

Verantwoording literatuuronderzoek

Module Parenterale medicatie

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Uitgangsvraag

Welke infectiepreventiemaatregelen dienen genomen te worden bij het voor toediening gereedmaken en de toediening van parenterale medicatie?

Methode

Onderzoeksvraag

A systematic review of the literature was performed to answer the following question: What is the effect of infection prevention measures in the preparation and administration of parental medication on healthcare related infection and contamination of the medication with micro-organisms?

P	Patients receiving parental medication.
I	Not applying any of the measures described at C.
C	Wearing gloves when preparing medication, wearing gloves when administering medication to the patient, hand disinfection, disinfecting the medication vial/puncture point, disinfecting the work area where medication is prepared.
O	Healthcare related infection, contamination of the medication with micro-organisms.

Relevant outcome measures

The guideline development group considered healthcare related infection as a critical outcome measure for decision making; and contamination of the medication with micro-organisms as an important outcome measure for decision making.

A priori, the working group did not define the outcome measures listed above but used the definitions used in the studies.

The working group defined a 25% difference for dichotomous outcomes (RR <0.8 or >1.25), and 10% for continuous outcomes as a minimal clinically (patient) important difference. The guideline development group considered healthcare related infection as a critical outcome measure for decision making; and contamination of the medication with micro-organisms as an important outcome measure for decision making.

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Search and select (Methods)

he databases Medline (via OVID), Embase (via embase.com(externe link)) and Cinahl were searched with relevant search terms until 30 November 2022. The detailed search strategy is available upon reasonable request via info@SRI-richtlijnen.nl. The systematic literature search resulted in 536 hits. Studies were selected if the study described the preparation or
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administration of parental medication and infection control measures as named under C. Eighty-eight studies were initially selected based on title and abstract screening. After reading the full text, 87 studies were excluded and one was included (Cortopassi, 1977).

Results

Despite not adhering to our PICO due to its experimental nature and the absence of patients, one study was included in the analysis of the literature (Cortopassi, 1977).

Summary of literature

Description of studies

Cortopassi (1977) performed an experimental study to investigate the effectiveness of scrubbing the additive port of IV-bags with isopropyl alcohol (70%) and polymerized iodine solution (1%) in preventing or reducing bacterial contamination in the preparation of intravenous medication. The study consists of two parts. In part I, the additive ports of IV-bags (50 mL) containing 5% dextrose in water were inoculated with 0.01 mL of *S. aureus* containing 107-108 organisms. In part II, the additive ports of IV-bags (50 mL) containing 5% dextrose in water were inoculated with 0.1 mL of *S. aureus* containing 102-103 organisms. Four experimental groups were set up: isopropyl alcohol (70%) (n=40), polymerized iodine solution (1%) (n=40), water (n=40), and a control (n=40). Inoculated bags were then scrubbed with either isopropyl alcohol (70%), polymerized iodine solution (1%), or water. Then, a sterile 5 mL disposable syringe was used to inject sterile water into the IV-bag via the additive site with was inoculated. The IV-solution was then filtered to trap *S. aureus*, after which the filter was cultured. For our analysis, isopropyl alcohol (70%) versus to control (no scrubbing) is the comparison of interest.

Results

Cortopassi (1977) reported that in part I of the study (0.01 mL of *S. aureus* containing 107-108 organisms), isopropyl alcohol (2.5% contaminated, 1.00x100 CFU/mL) performed significantly ($p=0.05$) better than the control group (100% contaminated, 3.78x10⁴ CFU/mL). In part II of the study (0.1 mL of *S. aureus* containing 102-103 organisms), isopropyl alcohol (0% contaminated, 0 CFU/mL) again performed significantly ($p=0.05$) better than the control group (78% contaminated, 2.05x10² CFU/mL).

Level of evidence of the literature

Due to the experimental nature of the study, no GRADE (Grading Recommendations Assessment, Development and Evaluation) could be applied.

Conclusions

<p>No GRADE</p>	<p><i>No evidence was found regarding the effect of infection prevention measures when preparing and administrating parenteral medication on healthcare related infection and contamination of the medication.</i></p> <p>Source: -</p>
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Referenties

Anderson R, Doyle GR, McCutcheon JA. Clinical Procedures for Safer Patient Care Clinical Procedures for Safer Patient Care.2018

Austin P, Elia M. Improved aseptic technique can reduce variable contamination rates of ward-prepared parenteral doses. J Hosp Infect. 2013 Feb;83(2):160-3. doi: 10.1016/j.jhin.2012.10.009. Epub 2013 Jan 10. PMID: 23313030.

