Clean vs. Sterile Dressing Techniques for Management of Chronic Wounds: A Fact Sheet

Originated By:

Wound, Ostomy and Continence Nurses Society™ (WOCN®) Wound Committee and the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) 2000 Guidelines Committee

Updated/Revised: WOCN® Wound Committee, 2011

Date Completed:

Original Publication Date: 2001
Review/Update: 2005
Revised: 2011

Purpose:

To present an update on the status of information about clean versus sterile dressing technique to manage chronic wounds.

Background/History:

This document originated in 2001 as a joint position statement from a collaborative effort of the Wound, Ostomy and Continence Nurses Society™ and the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC & WOCN®, 2001; Wooten, Hawkins, & APIC Committee, 2001). Its purpose was to review the evidence about clean vs. sterile technique and present approaches for chronic wound care management. Then as now, areas of controversy exist due to a lack of agreement on the definitions of “clean” and “sterile” technique, lack of consensus as to when each is indicated in the management of chronic wounds, and lack of research to serve as a guide. Wound care practices are extremely variable and are frequently based on rituals and traditions as opposed to a scientific foundation.

Discussion of Problems/Issue/Needs:

Definition of terms.

Clean versus sterile technique. Various definitions and descriptions of dressing technique for wound care exist. Terms have been used interchangeably and all are subject to
individual interpretation. The following definitions provide a point of reference for the terms used in this document.

**Sterile technique.** Sterile is generally defined as meaning free from microorganisms (Rowley, Clare, Macqueen, & Molyneux, 2010). Sterile technique involves strategies used in patient care to reduce exposure to microorganisms and maintain objects and areas as free from microorganisms as possible. Sterile technique involves meticulous hand washing, use of a sterile field, use of sterile gloves for application of a sterile dressing, and use of sterile instruments. “Sterile to sterile” rules involve the use of only sterile instruments and materials in dressing change procedures; and avoiding contact between sterile instruments or materials and any non-sterile surface or products. Sterile technique is considered most appropriate in acute care hospital settings, for patients at high risk for infection, and for certain procedures such as sharp instrumental wound debridement (Bates-Jensen & Ovington, 2007; Ferreira & de Andrade, 2008; Rowley et al., 2010).

**Clean technique.** Clean means free of dirt, marks, or stains (Rowley et al., 2010). Clean technique involves strategies used in patient care to reduce the overall number of microorganisms or to prevent or reduce the risk of transmission of microorganisms from one person to another or from one place to another. Clean technique involves meticulous handwashing, maintaining a clean environment by preparing a clean field, using clean gloves and sterile instruments, and preventing direct contamination of materials and supplies. No “sterile to sterile” rules apply. This technique may also be referred to as non-sterile. Clean technique is considered most appropriate for long-term care, home care, and some clinic settings; for patients who are not at high risk for infection; and for patients receiving routine dressings for chronic wounds such as venous ulcers, or wounds healing by secondary intention with granulation tissue (APIC & WOCN®, 2001; Aziz, 2009; Bates-Jensen & Ovington, 2007; Ferreira & de Andrade, 2008; Pegram & Bloomfield, 2010; Rowley et al., 2010; Wooten et. al, 2001).

**Aseptic technique.** Asepsis or aseptic means free from pathogenic microorganisms (Rowley et al., 2010). Aseptic technique is the purposeful prevention of the transfer of organisms from one person to another by keeping the microbe count to an irreducible minimum. Some authors have made a distinction between surgical asepsis or “sterile technique” used in surgery and medical asepsis or “clean technique” that involves procedures to reduce the number and transmission of pathogens (Bates-Jensen & Ovington, 2007).

**No touch technique.** No touch is a method of changing surface dressings without directly touching the wound or any surface that might come in contact with the wound. Clean gloves are used along with sterile solution/supplies/dressings that are maintained as clean (Rolstad, Bryant, & Nix, 2012).

**Definition of infection.** Infection has been defined as a continuum from contamination, colonization, critical colonization, biofilm, and infection (Stotts, 2012).

**Contamination.** Contamination is the presence of non-replicating microorganisms on the surface of the wound. All open wounds have some level of bacterial burden that is ordinarily cleared by the host (Landis, 2008; Sibbald, Woo, & Ayello, 2009; Stotts, 2012).
Colonization. In colonization, microorganisms attach to the wound surface and replicate but do not impair healing or cause signs and/or symptoms of infection. The bacteria are not pathogenic and do not require treatment. All chronic wounds are colonized to varying degrees (Stotts, 2012).

