EMERGENCY NURSES ASSOCIATION

Clinical Practice Guideline:
Wound Preparation

What method of wound preparation is most effective in promoting wound healing and reducing infection for emergency department patients with acute wounds (e.g., lacerations, punctures)?

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Background and Significance

Patients frequently present to the emergency department (ED) with acute wounds (Bonham, 2016; Mankowitz, 2017; Navanandan, Renna-Rodriguez, & DiStefano, 2017). The goal of wound preparation is to reduce the risk of infection and promote wound healing (Nicks, Ayello, Woo, Nitzki-George, & Sibbald, 2010). Wound preparation takes into account the type, location, age, and size of wound (Beam, Buckley, Holcomb, & Ciocca, 2016; Bonham, 2016; Mankowitz, 2017; Nicks et al., 2010) as well as infection risk associated with type of wound (e.g., bites) (Kennedy, Stoll, & Lauder, 2015).

The standard of care for wound preparation includes cleaning and irrigating acute wounds. The role of irrigation includes removal of wound debris, loose devitalized tissue, bacteria, and foreign bodies to reduce the risk of infection and promote optimal healing (Beam et al., 2016; Bonham, 2016; Mankowitz, 2017; Nicks et al., 2010).

Methods

This clinical practice guideline (CPG) was created based on a review and critical analysis of the literature following ENA's Requirements for the Development of Clinical Practice Guidelines. Articles relevant to the topic were identified with a comprehensive literature search. Searches were performed using the following search engines: PubMed, HelioBLAST, CINAHL, the Cochrane Library, the British Medical Journal, the Agency for Healthcare Research and Quality, the National Guideline Clearinghouse, and Google Scholar. The search strategy used various combinations of key words including "acute wounds", "laceration", "puncture wound", "wound cleansing", "wound irrigation", "acute wound care", and "traumatic wound care". The initial development of this guideline in 2011 was limited to English language articles from January 2005–October 2011. An update on this topic in 2015 included articles published from October 2011–July 2015. The searches for the new wound management PICOT question were limited to English language articles from January 2007–June 2018 using the same key words and inclusion criteria. In addition, the reference lists in the selected articles were reviewed for pertinent research findings. Research articles from ED settings, non-ED settings, position statements, and guidelines from other sources were also reviewed. Clinical findings and levels of recommendation regarding patient management were made by the 2018 Emergency Nurses Association (ENA) CPG Committee according to ENA's classification of levels of recommendation for practice (Table 1). Three additional research articles were found to augment pertinent research literature from the 2015 wound preparation CPG addressing the revised PICOT: What method of wound preparation is most effective in promoting wound healing and reducing infection for emergency department patients with acute wounds (e.g., lacerations, punctures)?

References in the selected articles were reviewed for pertinent research findings. Meta-analyses, systematic reviews, and research articles from emergency department settings, non-ED settings, position statements, and guidelines from other sources were reviewed (Appendix 3). The CPG authors used standardized worksheets, including the Evidence-Appraisal Table Template and the Critique Worksheet, to prepare tables of evidence, ranking each article in terms of the level of evidence, quality of evidence, and relevance and applicability to practice. Clinical findings and levels of recommendation regarding wound preparation were made by the CPG Committee according to ENA's classification of levels of recommendation for practice (Table 1). The articles reviewed to formulate the recommendations in this CPG are described in Appendix 1.

Table 1. Levels of Recommendation for Practice

Level A Recommendations: High
• Reflects a high degree of clinical certainty • Based on availability of high quality level I, II, and/or III evidence rated using the Melnyk and Fineout-Overholt grading system (Melnyk & Fineout-Overholt, 2015) • Based on consistent and good quality evidence; has relevance and applicability to emergency nursing practice • Is beneficial
Level B Recommendations: Moderate
• Reflects moderate clinical certainty • Based on availability of Level III and/or Level IV and V evidence rated using the Melnyk and Fineout-Overholt grading system (Melnyk & Fineout-Overholt, 2015) • There are some minor inconsistencies in quality evidence; has relevance and applicability to emergency nursing practice • Is likely to be beneficial
Level C Recommendations: Weak
• Has limited or unknown effectiveness • Level V, VI, and/or VII evidence rated using the Melnyk and Fineout-Overholt grading system (Melnyk & Fineout-Overholt, 2015 - Based on consensus, usual practice, evidence, case series for studies of treatment or screening, anecdotal evidence, and/or opinion
Not Recommended for Practice
• No objective evidence or only anecdotal evidence available, or the supportive evidence is from poorly controlled or uncontrolled studies • Other indications for not recommending evidence for practice may include: ◦ Conflicting evidence ◦ Harmfulness has been demonstrated ◦ Cost or burden necessary for intervention exceeds anticipated benefit ◦ Does not have relevance or applicability to emergency nursing practice • There are certain circumstances in which the recommendations stemming from a body of evidence should not be rated as highly as the individual studies on which they are based. For example: ◦ Heterogeneity of results ◦ Uncertainty about effect magnitude and consequences ◦ Strength of prior beliefs ◦ Publication bias

