



****Please note that this publication is currently undergoing update.**
The systematic review on which this issue has been based (published in 2002) has been updated and is available on our web site.
Fernandez, R., Griffiths, R., Ussia, C. (2004) Effectiveness of solutions, techniques and pressure in wound cleansing: a systematic review. JBI Reports 2(7): 231-270.

Practice

Evidence Based Practice Information Sheets for Health Professionals

Solutions, Techniques and Pressure for Wound Cleansing

Information Source

This Best Practice Information Sheet has been derived from a systematic review conducted by the New South Wales Centre for Evidence Based Nursing & Midwifery¹ a collaborating centre of The Joanna Briggs Institute. The focus of this information sheet is the effectiveness of solutions, techniques and pressure in wound cleansing.

The primary references on which this information sheet is based are available in the systematic review report available from The Joanna Briggs Institute and from the web site:

www.joannabriggs.edu.au

This Information Sheet Covers the Following Concepts:

- Background
- Types of Wound Cleansing Solutions
- Optimal Irrigation Pressure for Wound Cleansing
- Techniques for Wound Cleansing
- Recommendations

Levels of Evidence

All studies were categorised according to the strength of the evidence based on the following revised classification system:²

Level I Evidence obtained from a systematic review of all relevant randomised controlled trials.

Level II Evidence obtained from at least one properly designed randomised controlled trial.

Level III.1 Evidence obtained from well designed pseudo-randomised controlled trials (alternate allocation or some other method).

Level III.2 Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case-control studies or interrupted time series with a control group.

Level III.3 Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group.

Level IV Evidence obtained from case series, either post-test or pre-test and post-test.

Definitions

For the purpose of this Best Practice Information Sheet the following definitions have been used.

Wound Cleansing

“The use of fluids to remove loosely adherent debris and necrotic tissue from the wound surface.”

Potable

Tap water that has been declared of suitable quality for drinking

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Inclusion Criteria

Randomised controlled trials, comparative, cohort and case controlled studies that assessed the effectiveness of various solutions, techniques and pressure for wound cleansing were considered.

Additionally studies involving adults or children and those describing objective or subjective measures of wound infection and healing were included.

Exclusion Criteria

Studies excluded from the review were those that:

- Utilised solutions for pre operative skin cleansing to prevent post-operative infections
- Assessed the effectiveness of solutions as part of the operative procedure, eg. lavage with Povidone-iodine or normal saline after fascia closure
- Compared solutions for dental procedures
- Compared solutions for patients with burns
- Compared dressings for patients with ulcers
- Used a solution eg. Povidone-iodine as a prophylactic treatment

Background

Cleansing is a vital component of wound management, however there is limited research to inform practice. Published research has mainly focused on types of dressings and little attention has been given to the solutions and techniques used for wound cleansing purposes. There is a lack of consensus among clinicians about the type of solution and the method for cleansing and policies tend to reflect local individual preferences.

The Evidence

A systematic search of the electronic databases and reference lists identified thirteen studies that assessed the effectiveness of solutions, five studies that assessed the effectiveness of pressures and seven studies that assessed the effectiveness of various techniques for wound cleansing.

Solutions For Wound Cleansing

Ten randomised controlled trials (RCTs), two cohort studies and one comparative study evaluated the effectiveness of tap water, normal saline, povidone iodine, procaine spirit, distilled water, isotonic saline and ShurClens (pluronic F-68) for wound cleansing. No studies comparing hypochlorites or peroxides were identified.

Tap Water vs No Cleansing

Pooled data from four RCTs compared patients (total sample size 483 patients) with acute surgical wounds with primary closure who were allowed to bathe or shower their wounds and those who were not. There was no significant difference in the incidence of wound infection (OR=0.80; 95% CI=0.29, 2.21) or healing (OR=1.24; 95% CI=0.27, 5.68) in either group. Similarly results from the two non randomised controlled studies (total sample size 300 patients) demonstrated either a lower infection rate or no infection in patients whose wounds were

showered compared to those whose were not. (OR=1.24; 95% CI=0.27, 5.68).