Critical colonization. With critical colonization, the organisms attach to the wound surface, replicate and multiply to a level that affects skin cell proliferation and tissue repair without provoking systemic signs of infection. There is no invasion of the healthy tissue at this point (Stotts, 2012).

Biofilm. Approximately 70% of chronic wounds have biofilm (Stotts, 2012). When organisms adhere to the wound surface, they begin to develop biofilm, which is a complex system of microorganisms embedded in an extracellular, polysaccharide matrix that protects from the invasion of other organisms, phagocytosis, and many commonly used antibiotics and antiseptics. Biofilms are difficult to treat and eradicate (Stotts, 2012). Recently it has been proposed that biofilm might be present in all chronic wounds (Cowan, 2010; Wolcott, Cox, & Dowd, 2010).

Infection. Infection occurs when organisms on the wound surface invade the healthy tissue, reproduce, overwhelm the host resistance, and create cellular injury leading to local or systemic symptoms (Gray & Doughty, 2001; Stotts, 2012). Infection is often described quantitatively as a bacterial count of greater than $10^5$ colony-forming units (CFU) per gram of tissue (Stotts, 2007). However, some organisms such as beta-hemolytic streptococci impair wound healing at less than $10^5$ CFU per gram of tissue (Bowler, 2003). According to Kravitz (2006), infection should be defined as the presence of bacteria in any quantity that impairs wound healing.

Clinical signs of infection include lack of healing after 2 weeks of proper topical therapy, erythema, increase in amount or change in character of exudate, odor, increased local warmth, friable granulation tissue, edema or induration, pain or tenderness, fever, chills, elevated white blood cell count, and elevated glucose in patients with diabetes (Stotts, 2012). In patients who are immunosuppressed or have ischemic wounds, signs of infection can be subtle. Signs of inflammation such as a faint halo of erythema and moderate amounts of drainage might be the only signs of an infected arterial wound (Cutting & White, 2005). Studies have shown that in chronic wounds, increasing pain, friable granulation tissue, wound breakdown, and foul odor have high validity for infection (Cutting & White, 2005; Gardner, Frantz, & Doebbling, 2001).

Definition of wounds.

Wound. A wound is any break in the skin that can vary from a superficial to a full thickness wound. A partial thickness wound is confined to loss of the epidermis and partial loss of the dermis; whereas a full thickness wound has a total loss of the epidermis and dermis and can involve the deeper subcutaneous and muscle tissues and/or bone (Doughty & Sparks-DeFriese, 2012; Somerset, 2007).
**Acute wound.** Acute wounds occur suddenly and are commonly due to trauma or surgery, which triggers blood clotting and a wound repair process that leads to wound closure within 2-4 weeks (Doughty & Sparks-DeFriese, 2012; Gray & Doughty, 2001).

**Chronic wound.** A chronic wound is a one that does not proceed through an orderly and timely repair process requiring more than 4 weeks to heal such as vascular wounds and pressure wounds (Doughty & Sparks-DeFriese, 2012; Gray & Doughty, 2001).

**Surgical wound.** A surgical wound that heals in an orderly and expected fashion may be considered an acute wound. Surgical wounds heal by primary closure or are left open for delayed primary closure or healing by secondary closure. Primary closure facilitates the fastest healing. However, infected wounds should not be primarily closed (Whitney, 2012).

**Gaps in Research Practice:**

There is no definitive evidence that sterile technique is superior to clean technique, improves outcomes, or is warranted when changing dressings on chronic wounds (Rolstad et al., 2012). Insufficient evidence is available to determine if there are significant differences in infection rates or healing when wounds are treated using clean or sterile technique (Gray & Doughty, 2001). There is a lack of agreement in published expert opinion as to what constitutes sterile versus non-sterile technique and when one or the other should be used.

**Overview of Research/Published Expert Opinion:**

Few national guidelines have addressed the topic of clean vs. sterile technique. Sterile technique and dressings have been recommended for post-operative management of wounds for 24-48 hours by the Centers for Disease Control and Prevention (Mangram, Horan, Pearson, Silver, & Jarvis, 1999). No recommendations are provided beyond 48 hours for wounds with primary closure (Mangram et al., 1999; Massachusetts Department of Public Health, 2008).

In 1994, clinical practice guidelines for pressure ulcer treatment, published by the Agency for Health Care Policy and Research, recommended use of clean gloves and clean dressings for pressure ulcers as long as the dressing procedures complied with the institution's policies (Bergstrom et al., 1994). Sterile instruments were recommended for debridement. Recent guidelines for pressure ulcers have not addressed specifics of clean or sterile technique other than to state that tap water or potable water can be used to clean pressure ulcers and that sterile instruments are needed for sharp debridement (NPUAP-EPUAP, 2009).