Summary of Literature Review

The summary of literature is organized by the major topic of wound irrigation and cleansing. Elements within this topic include: irrigation for cleansing, irrigation versus no irrigation, and irrigation fluid solution dynamics (flow of fluid). In addition, the use of saline versus other irrigation solutions and the use of tap water versus other irrigation solutions are summarized.

WOUND IRRIGATION AND CLEANSING

High Pressure Irrigation for Wound Cleansing

Wound cleansing and irrigation are the standard of care for acute soft tissue lacerations. The current method for effective wound irrigation was established using an animal model for primary research in fluid dynamics (Stevenson et al., 1976). The authors showed that the fluid pressure achieved with a 19-gauge needle is lower with larger syringes. For example, the pressure using a 35 mL syringe is 7 lbs/inch2 compared with 20 lbs/inch2 for a 12 mL syringe. (A bulb syringe produces an irrigation fluid pressure of only 0.05 lbs/inch2). Longmire, Broom, and Burch (1987) conducted a randomized controlled trial (RCT) comparing infection and inflammation rates among ED patients (N = 335) based on the type of wound irrigation. Irrigation with a bulb syringe was compared to high-pressure syringe irrigation. Subjects who received bulb syringe irrigation had a 27.8% positive assessment for wound inflammation and 6.9% positive assessment for wound infection. Those who received high-pressure syringe irrigation had a 16.8% positive assessment for wound inflammation and 1.3% positive assessment for wound infection. In summary, high-pressure irrigation decreased bacterial contamination and reduced wound infection, while wound irrigation with a bulb syringe was less effective in removing bacteria (Longmire et al., 1987; Stevenson, et al., 1976).

Irrigation versus No Irrigation

The literature is limited, although Hollander et al. (1998) examined the use of irrigation versus no irrigation for patients with facial and scalp lacerations. Infection rates for facial and scalp lacerations were compared. In patients who presented less than six hours after injury and who were at low risk for infection (i.e. no history of diabetes mellitus, no renal disease, and not immunocompromised), infection rates did not differ significantly ($p = 0.28$) between subject groups who received wound irrigation and those who did not. Therefore, irrigation may not be indicated for wounds at low risk for infection.

Saline versus Other Solutions for Cleansing

Saline has traditionally been used in the ED for wound cleansing and irrigation. Dire and Welsh (1990) compared normal saline, 1% povidone-iodine, and pluronic F-68 (Shur-Clens®) to determine their efficacies in reducing the risk of laceration wound infections. Comparisons of the three solutions did not demonstrate any significant differences in infection rates ($p = 0.571$). Normal saline was the most cost effective and well tolerated. Researchers reported that povidone-iodine can be cytotoxic and pluronic F-68 (Shur-Clens®) may be costly. The study was limited, however, in that it did not include patients who were at greatest risk for complicated wounds i.e., wounds were typically confined to the head and neck, and at lower risk for infection. Ghafouri, Zare, Bazrafshan, Abazarian and Ramim (2016) compared diluted povidone-iodine solution with normal saline for wound irrigation. Infection rates were comparable for the povidone-iodine (7.65%) and normal saline irrigation (7.26%) groups. In an RCT of ED patients (N = 500), Gravett, Sterner, Clinton, and Ruiz (1987) compared saline-only irrigation with saline plus povidone-iodine scrub. The saline-only irrigation group had a significantly higher percentage of wounds assessed to be purulent (6.19%) compared with irrigation plus povidone-iodine scrub (1%).

