Journal of Medical Science and Clinical Research Studies* (Vol. 3, Issue 5). <https://doi.org/10.47191/ijmscrs/v3-i5-23>
162. McDonald, P., Foley, T., Verheij, R., Braithwaite, J., Rubin, J. C., Harwood, K., Phillips, J., Gilman, S. D., & Wees, P. J. van der. (2024). Data to knowledge to improvement: creating the learning health system. In P. McDonald, T. Foley, R. Verheij, J. Braithwaite, J. C. Rubin, K. Harwood, J. Phillips, S. D. Gilman, & P. J. van der Wees, *BMJ*. <https://doi.org/10.1136/bmj-2023-076175>
163. McDonnell, G. (2017). Antiseptics and Antisepsis. In G. McDonnell, *ASM Press eBooks* (p. 149). <https://doi.org/10.1128/9781555819682.ch4>
164. Menichetti, J., Libreri, C., Lozza, E., & Graffigna, G. (2014). Giving patients a starring role in their own care: a bibliometric analysis of the on-going literature debate [Review of Giving patients a starring role in their own care: a bibliometric analysis of the on-going literature debate]. *Health Expectations*, 19(3), 516. Wiley. <https://doi.org/10.1111/hex.12299>
165. Montgomery, A., Lainidi, O., & Γεωργαντά, K. (2024). Why Talking Is Not Cheap: Adverse Events and Informal Communication. In A. Montgomery, O. Lainidi, & K.

Γεωργαντά, Healthcare (Vol. 12, Issue 6, p. 635). Multidisciplinary Digital Publishing Institute. <https://doi.org/10.3390/healthcare12060635>

166. New guidance aims to reduce bloodstream infections from catheter use. (2024). <https://www.who.int/news/item/09-05-2024-new-guidance-aims-to-reduce-bloodstream-infections-from-catheter-use>
167. Nye, T. M., Zou, Z., Obernuefemann, C. L. P., Pinkner, J. S., Lowry, E., Kleinschmidt, K., Bergeron, K., Klim, A., Dodson, K., Flores-Mireles, A. L., Walker, J. N., Wong, D., Desai, A., Caparon, M. G., & Hultgren, S. J. (2024). Microbial co-occurrences on catheters from long-term catheterized patients. In T. M. Nye, Z. Zou, C. L. P. Obernuefemann, J. S. Pinkner, E. Lowry, K. Kleinschmidt, K. Bergeron, A. Klim, K. Dodson, A. L. Flores-Mireles, J. N. Walker, D. Wong, A. Desai, M. G. Caparon, & S. J. Hultgren, *Nature Communications* (Vol. 15, Issue 1). Nature Portfolio. <https://doi.org/10.1038/s41467-023-44095-0>
168. O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P. A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I., Randolph, A. G., Rupp, M. E., & Saint, S. (2011). Guidelines for the Prevention of Intravascular Catheter-related Infections. In N. P. O'Grady, M. Alexander, L. A. Burns, E. P. Dellinger, J. Garland, S. O. Heard, P. A. Lipsett, H. Masur, L. A. Mermel, M. L. Pearson, I. Raad, A. G. Randolph, M. E. Rupp, & S. Saint, *Clinical Infectious Diseases* (Vol. 52, Issue 9). Oxford University Press. <https://doi.org/10.1093/cid/cir257>
169. O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., Lipsett, P. A., Masur, H., Mermel, L. A., Pearson, M. L., Raad, I., Randolph, A. G., Rupp, M. E., & Saint, S. (2011). Summary of Recommendations: Guidelines for the Prevention of Intravascular Catheter-related Infections. In N. P. O'Grady, M. Alexander, L. A. Burns, E. P. Dellinger, J. Garland, S. O. Heard, P. A. Lipsett, H. Masur, L. A. Mermel, M. L. Pearson, I. Raad, A. G. Randolph, M. E. Rupp, & S. Saint, *Clinical Infectious Diseases* (Vol. 52, Issue 9, p. 1087). Oxford University Press. <https://doi.org/10.1093/cid/cir138>
170. Parás-Bravo, P., Paz-Zulueta, M., Lavín, R. S., Amo-Setién, F. J., Herrero-Montes, M., Olavarría-Beivíde, E., Rodríguez-Rodríguez, M., Torres-Manrique, B., Vega, C. R. la, Caso-Álvarez, V., González-Parralo, L., & Antolín-Juárez, F. M. (2016). Complications of Peripherally Inserted Central Venous Catheters: A Retrospective Cohort Study. In P. Parás-Bravo, M. Paz-Zulueta, R. S. Lavín, F. J. Amo-Setién, M. Herrero-Montes, E. Olavarría-Beivíde, M. Rodríguez-Rodríguez, B. Torres-Manrique, C. R. la Vega, V. Caso-Álvarez, L. González-Parralo, & F. M. Antolín-Juárez, *PLoS ONE* (Vol. 11, Issue 9). Public Library of Science. <https://doi.org/10.1371/journal.pone.0162479>
171. Patient safety. (2019). <https://www.who.int/health-topics/patient-safety>
172. Patient Safety. (2023). <https://www.ncbi.nlm.nih.gov/books/NBK216083/>
173. Pittet, D., & Donaldson, L. (2005). Clean Care is Safer Care: The first global challenge of the WHO World Alliance for Patient Safety. In D. Pittet & L. Donaldson, *American Journal of Infection Control* (Vol. 33, Issue 8, p. 476). Elsevier BV. <https://doi.org/10.1016/j.ajic.2005.08.001>

