Effectiveness of Solutions, Techniques and Pressure in Wound Cleansing

Technical report

Ritin Fernandez RN MN (CritCare) PhD Candidate,
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Joanna Briggs Institute Evidence Based Publications

The Joanna Briggs Institute is involved in the development and dissemination of a number of publications that inform health professionals about clinical practice and specifically what constitutes best practice in health care. These serials include the International Journal of Evidence Based Healthcare (formerly JBI Reports) published by Blackwell Publishing and available online at http://www.blackwell-synergy.com. Systematic reviews conducted by Collaborating Centres of the Joanna Briggs Institute are published in the International Journal of Evidence Based Healthcare. These systematic review reports are further abstracted and published by Blackwell Publishing as the series Best Practice Information Sheets for Health Professionals. All Best Practice Information Sheets are derived from systematic reviews of health care research literature either conducted by the Joanna Briggs Institute Collaborating Centres or in some cases by an external source.

Aims and scope of the Technical Report

The conduct of systematic reviews and the development of Best Practice Information Sheets involve rigorous, standardised methods to ensure that all information provided to health professionals is of the highest standard and constitutes best practice. The conduct of a systematic review and development of the corresponding Best Practice issue are two parts of a staged process. All aspects of the conduct of the systematic review and the development of the accompanying Best Practice issue are documented so that these methods may be scrutinised. The processes involved in conducting Joanna Briggs Institute systematic reviews, including review methods are documented within the systematic review report. The format of Best Practice precludes it from including detailed information regarding the abstraction of evidence and development of recommendations embodied in the publication. For this reason JBI Best Practice Technical Reports are provided as a complementary publication to document all aspects of the development of Best Practice Information Sheets. In determining the quality of the Joanna Briggs Institute Best Practice Information Sheets the information provided in the Technical Report and the Systematic Review Report should also be considered.

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Disclaimer

“The procedures described in Best Practice must only be used by people who have appropriate expertise in the field to which the procedure relates. The applicability of any information must be established before relying on it. While care has been taken to ensure that this edition of Best Practice summarises available research and expert consensus, any loss, damage, cost, expense or liability suffered or incurred as a result of reliance on these procedures (whether arising in contract, negligence or otherwise) is, to the extent permitted by law, excluded”.

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Technical report

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Introduction

The aim of Joanna Briggs Institute evidence publications is to provide the best available evidence relating to clinical questions that are important to health professionals and consumers. Although the publications relate to the same clinical question/s and are therefore complementary they serve different purposes and so are of a different scope and format. The Best Practice Information Sheets are targeted to base level health professionals and are restricted to a six-page format, recognising the time constraints on today's clinicians. This prevents details of the development process being presented in the Best Practice Information Sheets. The Best Practice Information Sheet Technical Report provides this detail to allow scrutiny of the development process. The development of these publications is essentially a stepped process involving first the identification and synthesis of the evidence (Systematic Review) and then the abstraction of the evidence and development of recommendations for practice (Best Practice Information Sheets). In examining the methods and processes that ultimately produce practice recommendations the reader should consider the information available in the both the Systematic Review Report and the Best Practice Information Sheet Technical Report for a given information sheet.

This technical report details the development process for the following Best Practice Information sheet.


Best Practice Information Sheets development methods

All Joanna Briggs Best Practice Information Sheets are developed by staff from one of the Joanna Briggs Collaborating Centres with the assistance of an advisory panel of clinicians and other experts.

Acknowledgements

Best Practice Information Sheet developers

Ritin Fernandez; Prof Rhonda Griffiths

Joanna Briggs Institute Collaborating Centre

The New South Wales Centre for Evidence Based Health Care, Liverpool, New South Wales, Australia, a collaborating centre of the Joanna Briggs Institute.
Advisory Panel

Ms Cheryl Ussia (CNS Prairiewood Community Health)
Mr Geoff Sussman (Director Wound Research Wound Foundation of Australia)
Ms Brenda Ramstadius (Vice President Wound Care Association of NSW)
Mr Matthew Wilson (CNS Wound care)
Dr Jeffrey Rowland (Director of Aged Care Liverpool Health Service)
Identification and synthesis of the evidence

All Best Practice Information Sheets are derived from systematic reviews of the best available evidence. The review upon which this BPIS is based is:


All Joanna Briggs Institute systematic reviews are conducted by trained reviewers with the assistance of expert review panels. The review protocols and reports are subjected to a rigorous internal and a blinded external review process.