Tap Water vs Normal Saline

Two RCTs compared infection rates in wounds cleansed with tap water and those cleaned with normal saline. One study undertaken on 705 patients with acute wounds reported higher infection rates in wounds cleaned with sterile normal saline ($p < 0.05$), while the study by Griffiths³ that involved 49 chronic wounds demonstrated no difference in the infection and healing rate of wounds cleansed with either normal saline (non sterile) or tap water. This

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evidence supports the use of potable tap water as a safe and effective solution for cleansing both acute and chronic wounds with regard to the risk and incidence of infection.

Sterile Normal Saline vs No Treatment

One RCT assessed infection rates in wounds that were soaked in normal saline (n=7) and those that received no treatment (n=8). The results demonstrate that wounds soaked in normal saline had an increase in bacterial count after treatment (p=0.0001). This may be due to the technique used for wound cleansing rather than the effect of the solution. This study used a small sample size and did not establish the pre treatment infection rate for all wounds in the study group, hence the results lack power and validity to inform clinical decision making.

1% Povidone Iodine Solution vs Sterile Normal Saline

Three RCTs and one cohort study compared infection rates between wounds that were cleansed with either 1% povidone iodine or sterile normal saline. While one RCT undertaken on 531 uncomplicated soft tissue lacerations demonstrated no significant difference in the number of wound infections between the two groups, studies undertaken on contaminated wounds reported a lower infection rate

in wounds that were cleansed using 1% povidone iodine. Wound healing was an outcome reported in one RCT undertaken on contaminated wounds. The results indicated that primary wound healing was increased in the wounds cleansed with povidone iodine. However, there was no statistically significant difference in the number of wounds that healed at less than 3 months or at 3–6 months between the two groups.

1% Povidone Iodine vs No Treatment

One RCT compared heavily contaminated traumatic wounds that were soaked in 1% povidone iodine (n=8) and those that were not cleansed (n=8). The results demonstrated no statistically significant difference in the bacterial count and the number of infections in either group.

Tap Water vs Procaine Spirit

One RCT that assessed the impact of procaine spirit on the episiotomy wounds in 100 women who had undergone normal vaginal delivery demonstrated no statistically significant difference in the pain scores, incidence of infection or the healing rate.

ShurClens vs Sterile Normal Saline

One RCT compared the effectiveness of ShurClens (n= 58) to normal saline (n=189) for cleansing traumatic

lacerations. There was no difference in the infection or healing rates between the two groups. ShurClens has also been reported to be a safe cleansing agent for periorbital lacerations.

Povidone Iodine vs ShurClens

The effectiveness of povidone iodine (n=184) and ShurClens (n=158) on reducing the infection rates in uncomplicated soft tissue lacerations was investigated in one RCT. Results demonstrated that although the infection rates between the groups were 4.3% and 5.7% respectively, these results were not statistically significant.

Water (distilled water and/or cool boiled water) vs Isotonic Saline

A three arm RCT was designed to compare the infection and healing rates as a consequence of cleansing open fractures using distilled water, boiled water or isotonic saline. When the results for the distilled and cool boiled water were pooled and compared with isotonic saline, there was no statistically significant difference in the number of infections (OR=0.55; 95% CI 0.18, 1.62).

Distilled water vs cool boiled water

Six out of 35 patients (17%) in the distilled water group and 9/31 (29%) in the boiled water group developed a wound infection; this difference was not statistically significant. (OR=1.98; 95% CI 0.61, 6.39).

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Distilled water vs isotonic saline

Outcomes from the distilled water group were also compared with the isotonic saline group. In this comparison 7/20 patients (35%) whose fractures were cleansed with isotonic saline developed an infection compared with 17% in the distilled water group (OR=0.38; 95% CI 0.11, 1.37). These results were not statistically significant.

Cool boiled water vs isotonic saline

In this comparison 9/31 patients (29%) whose fractures were cleansed with cool boiled water developed an infection compared with 35% cleansed with isotonic saline (OR=0.76; 95% CI 0.23, 2.53). These results were not statistically significant.

Pressure For Wound Cleansing

Three RCTs investigated fluid pressure in wound cleansing. One study compared syringe and needle irrigation with bulb syringe irrigation. The second compared two new products, a port against a cap – both of which can be attached to 1000ml flasks of solution. The third trial compared irrigation with a pressurised canister to a 30ml syringe and 20G needle.