174. Practical guide for safe central venous catheterization and management 2017. (2019). *Journal of Anesthesia*, 34(2), 167. Springer Science+Business Media. <https://doi.org/10.1007/s00540-019-02702-9>
175. Prevent Catheter-Related Bloodstream Infections. (2024). <https://www.cidrap.umn.edu/antimicrobial-stewardship/who-issues-guidance-prevent-catheter-related-bloodstream-infections>
176. Primary Health Care and patient participation in the quality and safety of care. (2024). <https://www.paho.org/en/events/primary-health-care-and-patient-participation-quality-and-safety-care>
177. Rahman, T., Ahmed, R., & Mahmud, A. (2023). Patient safety culture plays an essential role to ensure safe patient care and quality in healthcare services. In T. Rahman, R. Ahmed, & A. Mahmud, *Pulse* (p. 53). <https://doi.org/10.3329/pulse.v14i1-3.66902>
178. Ramin Jamshidi. (2019). Central venous catheters: Indications, techniques, and complications. <https://www.sciencedirect.com/science/article/pii/S1055858619300058>
179. Rezer, F., & Faustino, W. R. (2019). NURSES' KNOWLEDGE OF INTENSIVE CARE UNIT ON CENTRAL VENOUS CATHETER DRESSING. In F. Rezer & W. R. Faustino, *Revista Prevenção de Infecção e Saúde* (Vol. 5). Universidade Federal do Piauí. <https://doi.org/10.26694/repis.v5i0.8113>
180. Robert W Taylor, taylrw@stlo.smhs.com, Ashok V Palagiri. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
181. SAFDAR, N., KLUGER, D., & MAKI, D. (2023). A Review of Risk Factors for Catheter-Related Bloodstream... https://journals.lww.com/md-journal/fulltext/2002/11000/a_review_of_risk_factors_for_catheter_related.7.aspx
182. Sahlström, M., Partanen, P., Azimirad, M., Selander, T., & Turunen, H. (2018). Patient participation in patient safety-An exploration of promoting factors. In M. Sahlström, P. Partanen, M. Azimirad, T. Selander, & H. Turunen, *Journal of Nursing Management* (Vol. 27, Issue 1, p. 84). Wiley. <https://doi.org/10.1111/jonm.12651>
183. Samri, M., & St-Germain, D. (2018). Can the craze for patient safety hinder a more holistic care of the person in the health care system? In M. Samri & D. St-Germain, *Journal of Nursing Education and Practice* (Vol. 8, Issue 12, p. 9). Sciedu Press. <https://doi.org/10.5430/jnep.v8n12p9>
184. Saut, A. M., Ho, L. L., Berger, S., & Berssaneti, F. T. (2023). How did healthcare professionals define patient engagement in quality management? A survey study. In A. M. Saut, L. L. Ho, S. Berger, & F. T. Berssaneti, *BMC Health Services Research* (Vol. 23, Issue 1). BioMed Central. <https://doi.org/10.1186/s12913-023-09098-z>