The executive summary of the systematic review is presented below. (Refer to the full systematic review report for additional information about the review processes followed):

Executive summary

Background This systematic review updates a previous review published in 2001. Cleansing is a vital component of wound management; however; little attention has been give to the solutions and techniques used for cleansing purposes. The objective of this review was to assess the effectiveness of different solutions, pressures and techniques used for wound cleansing to prevent infection and promote wound healing.

Search strategy Randomised and clinical controlled trials were identified using the Cochrane Central Register of Controlled Trials (CENTRAL). Additional searches of other databases and hand searches of journals and bibliographies was undertaken to identify further trials.

Selection criteria All randomised and clinical controlled trials involving adults and/or children whose wounds were cleaned with commercial cleansers, normal saline, water, chlorhexidine, hydrogen peroxide or povidone-iodine were eligible for inclusion. Studies that utilised solutions for preoperative skin cleansing, compared solutions for burns or dental procedures, and those that compared dressings for patients with ulcers were excluded from this review. Outcomes included rate of healing, incidence of infections or levels of bacterial count. Selection of potential articles, assessment of methodological quality and data abstraction was conducted independently by two reviewers. Trials with similar patients, comparisons, and outcomes were pooled. The data were analysed using Cochrane Review Manager 4.2. Where pooling was inappropriate, trials are discussed in a narrative review.

Results Fourteen randomised controlled trials were included that compared various solutions for wound cleansing. The evidence indicates that there is no difference in the infection and healing rates in acute and chronic wounds cleansed with either tap water or normal saline. An irrigation pressure of 13 psi is effective for cleansing wounds and reducing infection without causing tissue trauma.

There were no studies comparing common techniques for wound cleansing such as swabbing or scrubbing. Showering postoperative wounds did not demonstrate any difference in infection rates; however, it increased the morale of the patient. Whirlpool therapy was effective in reducing inflammation and pain in surgical wounds.

Conclusions These conclusions are based on the best available clinical evidence. However, there is an urgent need to support these findings with rigorous research as some of the conclusions are based on single studies with limited sample sizes.
Solutions for wound cleansing:
• The evidence supports the use of potable tap water for cleansing lacerations in both adults and children and postoperative wounds in adults only.
• Potable tap water as well as boiled and cooled water is also an effective wound cleansing solution. This finding, however, is based on a trial that had a small sample size.
• The evidence to support the use of potable tap water is limited (only one study with low power); therefore, further studies are required to confirm that assumption.
• Povidone-iodine is an effective cleansing solution for contaminated wounds.

Pressure for wound cleansing:
• A pressure of 13 psi is effective in reducing infection and inflammation in both adults and children with lacerations and traumatic wounds.

Techniques for wound cleansing:
• Evidence to support or refute swabbing and scrubbing to cleanse wounds is lacking.
• The review demonstrated no evidence of a difference in the wound infection and healing rates between wounds that were showered and those that were not.
• The evidence for showering ulcers and other chronic wounds is lacking; therefore, this technique of wound cleansing should be undertaken with caution.
• Whirlpool therapy is effective to reduce pain and inflammation in surgical wounds and improve the healing rate in pressure ulcers.
• The evidence to support the use of Sitz bath for patients following episiotomy is limited.