Tap Water versus Other Solutions for Cleansing

Tap water is commonly used in community settings for wound cleansing. Tap water is advantageous because of its cost effectiveness and ready availability (Fernandez & Griffiths, 2012; Weiss, Oldham, Lin, Foster & Quinn, 2013). Effects on wound healing and infection using potable tap water were compared with other solutions in seven trials in a Cochrane Review. (Fernandez et al., 2012). The review examined results for wounds cleaned with water versus saline, water versus procaine spirits, and cleaned versus not cleaned. The cleansing of acute wounds in adults and children with tap water was not associated with a statistically significant difference in infection rates when compared with normal saline (adults: RR 0.66, 95% CI 0.42–1.04; children: RR 1.07, 95% CI 0.43–2.64). Fernandez et al. (2012) emphasized that, although data from one study showed a significantly higher rate of infection in the group with wounds irrigated with normal saline, analysis indicated that this may be attributed to differences in the temperature of the irrigation solution. Similarly, there was no difference in infection rates among ED patients (N = 631) whose wounds were irrigated with sterile normal saline (Weiss et al., 2013). Overall infection rate was 4.9%. The normal saline group had an infection rate of 6.4% compared with 2.9% for the tap water group. Tap water quality, type of wound, and patient condition should be taken into consideration in wound cleansing.

Description of Decision Options/Interventions and the Level of Recommendation

Description of Decision Options/Interventions and the Level of Recommendation		
Solution	Potable tap water may equivalent to normal saline for laceration cleansing and irrigation in patients of all ages. Tap water quality, type of wound, patient condition and comorbid conditions should be considered in wound cleansing. (Fernandez et al., 2012; Weiss et al., 2013).	A
Solution	Normal saline, povidone-iodine and pluronic F-68 may be equally effective as irrigation solutions for wound cleansing. (Dire & Welsh, 1990; Ghafouri et al., 2016; Gravett et al., 1987).	B
Technique	Bulb syringe irrigation is less effective than high pressure irrigation with a syringe and needle/catheter for laceration cleansing and irrigation. (Longmire et al., 1987; Stevenson et al., 1976).	B
Technique	In both adult and pediatric patients with clean, non-contaminated lacerations with no significant co-morbidities (e.g., diabetes, renal disease, or immunocompromise), wound cleansing and irrigation may not be necessary for wounds less than 6 hours old. (Hollander et al., 1998).	C

Level A (High)	Based on consistent and good quality of evidence; has relevance and applicability to emergency nursing practice.
Level B (Moderate):	There are some minor inconsistencies in quality evidence; has relevance and applicability to emergency nursing practice.
Level C (Weak)	There is limited or low-quality patient-oriented evidence; has relevance and applicability to emergency nursing practice.
N/R Not Recommended	Based upon current evidence.
I/E:	Insufficient evidence upon which to make a recommendation.
N/E:	No evidence upon which to make a recommendation.

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Fernandez, R., & Griffiths, R. (2012). Water for wound cleansing. *Cochrane Database of Systematic Reviews,* (2):CD003861. doi:10.1002/14651858.CD003861.pub3

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Gravett, A., Sterner, S., Clinton, J. E., & Ruiz, E. (1987). A trial of povidone-iodine in the prevention of infection in sutured lacerations. Annals of Emergency Medicine, 16(2), 167–171. doi:10.1016/S0196-0644(87)80008-2

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Acknowledgments

ENA would like to acknowledge the work of the previous Emergency Nursing Resources Committee and Clinical Practice Guidelines Committee that developed the original and first revision to this document. ENA also acknowledges following members of the 2018 Institute for Emergency Nursing Research (IENR) Advisory Council for their review of this document:

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Developed: 2011
Revised: 2015, 2018