CDC(Centers for Disease Control and Prevention) (2018). Basic Expectations for Safe Care Training Module 6 – Safe Injection Practices.

Cortopassi RF, Kikugawa CA. Evaluation of antiseptics in the preparation of intravenous admixtures. Am J Hosp Pharm. 1977 Nov;34(11):1193-6. PMID: 930935.

Dolan SA, Arias KM, Felizardo G, Barnes S, Kraska S, Patrick M, Bumsted A. APIC position paper: Safe injection, infusion, and medication vial practices in health care. Am J Infect Control. 2016 Jul 1;44(7):750-7. doi: 10.1016/j.ajic.2016.02.033. Epub 2016 May 13. PMID: 27184207.

Gargiulo DA, Sheridan J, Webster CS, Swift S, Torrie J, Weller J, Henderson K, Hannam J, Merry AF. Anaesthetic drug administration as a potential contributor to healthcare-associated infections: a prospective simulation-based evaluation of aseptic techniques in the administration of anaesthetic drugs. BMJ Qual Saf. 2012 Oct;21(10):826-34. doi: 10.1136/bmjqs-2012-000814. Epub 2012 Jun 16. PMID: 22706928.

Gorski LA. Central venous access device associated infections: recommendations for best practice in home infusion therapy. Home Healthc Nurse. 2010 Apr;28(4):221-9. doi: 10.1097/NHH.0b013e3181d6c3ad. PMID: 20520262.

Kane E, Bretz G. Reduction in coagulase-negative staphylococcus infection rates in the NICU using evidence-based research. Neonatal Netw. 2011 May-Jun;30(3):165-74. doi: 10.1891/0730-0832.30.3.165. PMID: 21576051.

Manchikanti L, Falco FJ, Benyamin RM, Caraway DL, Helm li S, Wargo BW, Hansen H, Parr AT, Singh V, Hirsch JA. Assessment of infection control practices for interventional techniques: a best evidence synthesis of safe injection practices and use of single-dose medication vials. Pain Physician. 2012 Sep-Oct;15(5):E573-614. PMID: 22996856.

Nederlandse vereniging van ziekenhuisapothekers (NVZA(Nederlandse Vereniging van Ziekenhuisapothekers)). GMP-ziekenhuisfarmacie, hoofdstuk Z3 Aseptische handelingen 2022

[NHS \(2019\). Policy for the Safe Management and Administration of Intravenous Medicines\(externe link\).](#)

Paul G, Bobic R, Dawud J, Ertelt K, Fluhr M, Harms G, Jovanovic J, Klink T, Loh U, Pollitt A, Schäfer E, Schöneck B, Synowzik I, Sethi S, Trautmann M. Bacterial contamination of nonsterile gloves versus hands after hand hygiene. Am J Infect Control. 2021 Nov;49(11):1392-1394. doi: 10.1016/j.ajic.2021.04.002. Epub 2021 Apr 18. PMID: 33882280.

[Roelofsen EE, Schuitemaker MG, Swart EL, Boom FA. Veiligheid op recept: een protocol voor veilig voor toediening gereedmaken en toedienen van parenteralia door verpleegkundigen. Pharm Weekbl 2007;142; wp 78-83\(externe link\).](#)

Suvikas-Peltonen E, Hakoinen S, Celikkayalar E, Laaksonen R, Airaksinen M. Incorrect aseptic techniques in medicine preparation and recommendations for safer practices: a systematic review. Eur J Hosp Pharm. 2017 May;24(3):175-181. doi: 10.1136/ejhpharm-2016-001015. Epub 2016 Oct 12. PMID: 31156932; PMCID: PMC6451622.