Key words: pressure, solutions, systematic review, techniques, wound cleansing
Abstraction of the evidence and development of practice recommendations

All Joanna Briggs Institute Best Practice Information Sheets are a standardised format that includes a background to the clinical question, a summary of the evidence from the systematic review, recommendations and/or implications for practice (graded using the Joanna Briggs Institute Feasibility, Appropriateness, Meaningfulness and Effectiveness scale). The recommendations arising from the evidence in the systematic review and embodied in the Best Practice Information Sheets are developed by the Best Practice Information Sheets developers with the assistance of the expert advisory panel. Essentially the recommendations for Best Practice Information Sheets are where possible evidence based. The developers and the advisory panel consider the evidence and the context in which the evidence may be used and then develop recommendations for practice. Where no evidence is identified in the systematic review the developers and the expert panel develop consensus statements to inform practice. At this point the Best Practice Information Sheet is subjected to an extensive review process external to the developers and advisory panel.

Peer review

All Joanna Briggs Institute evidence publications are subjected to a rigorous peer review process. This process begins with the submission of the protocol for the systematic review to the Joanna Briggs Institute Associate Director, Collaboration and Evidence Translation. The protocol is peer reviewed by two other nominated Joanna Briggs Collaborating Centres not involved in the review itself. All other Joanna Briggs Collaborating Centres are able to make additional comments with regard to the protocol. When the systematic review is at draft report stage it is peer reviewed by the Collaborating Centres who appraised the protocol initially. In addition to the Joanna Briggs Collaborating Centres the systematic review report is subjected to external blinded peer review before publication by Blackwell Publishing. The draft Best Practice Information Sheet is also reviewed by the two nominated Joanna Briggs Collaborating Centres. The Best Practice Information Sheet is then distributed to all other Joanna Briggs Collaborating Centres for comment with regard to cultural, professional and organisational issues that may impact on the implementation of the BPIS recommendations within their constituency.

Best Practice Information Sheets ongoing review/update

All Joanna Briggs Institute evidence publications are based on the best available evidence at the time of publication. When using the publications to inform practice the reader should consider the date of publication and the possibility that recent research may have implications about the strength or direction of recommendations. All Joanna Briggs Institute systematic reviews on which the Best Practice Information Sheets are based are assessed for update at five years post publication and at this time the relevant Best Practice Information Sheets is also reviewed.

Funding

Although the majority of Joanna Briggs Institute systematic reviews and Best Practice Information Sheets are funded by corporate membership funds and/or by the Joanna Briggs Collaborating Centres, external funding is occasionally used. In these cases the internal and external peer review processes ensure that editorial independence from the funding body is maintained.

Conflict of interest

Any conflict of interest by Joanna Briggs Collaborating Centre staff and/or advisory panel members is declared in a statement within the systematic review report.
Appendix 1 - Levels of Evidence and Grades of Recommendation

It is the policy of Joanna Briggs Institute that all systematic reviews will utilise the Joanna Briggs Institute Levels of Evidence with the specific evidence hierarchy corresponding to the type of evidence identified. See evidence tables below.

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Feasibility</th>
<th>Appropriateness</th>
<th>Meaningfulness</th>
<th>Effectiveness E(1-4)</th>
<th>Economic Evidence EE(1-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SR of research with unequivocal synthesised findings</td>
<td>SR of research with unequivocal synthesised findings</td>
<td>SR (with homogeneity) of Experimental studies (e.g., RCT with concealed allocation)</td>
<td>SR 1 or more large experimental studies with narrow confidence intervals</td>
<td>SR (with homogeneity) of evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis</td>
</tr>
<tr>
<td>2</td>
<td>SR of research with credible synthesised findings</td>
<td>SR of research with credible synthesised findings</td>
<td>Quasi-experimental studies (e.g., without randomisation)</td>
<td></td>
<td>Evaluation of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis</td>
</tr>
<tr>
<td>3</td>
<td>SR of text opinion with credible synthesised findings</td>
<td>SR of text opinion with credible synthesised findings</td>
<td>3a. Cohort studies (with control group)</td>
<td>3b. Case-controlled</td>
<td>Evaluation of important alternative interventions comparing a limited number of outcomes against appropriate cost measurement without a clinically sensible sensitivity analysis</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion without explicit critical appraisal</td>
<td>Expert opinion without explicit critical appraisal</td>
<td>Expert opinion without explicit critical appraisal</td>
<td>Expert opinion without explicit critical appraisal, or based on physiology, bench research or consensus</td>
<td></td>
</tr>
</tbody>
</table>

It is the policy of the Joanna Briggs Institute that all Best Practice Information Sheets will utilise the Joanna Briggs Institute Grades of Recommendation with the specific hierarchy corresponding to the type of recommendation provided. See recommendation tables below.