Appendix 1: Evidence Table

Reference	Purpose/Hypothesis	Design/Sample Setting	Variables/Measures Analysis	Findings/Implications	Quality of Evidence	Level of Evidence
Dire, D. J., & Welsh, A. P. (1990). A comparison of wound irrigation solutions used in the emergency department. Annals of Emergency Medicine, 19(6), 704–708. doi:10.1016/S0196-0644(05)82484-9	To examine which of three irrigation solutions (normal saline, 1% povidone-iodine, or pluronic F-68 [Shur-Clens®]) used in the ED is the most efficacious in reducing the risk of wound infections in patients with soft tissue lacerations.	Prospective, non-randomized, controlled trial IRB approved Community military ED 531 patients with minor soft-tissue lacerations divided into 3 groups: 189 normal saline 184 povidone-iodine 184 Shur-Clens® (pluronic F-68)	Patients returned to ED for suture removal by study authors. Subjective and objective measures of infection were assessed including abscess formation, cellulitis, lymphangitis, adenopathy, and systemic symptoms. Overall infection rates not significantly different among the three solutions (p = 0.571).	There were no significant differences found between infection rates for the three irrigation solutions. Normal saline is the most cost-effective, povodone-iodine has risks of cytotoxicity, and Shur-Clens® can be cost prohibitive.	I	III
Fernandez, R., & Griffiths, R. (2012). Water for wound cleansing. Cochrane Database of Systematic Reviews, (2):CD003861. doi:10.1002/14651858.CD003861.pub3	To assess the effects of tap water compared with other solutions for wound cleansing.	Systematic review of 7 trials comparing rates of infection and healing in wounds cleansed with water or saline 3 trials comparing cleansing with no cleansing, 1 trial comparing procaine spirit with water	Calculated weighted treatment effect across trials using Cochrane statistical package (RevMan version 4.2). Assessed for clinical heterogeneity by considering settings, populations, interventions, and outcomes. When 2 or more compared, tested for heterogeneity using I? statistic.	For chronic wounds, risk of infection when cleaned with tap water compared with normal saline was 0.16 (95% CI 0.01–2.96); no difference between groups. Cleansing acute wounds in adults and children with tap water was not associated with a statistically significant difference in infection risk compared with saline (adults: RR 0.66, 95% CI 0.42–1.04; children: RR 1.07, 95% CI 0.43–2.64). No significant differences in infection rates when wounds cleaned with tap water or not cleaned at all (RR 1.06, 95% CI 0.07–16.5). No difference in infection rates in episiotomy wounds cleansed with water or procaine spirit. Use of isotonic saline, distilled water, or boiled water for cleaning open fractures showed no statistically significant difference in infection rates.	I	I

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Ghafouri, H. B., Zare, M., Bazrafshan, A., Abazarian, N., & Ramim, T. (2016). Randomized, controlled trial of povidone-iodine to reduce simple traumatic wound infections in the emergency department. Injury, 47(9), 1913–1918. doi:10.1016/j.injury.2016.05.031	Comparison of efficacy and safety of diluted (1%) povidone-iodine solution with normal saline as irrigation solutions to decrease infection of traumatic wounds repaired in the ED.	Prospective RCT; (power analysis based on 10% wound infection rate) Sample: N = 446 convenience sample, randomized patients > 18 years with traumatic wounds (from 520 eligible ED pts.); 223 were allocated to povidone-iodine group and 223 to normal saline group) Setting: 2 EDs in teaching hospitals in Iran with annual census of 40,000 and 80, 000 patients, respectively Wound defined as: simple, traumatic (not caused by bites and with no vessel, nerve, tendon, bone, or joint injuries; wound age < 12 hours Exclusions: immune-deficient and patients allergic to povidone-iodine	Primary outcome: Wound infection rate based on: signs (cellulitis > 1 cm, lymphangitis, presence of discharge or necrosis) and symptoms) Secondary outcomes: skin irritation (based on symptoms [pain, dryness, itching]) and wound dehiscence	1. Wound infection: 7.65% in the povidone-iodine group (n = 15); 7.26% in the normal saline group (n = 14) 2. No wound dehiscence in either group None of the patients required IV antibiotics or hospitalization.	II	II
Gravett, A., Sterner, S., Clinton, J. E., & Ruiz, E. (1987). A trial of povidone-iodine in the prevention of infection in sutured lacerations. Annals of Emergency Medicine, 16(2), 167–171. doi:10.1016/S0196-0644(87)80008-2	To evaluate the effectiveness of a 1% povidone-iodine solution in the prevention of infection in sutured lacerations.	Prospective, non-randomized, controlled study IRB approval obtained. Sample: 531 patients divided into 3 groups: 189 Normal saline 184 povidone-iodine 184 Shur-Clens® Included patients with minor soft-tissue lacerations. Setting: A community military Emergency Department	Measures: Patients returned to ED for suture removal by study authors. Subjective and objective measures of infection were assessed including abscess formation, cellulitis, lymphangitis or lymphadenitis, and systemic symptoms. Overall infection rates for the three solutions not significantly different (p = 0.571).	Findings: No significant differences in infection rates between the three irrigation solutions. Normal saline is the most cost-effective. Povidone-iodine is cytotoxic and carries risks, and Shur-Clens® can be cost prohibitive.	II	IV