185. Silva, E. R. da, & Santos, F. H. (2024). A portrait of Brazilian healthcare for people with intellectual and developmental disabilities. In E. R. da Silva & F. H. Santos, *Journal of Policy and Practice in Intellectual Disabilities* (Vol. 21, Issue 2). Wiley. <https://doi.org/10.1111/jppi.12494>
186. Smith, R. N., & Nolan, J. P. (2013). Central venous catheters [Review of Central venous catheters]. *BMJ*, 347. <https://doi.org/10.1136/bmj.f6570>
187. Stevens, C., Milner, K. A., & Trudeau, J. (2018). Routine Versus Clinically Indicated Short Peripheral Catheter Replacement: An Evidence-based Practice Project. <https://journals.lww.com/00129804-201805000-00008>
188. Stewart, G. L., Manges, K. A., & Ward, M. M. (2024). Empowering Sustained Patient Safety: The Benefits of... https://journals.lww.com/jncqjournal/abstract/2015/07000/empowering_sustained_patient_safety__the_benefits.9.aspx
189. Svenšek, A., Muršec, D., & Fijačko, N. (2024). Assessing the incorporation of the “Five Moments for Hand Hygiene” into nursing procedure textbooks. In A. Svenšek, D. Muršec, & N. Fijačko, *Nurse Education in Practice* (Vol. 79, p. 104044). Elsevier BV. <https://doi.org/10.1016/j.nepr.2024.104044>
190. Tartari, E., Bellissimo-Rodrigues, F., Pires, D., Fankhauser, C., Lotfinejad, N., Saito, H., Suchomel, M., Krämer, A., Allegranzi, B., Boyce, J. M., Sax, H., Stewardson, A. J., Pittet, D., Rodin, A., Yuichi, K., Benjamin, A., Pamela, L., Tingxu, L., Jim, A., ... Walter, Z. (2024). Updates and future directions regarding hand hygiene in the healthcare setting: insights from the 3rd ICPIIC alcohol-based handrub (ABHR) task force. In E. Tartari, F. Bellissimo-Rodrigues, D. Pires, C. Fankhauser, N. Lotfinejad, H. Saito, M. Suchomel, A. Krämer, B. Allegranzi, J. M. Boyce, H. Sax, A. J. Stewardson, D. Pittet, A. Rodin, K. Yuichi, A. Benjamin, L. Pamela, L. Tingxu, A. Jim, ... Z. Walter, *Antimicrobial Resistance and Infection Control* (Vol. 13, Issue 1). BioMed Central. <https://doi.org/10.1186/s13756-024-01374-9>
191. Tartari, E., Garlasco, J., Mezerville, M. H., Ling, M. L., Márquez-Villarreal, H., Seto, W., Simon, A., Hennig, T.-J., & Pittet, D. (2024). Ten years of hand hygiene excellence: a summary of outcomes, and a comparison of indicators, from award-winning hospitals worldwide. In E. Tartari, J. Garlasco, M. H. Mezerville, M. L. Ling, H. Márquez-Villarreal, W. Seto, A. Simon, T.-J. Hennig, & D. Pittet, *Antimicrobial Resistance and Infection Control* (Vol. 13, Issue 1). BioMed Central. <https://doi.org/10.1186/s13756-024-01399-0>
192. Taylor, R. W., & Palagiri, A. V. (2023). Central venous catheterization. https://journals.lww.com/ccmjjournal/abstract/2007/05000/central_venous_catheterization.27.aspx
193. Teja, B. (2024). Complication Rates of Central Venous Catheters. <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2815818?guestAccessKey=c299df71-e47a-46f2-94a1->