<table>
<thead>
<tr>
<th>Grade of Recommendation</th>
<th>Feasibility</th>
<th>Appropriateness</th>
<th>Meaningfulness</th>
<th>Effectiveness</th>
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<tbody>
<tr>
<td>A</td>
<td>Immediately practicable</td>
<td>Ethically acceptable and justifiable</td>
<td>Provides a strong rationale for practice change</td>
<td>Effectiveness established to a degree that merits application</td>
</tr>
<tr>
<td>B</td>
<td>Practicable with limited training and/or modest additional resources</td>
<td>Ethical acceptance is unclear</td>
<td>Provides a moderate rationale for practice change</td>
<td>Effectiveness established to a degree that suggests application</td>
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<tr>
<td>C</td>
<td>Practicable with significant additional training and/or resources</td>
<td>Conflicts to some extent with ethical principles</td>
<td>Provides limited rationale for practice change</td>
<td>Effectiveness established to a degree that warrants consideration of applying the findings</td>
</tr>
<tr>
<td>D</td>
<td>Practicable with extensive additional training and/or resources</td>
<td>Conflicts considerably with ethical principles</td>
<td>Provides minimal rationale for advocating change</td>
<td>Effectiveness established to a limited degree</td>
</tr>
<tr>
<td>E</td>
<td>Impracticable</td>
<td>Ethically unacceptable</td>
<td>There is no rationale to support practice change</td>
<td>Effectiveness not established</td>
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### Appendix 2 - Table of included studies from the systematic review

**Randomised controlled trials (RCT)**

<table>
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<tr>
<th>Author</th>
<th>Description of inclusion and exclusion criteria</th>
<th>Study described as RCT</th>
<th>Method to assess adverse events described</th>
<th>Study described as double blind</th>
<th>Description of withdrawals and dropouts</th>
<th>Method of statistical analysis described</th>
<th>Total</th>
<th>Method of allocation</th>
<th>Sample size calculation</th>
<th>Blinded outcome assessment</th>
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<td>Solutions</td>
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<td>7</td>
<td>Odds and even week</td>
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<tr>
<td>Dire &amp; Welsh</td>
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<td>1</td>
<td>1</td>
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<td>0</td>
<td>0</td>
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<td>By the month</td>
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<td>5</td>
<td>Random no. table</td>
<td>Not Stated</td>
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<tr>
<td>Tay</td>
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<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>Odd and even dates</td>
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<tr>
<td>Fraser</td>
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<td>2</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>Odds and evens</td>
<td>Yes</td>
<td>Yes</td>
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<td>Random table</td>
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<td>Yes</td>
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<td>0</td>
<td>3</td>
<td>Alternate</td>
<td>No</td>
<td>Not Stated</td>
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<td>Riederer</td>
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<td>1</td>
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<td>1</td>
<td>0</td>
<td>4</td>
<td>Alternate</td>
<td>Not Stated</td>
<td>Not Stated</td>
</tr>
</tbody>
</table>
### Non-randomised controlled trials