Appendix 1: Evidence Table

Reference	Purpose/Hypothesis	Design/Sample Setting	Variables/Measures Analysis	Findings/Implications	Quality of Evidence	Level of Evidence
Hollander, J. E., Richman, P. B., Werblud, M., Miller, T., Huggler, J., & Singer, A. J. (1998). Irrigation in facial and scalp lacerations: does it alter outcome? Annals of Emergency Medicine, 31(1), 73–77. doi:10.1016/S0196-0644(98)70284-7	To compare the outcomes for lacerations to the face and scalp with and without irrigation of the wounds.	Prospective, cross-sectional study IRB approved. 1,923 subjects in an urban academic ED	Healing (outcome measures): step-off borders, contour irregularities, wound margin separation, edge inversion, and overall appearance Statistical analysis: infection rates did not differ between groups ($p = 0.28$).	No difference in rates of infection between those who received irrigation and those who did not No difference in "optimal" cosmetic appearance between groups at the time of suture removal A trend towards worse cosmetic outcome in patients who received irrigation, however	II	IV
Longmire, A. W., Broom, L. A., & Burch, J. (1987). Wound infection following high-pressure syringe and needle irrigation. The American Journal of Emergency Medicine, 5(2), 179–181. doi:10.1016/0735-6757(87)90121-5	To compare high pressure to low pressure irrigation for acute traumatic wounds and the impact on wound infections.	Prospective, randomized, controlled trial IRB status not stated. All subjects had wounds anesthetized with 1% lidocaine without epinephrine and cleansed with povidone-iodine immediately prior to irrigation. N = 335 subjects with acute soft tissue lacerations incurred within the preceding 24 hours and requiring closure in an ED. Control group (n = 158) received wound irrigation with 350 mL of normal saline by bulb syringe method. Experimental group (n = 177) received high-pressure syringe irrigation (12 mL syringe and 22-gauge needle) with 72 mL of normal saline. Additional saline was utilized in the experimental group if the repair was not immediately completed.	Subjects returned to the ED two days after irrigation and closure to be assessed for signs of wound infection. Infection was considered present if any of the following were present: redness, drainage, tenderness, swelling, or warmth. If subjects did not return at two days, they were assessed on the fifth or seventh day at the time of suture removal. Decreased inflammation ($p = 0.034$) and infection ($p = 0.017$) were found in the group receiving high-pressure syringe irrigation.	Those subjects who received high-pressure syringe irrigation had a significant decrease in infection and inflammation compared with those who received bulb syringe irrigation. Of the subjects who received bulb syringe irrigation, 27.8% had evidence of wound inflammation and 6.9% had evidence of wound infection. Of those subjects who received high-pressure syringe irrigation, 16.8% had evidence of inflammation and 1.3% had evidence of infection at the time of assessment.	I	II