There is a paucity of research about clean vs. sterile technique for wound care and studies have varied greatly in their design and findings. Angeras, Brandberg, Falk, and Seeman (1992) compared the use of sterile saline or tap water for cleaning acute traumatic soft tissue wounds and found that the infection rate in the tap water group was 5.4% compared to 10.3% in the group using sterile saline ($p < .05$) with a 50% decrease in costs for the tap water group.

Two studies examined the strike through contamination in saturated sterile dressings. Alexander, Gannage, Nichols, and Gaskins (1992) reported that when gauze sponges were
saturated directly in their wrapper, that contamination occurred in 100% of sponges in uncoated wrappers. In the coated wrapped sponges, 80% exposed to Staphylococcus epidermidis and 20% exposed to Escherichia coli had strike through. In another study, cultures were taken from gauze sponges that were saturated directly on their wrappers on hospital over-bed tables of postoperative surgical patients (Popovich, Alexander, Rittman, Martorella, & Jackson, 1995). The saturated gauze showed significant growth of microorganisms. The authors reported there was no significant difference in strike-through contamination in gauze saturated on coated or uncoated wrappers. Investigators in both these studies concluded that the practice of saturating gauze sponges on their wrappers was unacceptable.

In 1993, Stotts and colleagues conducted a descriptive, exploratory survey of members of WOCN® to obtain information regarding wound care practices in the United States. Two hundred and forty-two (242) members responded to the survey. Of the respondents, 51.4% reported use of sterile technique and 43% reported use of non-sterile technique. Sterile technique was performed more frequently in acute care than in other settings. It was also reported that 90% of patients with open wounds being discharged from hospitals were taught to perform non-sterile technique at home regardless of whether clean or sterile technique was used during hospitalization.

In 1997, Stotts and colleagues compared the healing rates and costs of sterile vs. clean technique in post-operative patients (N = 30) who had wounds healing by secondary intentions following gastrointestinal surgery. The authors reported there was no statistically significant difference in the rate of wound healing between the two groups (p < 0.55). The cost however was significantly higher with sterile technique (p < .05) compared with clean technique.

Also, in 1997, Wise, Hoffman, Grant, and Bostrom surveyed staff nurses (N = 723) in five health care agencies about the use of sterile vs. non-sterile gloves for wound care. The authors reported great variations in practice and that acute care nurses used sterile gloves for wound care more commonly than home care nurses. In acute care, sterile gloves were used more than non-sterile for packing wounds, in cases of purulence or tunneling, or for open orthopedic wounds. Clean gloves were used for dressing changes of intact surgical wounds and pressure ulcers. In home care, non-sterile gloves were commonly used except for open orthopedic wounds (i.e., exposed bone/tendon). Three factors that were identified as the most influential in glove choice were type of wound, exposed bone, and immunosuppression. Some of the other factors affecting glove choice included type of dressing, type of drainage, time since surgery, licensure (i.e., registered nurse vs. licensed vocational nurse), agency policy, physician preference, and what they were taught in school.

Lawson, Juliano, and Ratliff (2003) in a non-experimental, longitudinal study monitored infection rates and supply costs of all patients with open surgical wounds healing by secondary intention before and 3 months after implementing non-sterile wound care. There was no statistically significant difference in infection rates. Dressing costs and time to perform the wound care were reduced using non-sterile dressing techniques (i.e., staff did not use sterile gloves, scissors, or bowls).
In 2006, Fellows and Crestodina reported that the optimal cleansing agent for wound cleaning should be sterile, noncytotoxic, and inexpensive. Because of the cost of sterile saline and reluctance of patients to discard unused solutions, Fellows and Crestodina conducted a small, quasi-experimental study in a home health setting to compare the bacterial content of home prepared saline made with distilled water and stored at room temperature (2 gallons) to saline stored in a refrigerator (2 gallons). Based on cultures of the solutions immediately following preparation and at weekly intervals for 4 weeks, the authors concluded that saline solution prepared by patients by adding table salt to distilled water (purchased from a grocery store) remained bacteria free for a month if refrigerated. The saline kept at room temperature had undesirable levels of bacteria after 2 weeks. The authors recommended further studies to confirm their findings.

An integrative literature review of seven published studies of clean and sterile technique for dressings revealed that while there is a lack of consensus about the benefit of clean versus sterile technique to improve healing or infection rates, clean technique results in lower costs (Fereira & de Andrade, 2008).

Conclusions:

There is not a consensus of expert opinion on the use of clean or sterile dressing technique in the management of chronic wounds. Research is limited and inconclusive about value of clean or sterile in healing outcomes. Limited evidence indicates clean technique reduces costs and might require less time to perform.