<p>| Author       | Description of method of sample selection | Description of inclusion &amp; exclusion criteria | Rationale for the project identified | Method of allocation identified | Regimen of care described | Method to assess outcomes described | Description of withdrawals and dropouts | Appropriate method for data analysis | Total | Type of study                                           | Level of evidence |
|--------------|------------------------------------------|-----------------------------------------------|-------------------------------------|---------------------------------|--------------------------|-------------------------------------|--------------------------------------|--------|-------------------------------------------------------|-------------------|
| <strong>Pressure</strong> |                                          |                                               |                                     |                                 |                          |                                     |                                      |         |                                                       |                   |
| Weller       | 1                                        | 0                                             | 1                                  | 0                               | 0                        | 0                                   | 0                                    | 0       | Comparative study with concurrent controls           | 111.1             |
| Meeker       | 1                                        | 0                                             | 1                                  | 1                               | 1                        | 1                                   | 0                                    | 1       | Comparative study with concurrent controls           | 111.1             |
| Hollander    | 1                                        | 1                                             | 1                                  | 1                               | 1                        | 1                                   | 1                                    | 1       | Comparative study with concurrent controls           | 111.1             |
| Oladokun     | 1                                        | 1                                             | 1                                  | 1                               | 0                        | 1                                   | 1                                    | 1       | Comparative study with concurrent controls           | 111.1             |</p>
<table>
<thead>
<tr>
<th>Author and country</th>
<th>Study type</th>
<th>Participant s</th>
<th>Intervention s</th>
<th>Results Outcomes</th>
<th>Notes</th>
<th>Level of evidence</th>
</tr>
</thead>
</table>
| Angeras Sweden     | RCT        | 705 patients with soft tissue wounds less than 6 hours old requiring suture, contusion, shear wounds | **Group A** irrigation with sterile saline  
**Group B** irrigation with tap water  
Swabs were taken for qualitative and quantitative culture after debridement and irrigation prior to closure  
Assessment of wound was performed by nurse 1-2 weeks after closure or earlier if necessary | **Infection**  
**Group A** 33/332 (10.3%)  
**Group B** 16/295 (5.4%) \( p < 0.05 \)  
**Appreciable No. of bacteria cultured from infected wounds**  
**Group A** 4/33 (12%)  
**Group B** 3/16 (19%)  
**bacterial count from tap water** < 5 bacteria / ml.  
No bacteria from tap water was found in the culture taken before closure | Method of allocation by even and odd weeks  
Telephone or letter follow up was attempted before patients were declared lost to follow up.  
88 patients lost to follow up  
Temperature of tap water 37°C  
Temperature of saline was room temperature.  
Blinded outcome assessment  
**criteria for infection**  
- pus visible in the wound  
- prolonged healing time as judged by the nurse | III.1 |
| Bansal USA         | RCT        | 46 children with simple lacerations | **Group A** Cleansing with saline (n=24)  
**Group B** Cleansing with tap water (n=21) | **Infection**  
**Group A** 2/24 wounds  
**Group B** 2/21 wounds | Method of randomisation using randomisation schedule.  
Person perform the wound irrigation was blinded to the solution used  