194. 446080918e44&utm_source=twitter&utm_medium=social_jamaim&utm_term=12802215500&utm_campaign=article_alert&linkId=346773145
195. The incidence of infectious complications of central venous ... (2023). https://journals.lww.com/ccmjjournal/abstract/2005/01000/the_incidence_of_infectious_complications_of.3.aspx
196. The Patient Safety Act. (2023). <https://psa.ahrq.gov/sites/default/files/wysiwyg/strategies-improve-patient-safety-final.pdf>
197. Username. (2024). Bundle care approach to reduce device associated infections in post-living-donor-liver transplantation in a tertiary care hospital, Egypt - PubMed. <https://pubmed.ncbi.nlm.nih.gov/38969966/>
198. Vaismoradi, M., Jordan, S., & Kangasniemi, M. (2014). Patient participation in patient safety and nursing input. <https://onlinelibrary.wiley.com/doi/10.1111/jocn.12664>
199. Vanessa Cristina Felipe Lopes Villar, Sabrina da Costa Machado Duarte, Mônica Martins. (2020). Patient safety in hospital care: a review of the patient's perspective. http://www.scielo.br/pdf/csp/v36n12/en_1678-4464-csp-36-12-e00223019.pdf
200. Vaughan, A., & Sandora, T. J. (2020). Using a Human Factors Framework to Assess Clinician Perceptions of and Barriers to High Reliability in Hand Hygiene. In A. Vaughan & T. J. Sandora, *Infection Control and Hospital Epidemiology* (Vol. 41). Cambridge University Press. <https://doi.org/10.1017/ice.2020.1084>
201. Vijayan, A., & Boyce, J. M. (2022). 100% Use of Infection Control Procedures in Hemodialysis. <https://journals.lww.com/cjasn/pages/articleviewer.aspx?year=2018&issue=04000&article=00026&type=Fulltext>
202. Vizcarra, C., Cassutt, C., Corbitt, N., Richardson, D., Runde, D., & Stafford, K. (2014). Recommendations for Improving Safety Practices With Short Peripheral Catheters. In C. Vizcarra, C. Cassutt, N. Corbitt, D. Richardson, D. Runde, & K. Stafford, *Journal of Infusion Nursing* (Vol. 37, Issue 2, p. 121). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0000000000000028>
203. Wang, H., He, L.-H., Han, C., & Wan, J. (2024). Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients [Review of Evidence-based systematic review of removal of peripheral arterial catheter in critically ill adult patients]. *BMC Anesthesiology*, 24(1). BioMed Central. <https://doi.org/10.1186/s12871-024-02458-0>
204. WHO best practices for injections and related procedures toolkit. (2023). https://www.ncbi.nlm.nih.gov/books/NBK138491/pdf/Bookshelf_NBK138491.pdf
205. WHO Guidelines on Hand Hygiene in Health Care: a Summary First Global Patient Safety Challenge Clean Care is Safer Care WHO Guidelines on Hand Hygiene in Health Care: a Summary. (2023).

https://apps.who.int/iris/bitstream/handle/10665/70126/WHO_IER_PSP_2009.07_eng.pdf

206. WHO Guidelines on Hand Hygiene in Health Care: a Summary. (2023). https://apps.who.int/iris/bitstream/handle/10665/70126/WHO_IER_PSP_2009.07_eng.pdf
207. Willet V, Dixit D, Fisher D, Bausch D G, Ogunsola F, Khabsa J et al. (2024). Summary of WHO infection prevention and control guideline for Ebola and Marburg disease: a call for evidence based practice. <https://www.bmj.com/content/384/bmj.p2811>
208. William, B. M., Bongu, N. R., Bast, M., Bociek, R. G., Bierman, P. J., Vose, J. M., & Armitage, J. O. (2013). Adverse events and technical complaints related to central venous catheters marketed in Brazil. In B. M. William, N. R. Bongu, M. Bast, R. G. Bociek, P. J. Bierman, J. M. Vose, & J. O. Armitage, *Revista Brasileira de Hematologia e Hemoterapia*. Elsevier BV. <https://doi.org/10.5581/1516-8484.20130055>
209. Williamson, D. A., Carter, G. P., & Howden, B. P. (2017). Current and Emerging Topical Antibacterials and Antiseptics: Agents, Action, and Resistance Patterns [Review of Current and Emerging Topical Antibacterials and Antiseptics: Agents, Action, and Resistance Patterns]. *Clinical Microbiology Reviews*, 30(3), 827. American Society for Microbiology. <https://doi.org/10.1128/cmr.00112-16>
210. Woody, G., & Davis, B. (2013). Increasing Nurse Competence in Peripheral Intravenous Therapy. In G. Woody & B. Davis, *Journal of Infusion Nursing* (Vol. 36, Issue 6, p. 413). Lippincott Williams & Wilkins. <https://doi.org/10.1097/nan.0000000000000013>
211. World Health Organization. (2019). Global action on patient safety. https://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_R6-en.pdf