Wound care is provided in a variety of patient care settings including acute care, sub-acute care, long-term care, outpatient clinics, and in the home. The question arises: Should a different technique be utilized in the delivery of wound care based on the health care setting? Decisions made about the type of technique to be used may be more reasonably based on what will be done to the wound, rather than where or to whom the care is delivered (APIC & WOCN®, 2001; Wooten et al., 2001).

Other factors that may influence the technique are the status/acuity of the patient, the health care setting, and type of caregiver (Wise et al., 1997). For instance, a frail, elderly patient who is receiving immunosuppressant drugs who has a large, full thickness, sternal wound receiving daily dressing changes might benefit from “sterile” technique. A middle-aged patient who was in an automobile accident and subsequently developed a non-infected, Stage III pressure ulcer treated with hydrocolloid dressings, changed every 3-4 days, might be adequately managed using “clean” technique. There is no scientific evidence or consensus that any one of these conditions is more or less important in selecting the appropriate method of care for the wound. It has been suggested that an assessment of patients risk for infection is an important factor in choosing the type of technique (Flores, 2008; Rowley et al., 2010).

Recommendations:

Recommendations for practice: Considerations for clean vs. sterile technique.
1. The following factors should be considered when planning and selecting dressing technique for chronic wound care (APIC & WOCN®, 2001; Flores, 2008; Wooten, et al., 2001).
   a. Patient factors, immune status, acute vs. chronic wound.
   b. Type, location, and depth of the wound.
   c. Invasiveness of wound care procedure.
      o How invasive is the procedure?
      o Is debridement to be performed?
      o Does the procedure involve changing a simple transparent film or hydrocolloid dressing or extensive packing of the wound?
   d. Health care setting.
      o Who will be doing the wound care?
      o What is the environment in which the care will be delivered?
   e. Selection/use of supplies/instruments.
      o Use and maintenance may be based on likelihood of exposure to organisms in the care setting.
      o What is clean, what is sterile, and what is contaminated?
      o Keep items apart by using no touch technique.
      o Initially, solutions such as commercially prepared wound cleansers and normal saline are sterile.
      o The shelf life of solutions once they are opened is based on manufacturers' recommendations and the policy of the health care institution providing the care. No definitive scientific evidence exists to guide the policies of the health care institution.

2. The following table addresses dressing technique for chronic wounds (APIC & WOCN®, 2001; Crow & Thompson, 2001; Wooten, Hawkins, & APIC Committee, 2001).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Hand Washing</th>
<th>Gloves</th>
<th>Supplies (Includes Solutions and Dressing Supplies)</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound Cleansing</td>
<td>Yes</td>
<td>Clean</td>
<td>Normal saline or commercially prepared wound cleaner</td>
<td>Irrigate with sterile device; maintain as clean per policy*</td>
</tr>
<tr>
<td>Routine Dressing Change without Debridement</td>
<td>Yes</td>
<td>Clean</td>
<td>Sterile, maintain as clean per policy*</td>
<td>Sterile; maintain as clean per policy*</td>
</tr>
<tr>
<td>Dressing Change with Mechanical, Chemical, or Enzymatic Debridement</td>
<td>Yes</td>
<td>Clean</td>
<td>Sterile, maintain as clean per policy*</td>
<td>Sterile; maintain as clean per policy*</td>
</tr>
</tbody>
</table>

Table. Suggested Dressing Technique for the Management of Chronic Wounds
**Dressing Change with Sharp Conservative Bedside Debridement**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Sterile</th>
<th>Sterile</th>
<th>Sterile</th>
</tr>
</thead>
</table>

* Maintain clean per policy means that each health care setting must establish policies that address the parameters for use/maintenance of supplies/solutions, taking into consideration such factors as expiration dates, costs, and manufacturers’ recommendations.

**Recommendation for education.** Health care facilities should develop policies and educational programs for staff to enhance understanding and principles of asepsis, choosing and criteria for performing clean or sterile technique.

**Recommendation for research.** Research is needed to provide an evidence-basis to support either “clean” or “sterile” dressing technique to manage chronic wounds. Continued research is needed that examines patient outcomes in terms of healing, infection rates, and costs of clean vs. sterile techniques. Studies should clearly describe methods and supplies used for clean or sterile technique. Large multi-site, randomized studies across health care settings are needed to insure appropriate patient outcomes are achieved in a cost effective manner that does not compromise patient safety.
References:


Louis, MO: Elsevier Mosby.


**Date Approved by the WOCN® Board of Directors:** September 27, 2011