Wound irrigated with 35ml syringe attached to irrigation shield (25-40 psi)  
**Criteria for wound complications**  
(one or more of the following)  
1. Cellulitis or erythema of the wound margin of more than 4 mm with tenderness  
2. Purulent discharge from the wound  
3. Ascending lymphangitis  
4. Dehiscence of the wound with wound separation of >2mm | II |
<table>
<thead>
<tr>
<th>Burke</th>
<th>RCT</th>
<th>USA</th>
<th>Study Design</th>
<th>Group A non whirlpool therapy</th>
<th>Group B whirlpool therapy</th>
<th>Number of wounds that improved</th>
<th>Number of wounds that deteriorated</th>
<th>Number of wounds that showed no change in size</th>
<th>Method of allocation not stated</th>
<th>Ulcers rather than patients were randomised</th>
<th>Criteria for healing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>42 grade III and IV pressure ulcers in 18 subjects</td>
<td>Group A 5/18</td>
<td>Group B 14/24</td>
<td>Group A 11/18</td>
<td>Group B 9/24</td>
<td>Group A 2/18</td>
<td>Group B 1/24</td>
<td></td>
<td>Changes in wound area was measured using a summation of height and width and divided by the number of weeks the wound was studied.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chisholm</th>
<th>RCT</th>
<th>USA</th>
<th>Study Design</th>
<th>Wound cleansed using</th>
<th>Wound complications</th>
<th>Mean irrigation time</th>
<th>Randomised using sealed envelopes</th>
<th>Syringe irrigation took almost twice as long as the pressurised canister.</th>
<th>Pressurised canister ensures standard pressure delivery</th>
<th>Criteria for complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>550 patients with lacerations requiring closure</td>
<td>Group A 8/221 (3.6%)</td>
<td>Group B 12/245 (5.0%)</td>
<td>Group A 7.3 minutes</td>
<td>Group B 3.9 minutes</td>
<td>Syringe irrigation took almost twice as long as the pressurised canister.</td>
<td>Pressurised canister ensures standard pressure delivery</td>
<td>Wound complication defined as presence of on or more of the following: Cellulitis, ascending lymphangitis, purulent discharge, suture abscess, dehiscence and patient dissatisfaction with wound healing</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Design</td>
<td>Participants</td>
<td>Wounds cleaned with</td>
<td>Infection</td>
<td>Allocation</td>
<td>Criteria for infection</td>
<td>Notes</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
| Dire and Welsh | USA | RCT | 531 patients with minor uncomplicated soft tissue lacerations | Group A: Normal Saline  
Group B: 1% Povidone Iodine  
Group C: Pluronic F-68 (ShurClens) | Group A: 13/189 (6.9%)  
Group B: 8/184 (4.3%)  
Group C: 9/158 (5.6%) | Allocation by the month.  
Allocation concealment not possible  
Blinding of assessor not stated  
Volume of irrigant different for each group | **Criteria for infection**  
0. None  
1. Simple stitch abscess  
2. Surrounding cellulitis >1cm  
3. Accompanying lymphangitis and/or lymphadenitis  
Systemic symptoms | III.1 |
| Fraser | UK | RCT | 100 patients after surgery with or without drains. | Patients randomised to bather group and non bather group | 4 patients in each group developed infection  
All wounds healed | Method of allocation using random card selection | **Criteria for infection**  
Confluent erythema or cellulitis around the wound with or without bacteriological confirmation  
Discharge of pus from the wound or sutures  
Release of deep seated infected haematoma despite good initial skin healing | II |
| Goldberg | USA | RCT | 200 patients with lacerations or incisions that were operated. | Group A: 100 patients allowed to rinse all over with soap and water after 24 hours  
Group B: 100 patients kept their wounds dry | No infection in either group was noted  
1 patient who was allowed to wash his wound after 24 hours, developed an inclusion cyst. | Consecutive patients allocated to each group.  
Does not state if the assessor was blinded | III.1 |
| Griffiths | Australia | RCT | 35 patients with 49 chronic wounds. | Group A: wounds irrigated with tap water  
Group B: wounds irrigated with normal saline | **Infection**  
Group A: 0/23 wounds  
Group B: 3/26 wounds  
**Healing**  
Group A: 8/23 wounds  
Group B: 16/26 wounds | Allocation was by a list of random numbers nominated by person not entering patients into the trial (closed list). Both patients and outcome assessors were blinded to the treatment. | II |