Appendix 1: Evidence Table

Reference	Purpose/Hypothesis	Design/Sample Setting	Variables/Measures Analysis	Findings/Implications	Quality of Evidence	Level of Evidence
Stevenson, T. R., Thacker, J. G., Rodeheaver, G. T., Bacchetta, C., Edgerton, M. T., & Edlich, R. F. (1976). Cleansing the traumatic wound by high pressure syringe irrigation. JACEP, 5(1), 17–21. doi:10.1016/S0361-1124(76)80160-8	Purpose: To examine the fluid dynamics of various combinations of needles and plastic disposable syringes as well as an Asepto glass bulb syringe on the efficacy of wound irrigation in reducing infection rate.	Method: Quantitative in vivo randomized controlled trial with anesthetized rabbits. Eight incisions were made on each animal; each incision was inoculated with Staphylococcus aureus bacteria. After 45 minutes, two groups of wounds were irrigated with 150 mL of normal saline using a 19-gauge needle from either a 35 mL or a 12 mL syringe. The remaining wounds served as controls. In another group of animals, two groups of wounds were irrigated with 150 mL of normal saline using an Asepto syringe or a 19-gauge needle from a 35 mL syringe. The remaining wounds again served controls. The wounds were excised from the animals and bacterial counts obtained. Wounds were then re-approximated with Steri-StripsTM and covered with a sterile dressing. Inflammatory response and bacterial count were measured at four days.	Measures: Inflammatory response measured by wound induration in millimeters. Infection was measured by excising wound and wound edges and measuring the number of bacteria. Analysis: Inflammatory response, fluid dynamics of irrigant, and number of contaminated wounds.	Infection rates for sterile saline and tap water were 2.8% (95% CI 1.1–5.7) and 2.9 (95% CI 1.2–5.9), respectively.	I	II
Weiss, E. A., Oldham, G., Lin, M., Foster, T., & Quinn, J. V. (2013). Water is a safe and effective alternative to sterile normal saline for wound irrigation prior to suturing: a prospective, double-blind, randomised, controlled clinical trial. BMJ Open, 3(1). doi:10.1136/bmjopen-2012-001504	To explore infection rates of wounds irrigated with sterile normal saline (SS) and tap water (TW) before primary wound closure.	Single site, prospective, randomized double-blind controlled trial with IRB approval. N = 631 with SS = 313 and TW = 318. After loss through lack of follow-up, SS = 308 and TW = 317. Patients older than 1 year with soft tissue lacerations requiring primary wound closure over an 18-month period. Setting: urban university-based medical center	A non-caregiver developed a randomization code and an ED tech completed the irrigation using the same method of irrigation (35 mL syringe with 500 mL irrigant volume, 18-gauge needles with approximately 8 psi. Analysis: 80% powered, ?2, t-test with 95% CI. Physician did the wound closure and follow-up. Sink cuktures were obtained monthly. Follow up was completed via phone calls and self-reporting.	Overall infections rate 4.9% (95% CI 3.4–7.0); SS (6.4%), TW (2.9%). No differences in demographics and no detectable bacteria in TW. Impact of economic and environmental factors when TW used instead of SS.	I	II

GRADING THE QUALITY OF THE EVIDENCE

I. Acceptable Quality: No concerns

II. Limitations in Quality: Minor flaws or inconsistencies in the evidence

III. Major Limitations in Quality: Many flaws and inconsistencies in the evidence

IV. Not Acceptable: Major flaws in the evidence

GRADING THE LEVELS OF THE EVIDENCE (MELNYK & FINEOUT-OVERHOLT, 2015)

I. Evidence from a systematic review or meta-analysis of all relevant, randomized, controlled trials or evidence-based clinical practice guidelines based on systematic reviews of RCTs