V&VN(Verpleegkundigen en Verzorgenden Nederland), Handreiking Voor Toediening Gereed Maken (VTGM) van geneesmiddelen, 2022

[WHO best practices for injections and related procedures toolkit. 2010\(externe link\).](#)

Evidence-tabellen

Evidence table for diagnostic accuracy studies

Study reference	Study characteristics	Patient characteristics	Intervention	Comparison	Follow-up	Outcome measures and effect size	Comments
Cortopassi, 1977	Type of study: experimental study Setting and country: laboratory, USA Funding and conflicts of interest: no conflicts of interest.	Not applicable	Four experimental groups were set up: 1) isopropyl alcohol (70%) (n=40), 2) polymerized iodine solution (1%) (n=40), 3) water (n=40), 4) control (n=40) Inoculated bags were scrubbed with either isopropyl alcohol (70%), polymerized iodine solution (1%), or water. Then, a sterile 5 mL disposable syringe was used to inject sterile water into the IV-bag via the additive site with was inoculated.	In part I, the additive ports of IV-bags (50 mL) containing 5% dextrose in water were inoculated with 0.01 mL of S. aureus containing 107-108 organisms. In part II, the additive ports of IV-bags (50 mL) containing 5% dextrose in water were inoculated with 0.1 mL of S. aureus containing 102-103 organisms	Not applicable	Outcome measures and effect size (include 95%CI and p-value if available): The IV-solution was then filtered to trap S. aureus, after which the filter was cultured. Part I of the study (0.01 mL of S. aureus containing 107-108 organisms), isopropyl alcohol (2.5% contaminated, 1.00x100 CFU/mL) performed significantly (p=0.05) better than the control group (100% contaminated, 3.78x104 CFU/mL). Part II of the study (0.1 mL of S. aureus containing 102-103 organisms), isopropyl alcohol (0% contaminated, 0 CFU/mL) again performed significantly (p=0.05) better than	

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						the control group (78% contaminated, 2.05x10 ² CFU/mL).	
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Exclusietabel

Reference	Reason for exclusion
Suvikas-Peltonen, E. and Hakoinen, S. and Celikkayalar, E. and Laaksonen, R. and Airaksinen, M. Incorrect aseptic techniques in medicine preparation and recommendations for safer practices: A systematic review. <i>European Journal of Hospital Pharmacy</i> . 2017; 24 (3) :175-181.	Wrong study design in the included studies (no comparative studies) or wrong comparison
Manchikanti, L. and Falco, F. J. E. and Benyamin, R. M. and Caraway, D. L. and Helm li, S. and Wargo, B. W. and Hansen, H. and Parr, A. T. and Singh, V. and Hirsch, J. A. Assessment of infection control practices for interventional techniques: A best evidence synthesis of safe injection practices and use of single-dose medication vials. <i>Pain Physician</i> . 2012; 15 (5) :E573-E614.	Wrong study design (no comparison, only observational)
Loftus, R. W. and Patel, H. M. and Huysman, B. C. and Kispert, D. P. and Koff, M. D. and Gallagher, J. D. and Jensen, J. T. and Rowlands, J. and Reddy, S. and Dodds, T. M. and Yeager, M. P. and Ruoff, K. L. and Surgenor, S. D. and Brown, J. R. Prevention of intravenous bacterial injection from health care provider hands: The importance of catheter design and handling. <i>Anesthesia and Analgesia</i> . 2012; 115 (5) :1109-1119.	Wrong focus (catheters)
Bawden, J. C. and Jacobson, J. A. and Jackson, J. C. and Anderson, R. K. and Burke, J. P. Sterility and use patterns of multiple-dose vials. <i>American journal of hospital pharmacy</i> . 1982; 39 (2) :294-297.	Wrong comparison (multiple dose vials)
Gargiulo, D. A. and Sheridan, J. and Webster, C. S. and Swift, S. and Torrie, J. and Weller, J. and Henderson, K. and Hannam, J. and Merry, A. F. Anaesthetic drug administration as a potential contributor to healthcare-associated	Wrong study design (simulation study)