Technical Report  
Wound Cleansing  
2(2) 2006  
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### Hollander et al. 1998 USA

#### Comparative study with concurrent controls

- **1923 patients with nonbite, non-contaminated facial or scalp lacerations**
- **Group A**
  - 1090 patients received saline irrigations
  - **Wound infection**
    - Group A: 0.9% in the irrigation group
    - Group B: 1.4% in the non-irrigation group
    - \( P = 0.28 \) for difference

- **Group B**
  - 833 patients cleaned with normal saline and gauze

#### Criteria for wound infection
- Presence of a stitch abscess, cellulitis > 1 cm, or purulent drainage

#### Cosmetic appearance
- Optimal cosmetic appearance at the time of suture removal
  - 1. **Group A**: 75.9% in the irrigation group
  - 2. **Group B**: 81.9% in the non-irrigation group
  - (95% CI for the difference between the groups: 0.2% - 11.8%)

#### Summary
- 4 patients in each group withdrew from the study.
- Wounds were assessed at the end of 6 weeks. Quality of tap water reported to meet Australian National Health and Medical Research Council requirements.

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**Technical Report**

Wound Cleansing

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<table>
<thead>
<tr>
<th>Johnson</th>
<th>UK</th>
<th>56 patients undergoing abdomino perineal excision of the rectum for carcinoma</th>
<th>Wounds cleaned with Group A Normal Saline Group B 1% Povidone Iodine (50 mls)</th>
<th>Primary healing when stitches were removed at approximately 3 weeks Group A 9/28 Group B 19/28 (p&lt; 0.02) Healing at &lt; than 3 months Group A 8/28 Group B 7/28 Healing at 3 - 6 months Group A 6/28 Group B 2/28 Mean No. of days in hospital Group A 28 days Group B 19 days Sinus at 6 months Group A 5/28 Group B 0/28 (p=0.0514) Total infection Group A 21/28 Group B 10/28 (p&lt;0.01)</th>
<th>Method of allocation not stated</th>
<th>All patients given the same bowel preparation before surgery. No adverse reaction with Povidone Iodine mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lammers</td>
<td>USA</td>
<td>Tissues from 37 heavily contaminated traumatic wounds from 35 patients 23 wounds were assessed for infection</td>
<td>6 X 10mm³ tissue excised and cultured wounds soaked in Group A saline Group B 1% Povidone iodine Group C no treatment</td>
<td>mean bacterial count /qgm of tissue Group A increased 3.39 X 10⁷ (SD 1.05 X 10⁸) Group B decreased 9.19 X10⁶ (SD 1.72 X 10⁷) Group C decreased 6.4 X10⁵ (SD 1.68 X 10⁶)</td>
<td>II</td>
<td>Method of allocation using random allocation table Blinding of assessor not stated Small sample size Criteria for infection not stated</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Country</td>
<td>Participants</td>
<td>Intervention</td>
<td>Randomisation</td>
<td>Criteria for Infection</td>
</tr>
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</tbody>
</table>
| Longmire | RCT | USA | 335 patients presenting with traumatic wounds less than 24hrs old | Irrigation with Group A 12-ml Syringe with 22G needle (13psi)  
Group B bulb syringe (0.05psi) | Randomly assigned by flipping a coin | High pressure irrigation can reduce inflammation  
Volume of fluid used in bulb syringe 350 cc while volume of fluid used in the syringe group was 72 cc.  
Inflamed if definite redness present | III.1 |
| Meeker | Comparative study with concurrent controls | USA | 63 patients in 2 hospitals presenting with traumatic wounds less than 24hrs old | Irrigation with Group A 31 patients having whirlpool therapy in the first 72 hours  
Group B 32 patients having no whirlpool therapy | Convenient sample | Wound Inflammation  
Whirlpool therapy subjects had significantly less wound inflammation compared to subjects in the control group.  
\( F_{1, 61} = 16.5, P<0.01 \) | III.2 |
| Morse | RCT | USA | 208 patients presenting with traumatic wounds less than 24hrs old | Irrigation with Group A a port device in a normal saline IV bottle (2.0 psi)  
Group B a cap device on a plastic normal saline bottle (1.5psi) | Randomised using sealed envelopes | Large volume of fluid used in both groups  
Wounds were irrigated in less than 4 minutes with both devices  
130 returned for follow-up  
110 phoned | II |
<table>
<thead>
<tr>