II. Evidence obtained from at least one properly designed, randomized, controlled trial

III. Evidence obtained from well-designed controlled trials without randomization

IV. Evidence obtained from well-designed case control and cohort studies

V. Evidence from systematic reviews of descriptive and qualitative studies

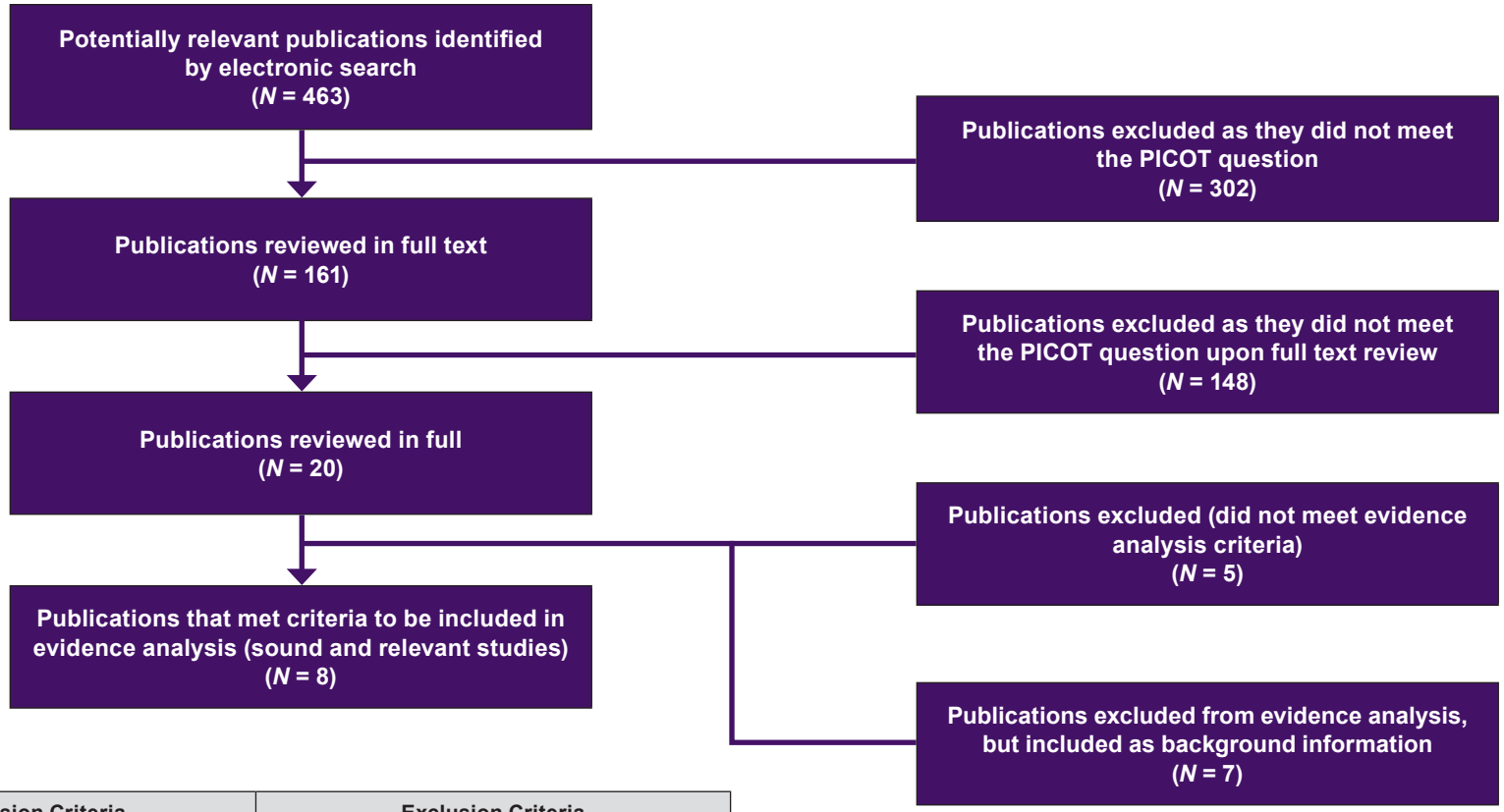
VI. Evidence from a single descriptive or qualitative study

VII. Evidence from opinion of authorities and/or reports of expert committees

Appendix 2: Other Resources Table

Reference	Research Purpose	Conclusions
Beam, J. W., Buckley, B., Holcomb, W. R., & Ciocca, M. (2016). National Athletic Trainers' Association Position Statement: Management of acute skin trauma. Journal of Athletic Training, 51(12), 1053–1070. doi:10.4085/1062-6050-51.7.01	To identify recommendations for cleansing,	This article reviews current recommendations for initial and ongoing feeding tube verification in adults. Recommend using a minimum of 2 bedside techniques to assess placement during insertion and can use these bedside techniques to determine if radiography needed.
debridement, dressing, and monitoring of acute skin trauma among athletes	Position statement on acute management of abrasions, avulsions, blisters, incisions, lacerations, punctures, cleansing, debridement, and infection rates. Reinforced wound preparation literature.	Sensitivity 100% with US and X-ray with no misplaced NG tube. Initial confirmation via auscultation, then X-ray performed followed by US completed by physician.
Bonham, J. (2016). Assessment and management of patients with minor traumatic wounds. Nursing Standard, 31(8), 60–71. doi:10.7748/ns.2016.e10573	N/A — review paper	Overview of debridement, minor traumatic wounds, surgical glue, stapling, suturing, and general wound care principles

Appendix 3: Study Selection Flowchart and Inclusion/Exclusion Criteria



Inclusion Criteria	Exclusion Criteria
Studies published in English	Studies not published in English
Studies involving human subjects	Non-human studies, other than primary research pertaining to wound preparation
January 2007 - June 2018	Studies not in the timeframe listed
Studies addressing the PICOT question	Studies not addressing the PICOT questions

The following databases were searched: PubMed, Google Scholar, CINAHL, Cochrane Library, Agency for Healthcare Research and Quality, Joanna Briggs, HelioBLAST, British Medical Journal, and the National Guideline Clearinghouse.

Search terms included: acute wounds, laceration, puncture wounds, wound preparation, wound cleansing, wound irrigation, acute wound care, traumatic wound care, and emergency department, using a variety of search combinations.