13psi (12cc syringe and 22G needle) vs 0.05psi (bulb syringe)

In traumatic wounds less than 24 hours old (n=335) a statistically significant reduction in inflammation (p=0.034) and infection (p=0.017) was reported when wounds were irrigated with a pressure of 13psi compared to those irrigated using a pressure of 0.05psi. The criteria for infection or inflammation were not objectively established and the volumes of water and method of application were different in the two groups, the findings should be considered in light of these factors.

8psi (pressurised canister) vs 8psi (30ml syringe with 20G needle)

A pressure of 8psi has been reported to be highly effective in cleaning wounds. One RCT compared irrigation times and infection rates in 535 wound lacerations. Although the wound complication rate between the groups was not statistically significant (p=0.50), the time

used to irrigate the wounds was significantly less (p <0.0001) with the use of the pressurised cannister.

8psi (pressurised cannister) vs 0.05psi (bulb syringe)

A pressure of 8psi was found to be more effective for removing bacteria than a pressure of 0.05psi.

2psi (port) vs 1.5psi (cap)

One RCT assessed the rate of infection in 205 wounds cleansed with two irrigation devices (port and cap) that exerted different exit pressures. Both port and cap devices used 1000ml of normal saline in either a bottle or bag. The results indicated no statistically significant difference (p=0.356) in the number of infections in wounds cleaned with either device. Irrigation with either device took four minutes therefore the authors concluded that this was significantly quicker than the traditional needle and syringe methods.

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Recommendations

These conclusions are based on the best available research evidence. However, research in this area is limited as some of the conclusions are based on a single study with a limited sample size.

Solutions for Wound Cleansing

- For adults with lacerations, tap water is an effective cleansing solution. **(Level III.1)**
- Tap water is effective to cleanse clean sutured surgical wounds in healthy adults. **(Level III.1)**
- Potable tap water can also be used as a cleansing solution for adults with chronic wounds³ **(Level II)**
- Irrigation with povidone iodine is recommended for cleansing **contaminated** wounds. **(Level III.1)**
- 1% Povidone Iodine should be applied to the area, left on for 3-5 minutes then washed off: **(expert opinion)**
- Boiled and cooled water is a viable alternative as a wound cleansing solution in the absence of normal saline or potable tap water. **(Level II)**

Pressure for Wound Cleansing

- A pressure of 13psi is effective in reducing infection and inflammation in both adults and children with lacerations and traumatic wounds. **(Level II)**
- Pressures of less than 8psi have been found to be ineffective in reducing bacterial count. **(Level III.2)**

Techniques for Wound Cleansing

- Showering post-operative wounds does not increase infection or slow the healing process and promotes a sense of well-being and health associated with cleanliness. **(Level I)**
- Compared to whirlpool therapy alone, this treatment followed by vigorous rinsing has demonstrated to significantly reduce the number of bacteria in venous stasis ulcers. **(Level IV)**
- Whirlpool therapy along with PCA aids in pain relief and promotes wound healing. **(Level III.2)**
- Showering of chronic wounds and ulcers may be undertaken with caution. **(consensus)**

Tap water should not be used if declared unpotable (unsuitable for drinking)



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Techniques for Wound Cleansing

Irrigation using a Syringe with 18-20G Needle vs Cleansing with Gauze

A comparative study demonstrated no statistically significant difference in infection rates between wounds cleansed using a syringe and 18-20g needle and those cleansed using a gauze swab ($p=0.28$). However, optimal cosmetic appearance at suture removal was higher in wounds that were irrigated.

Showering vs Non Showering

Four studies compared the effect of showering to non-showering patients in the post-operative period (total sample size 483 patients). The results of the studies indicated no statistical difference in the infection rate or the healing rate between the groups. However, two

studies reported that patients in the showering group felt a sense of health and well being derived from the hygiene and motivation of showering.

Whirlpool Therapy

A single study that investigated the effects of whirlpool therapy on pain relief and wound healing after abdominal surgery indicated that the 31 patients who received whirlpool therapy along with patient controlled analgesia (PCA) in the first 72 hours, experienced reduced pain and decreased wound inflammation compared to those who had not (32 patients). Whirlpool treatment followed by vigorous rinsing when compared to whirlpool therapy alone demonstrated a significant reduction in the number of bacteria in venous stasis ulcers.

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The review report and recommendations were reviewed by an expert panel. In addition the Best Practice Information Sheet has been peer reviewed by experts nominated by the JBI collaborating centres throughout Australia, New Zealand and Hong Kong.