<th>Study Location</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Intervention Details</th>
<th>Outcome Measures</th>
<th>Method of Allocation</th>
<th>Sample Size Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>RCT</td>
<td>86 patients with different grades of open fractures</td>
<td>Fractures irrigated with Group A: Isotonic saline</td>
<td>Chronic osteomyelitis Group A: 1/20</td>
<td>Sample size small.</td>
<td>Criteria for infection not stated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Group B: Distilled water</td>
<td>Group B: 2/35</td>
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<td></td>
<td></td>
<td></td>
<td>Group C: Boiled water</td>
<td>Group C: 2/31</td>
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<tr>
<td>Neus 2000</td>
<td>Quasi-randomised control trial</td>
<td>817 patients having surgery for varicose veins. Exclusion criteria not specified.</td>
<td>Group A: wounds showered on day two (water only) Group B: wounds showered on day two (water + shower gel) Group B: wounds kept dry for 8-10 days (not cleansed)</td>
<td>Infection rate Group A: 0/144 Group B: 0/220 Group C: 0/208</td>
<td>Method of allocation by the month</td>
<td>Blinding not mentioned Criteria for wound infections not defined</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Wound Dehiscence Group A: 1/144 Group B: 1/220 Group C: 0/208</td>
<td></td>
<td>94 patients in the non showered group, 130 in the group that used only water and 40 patients in the group that used water and shower gel were lost to follow up.</td>
</tr>
<tr>
<td>Oladokun 2000</td>
<td>Clinical controlled Trial</td>
<td>324 women who had elective episiotomy in the labour ward</td>
<td>Group A Sitz bath Group B non sitz bath</td>
<td>Well healed episiotomy Group A: 148/159 Group B: 135/151</td>
<td>Method of allocation by alternation</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Location</td>
<td>Study Type</td>
<td>Sample Size</td>
<td>Intervention</td>
<td>Outcome</td>
<td>Allocation</td>
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<tr>
<td>Riederer</td>
<td>Germany</td>
<td>RCT</td>
<td>121 patients after surgery for inguinal hernia</td>
<td>Group A: 49 patients showered on day 1, Group B: 52 patients kept wounds dry for 14 days</td>
<td>1 stitch abscess in each group</td>
<td>Allocation of patients by alternation.</td>
</tr>
<tr>
<td>Tay</td>
<td>Singapore</td>
<td>RCT</td>
<td>100 women who had undergone normal vaginal delivery with an episiotomy</td>
<td>Group A: Perineal toilet with water followed by procaine spirit, Group B: perineal toilet with water</td>
<td>No statistical difference in infection, wound complications or healing between the two groups</td>
<td>Method of allocation by even and odd dates of delivery, quality of water not stated</td>
</tr>
<tr>
<td>Valente</td>
<td>USA</td>
<td>Clinical controlled trial</td>
<td>530 children with simple lacerations</td>
<td>Group A: Cleansing with saline, Group B: Cleansing with tap water</td>
<td>Infection</td>
<td>Method of allocation was by alternation. Tap water pressure and flow rates were measured prior to the study.</td>
</tr>
<tr>
<td>Voorhees</td>
<td>USA</td>
<td>RCT</td>
<td>82 patients after surgery with or without drains</td>
<td>Group A: Showered on 2nd post operative day, Group B: Not showered</td>
<td>Infection</td>
<td>Method of allocation using social security numbers</td>
</tr>
<tr>
<td>Weller Canada</td>
<td>Comparative study with concurrent controls</td>
<td>30 patients with full thickness wounds</td>
<td>Wounds cleansed with either 1. Dey wash skin cleanser or 2. Bulb syringe with normal saline</td>
<td>Wounds cleansed with bulb syringe reported higher bacterial counts. Irrigation with dey wash reduced procedure time in half.</td>
<td>Photographs of wound taken before and after irrigation. User satisfaction survey undertaken. Large amount of solution used with bulb syringe. Random culturing of wounds in both groups</td>
<td>III.2</td>
</tr>
</tbody>
</table>

Wound Cleansing

Photographs of wound taken before and after irrigation
User satisfaction survey undertaken
Large amount of solution used with bulb syringe. Random culturing of wounds in both groups

III.2
Appendix 3 - References from the systematic review


Thomlinson D. To clean or not to clean? *Nurs Times* 1987; **83**: 71–5.