infections: A prospective simulation-based evaluation of aseptic techniques in the administration of anaesthetic drugs. <i>BMJ Quality and Safety</i> . 2012; 21 (10) :826-834.	
Trautmann, M. and Zauser, B. and Wiedeck, H. and Buttenschon, K. and Marre, R. Bacterial colonization and endotoxin contamination of intravenous infusion fluids. <i>The Journal of hospital infection</i> . 1997; 37 (3) :225-36.	Wrong comparison (time to change infusion system)
Casey, Anna L. and Karpanen, Tarja J. and Nightingale, Peter and Elliott, Tom S. J. The risk of microbial contamination associated with six different needle-free connectors. <i>British Journal of Nursing</i> . 2018; 27 (2) :S18-S26.	Wrong study design (simulation study)
Harrold, Karen Guide to the safe use of needlefree connectors. <i>British Journal of Nursing</i> . 2019; 28 :1-6.	Wrong study design (survey)
Kane, Ellen and Bretz, Gwen Reduction in coagulase-negative staphylococcus infection rates in the nicu using evidence-based research. <i>Neonatal Network</i> . 2011; 30 (3) :165-174.	Wrong publication type (review)
Ruschman, K. L. and Fulton, J. S. Effectiveness of disinfectant techniques on intravenous tubing latex injection ports. <i>Journal of Intravenous Nursing</i> . 1993; 16 (5) :304-308.	Wrong intervention (disinfecting skin)
Sundermann, Alexander J. and Babiker, Ahmed and Marsh, Jane W. and Shutt, Kathleen A. and Mustapha, Mustapha M. and Pasculle, Anthony W. and Ezeonwuka, Chinelo and Saul, Melissa I. and Pacey, Marissa P. and Tyne, Daria Van and Ayres, Ashley M. and Cooper, Vaughn S. and Snyder, Graham M. and Harrison, Lee H. Outbreak of Vancomycin-resistant <i>Enterococcus faecium</i> in Interventional Radiology: Detection Through Whole-genome Sequencing-based Surveillance. <i>Clinical Infectious Diseases</i> . 2020; 70 (11) :2336-2343.	Wrong outcome (outbreak)
De Smet, B. and Veng, C. and Kruij, L. and Kham, C. and van Griensven, J. and Peeters, C. and Ieng, S. and Phe, T. and	Wrong outcome (outbreak due to contaminated flushing liquid)

<p>Vlieghe, E. and Vandamme, P. and Jacobs, J. Outbreak of Burkholderia cepacia bloodstream infections traced to the use of Ringer lactate solution as multiple-dose vial for catheter flushing, Phnom Penh, Cambodia. Clinical Microbiology and Infection. 2013; 19 (9) :832-837.</p>	
<p>Lieffers, M. A. M. and Mookink, H. G. A. Disinfection of the skin prior to injections does not influence the incidence of infections; a literature study. Nederlands Tijdschrift voor Geneeskunde. 2002; 146 (16) :765-767.</p>	<p>Wrong intervention (disinfecting skin)</p>
<p>Zingg, W. and Imhof, A. and Maggiorini, M. and Stocker, R. and Keller, E. and Ruef, C. Impact of a prevention strategy targeting hand hygiene and catheter care on the incidence of catheter-related bloodstream infections. Critical Care Medicine. 2009; 37 (7) :2167-2173.</p>	<p>P does not meet PICO I does not meet PICO C does not meet PICO</p> <p>P = patient with CVC I = educational IP program C = no educational IP program</p>
<p>Charalambous, C. P. and Tryfonidis, M. and Sadiq, S. and Hirst, P. and Paul, A. Septic arthritis following intra-articular steroid injection of the knee--a survey of current practice regarding antiseptic technique used during intra-articular steroid injection of the knee. Clinical rheumatology. 2003; 22 (6) :386-90.</p>	<p>Design does not meet selection criteria</p> <p>Non-comparative study</p>
<p>Matsumoto, S. and Suenaga, H. and Naito, K. and Sawazaki, M. and Hiramatsu, T. and Agata, N. Management of suspected nosocomial infection: An audit of 19 hospitalized patients with septicemia caused by Bacillus species. Japanese Journal of Infectious Diseases. 2000; 53 (5) :196-202.</p>	<p>Design does not meet selection criteria</p> <p>Non-comparative study</p>
<p>Siboni, K. and Olsen, H. and Ravn, E. Pseudomonas cepacia in 16 non-fatal cases of postoperative bacteremia derived from intrinsic contamination of the anaesthetic fentanyl. Clinical and epidemiological observations in Denmark and Holland. Scandinavian Journal of Infectious Diseases. 1979; 11 (1) :39-45.</p>	<p>Design does not meet selection criteria</p> <p>Non-comparative study</p>
<p>Koivisto, V. A. and Felig, P. Is skin preparation necessary before insulin</p>	<p>I does not meet PICO</p> <p>I = skin disinfection</p>

injections? Lancet. 1978; 1 (8073) :1072-1073.	
Frank, M. J. and Schaffner, W. Contaminated aqueous benzalkonium chloride: an unnecessary hospital infection hazard. Journal of the American Medical Association. 1976; 236 (21) :2418-2419.	Design does not meet selection criteria Non-comparative study