

Wound Infections

Given the complexity of wound healing and the multiple factors that affect healing, wound care in the home can be a challenge. Chronic health conditions and multiple co-morbidities, such as diabetes, cancer, or heart failure must all be taken into account. Home care nurses treat a variety of wounds. The plan of care must address the whole patient and must take into account any assistance the patient may need due to physical or mental deficits, nutritional needs, family support, wound care strategies, and reimbursement.

Wound Infection continues to be a challenging problem and represents a healthcare burden.

Most wounds contain micro-organisms; many heal successfully with proper cleansing and wound care. However, micro-organisms and bacteria, can multiply, invade and damage tissues that delay healing and cause systemic infections.

It is important to be aware of the normal healing process of wound care. The phases of full thickness wound healing are outlined below.

- **Phase 1 - Inflammation phase (0-3 days).** This is the body's normal response to injury. This phase activates vasodilation leading to increased blood flow causing heat, redness, pain, swelling, loss of function (example: arm swells and cannot bend). Wound oozing may be present and is a normal in phase 1.
- **Phase 2 - Proliferative phase (3-24 days).** This is the time when the wound is healing. The body makes new blood vessels, which cover the wound. This phase includes reconstruction and epithelization. The wound will gradually become smaller as it heals.
- **Phase 3 - Maturation Phase (24-365 days).** Final phase of healing, when scar tissue is formed. The wound at this stage is still at risk and should be protected where possible. (Bryant, Ruth. 2000. Acute and Chronic Wounds, 2nd Edition, Mosby.)

All healthcare providers have a role in prevention of wound infection. Using standardized evidence-based wound protocols and by recommending appropriate support surfaces and dressings, healing times can be shortened and additional wounds can be prevented, thereby reducing healthcare costs. Patient and caregiver education is vital in prevention of infection and reducing further wounds from occurring.

OASIS C2-Integumentary System

The Wound, Ostomy, Continence Nurses Society has developed guidelines to facilitate the classification of wounds by home health clinicians in collaboration with the updated OASIS C2 changes in the integumentary system. For more information on OASIS and how to complete the skin assessment, please visit:

http://c.ymcdn.com/sites/www.wocn.org/resource/resmgr/publications/WOCN_Guidance_on_OASIS-C2_In.pdf

Who is at risk of wound infection?

The risk of infection is increased by any factor that debilitates the patient, impairs immune resistance or reduces tissue perfusion such as:

- co-morbidities (diabetes, immunocompromised states, hypoxia, poor tissue perfusion due to anemia, arterial, cardiac, respiratory, and renal impairment, malignancy, obesity and malnutrition.
- Medication including corticosteroids, cytotoxic agents, and immunosuppressant medications
- Psychosocial factors: hospitalizations, poor personal hygiene, unhealthy lifestyles and economics.

Assessment

Diagnosis of wound infection is made mainly on clinical symptoms. Assessment should include evaluation of the patient, the tissues around the wound and the wound itself for signs and symptoms of infection. Routine wound assessment will aid in early detection of infection. An infection is defined as the presence of 10^6 bacteria or other organisms in a gram of tissue. This can lead to a host of reactions from contamination, colonization, local infection, spreading infection, and progressing to systemic infection.

Bioburden States	
Contamination	Bacteria are present on the surface but do not multiply and do not cause an immune response
Colonization	A normally healing wound will be colonized with bacteria. Colonization is a stable state where the growth and death of microorganisms within a wound is in balance with the patients' immune system. It does not interfere with healing nor damage wound tissue or trigger an immune response.
Critical Colonization	The presence of bacteria in the wound results in delayed healing.
Local Infection	Bacteria multiply, disrupt healing and result in damage to wound tissue.

Signs and Symptoms of Infection In Acute Wounds

- New or increasing pain
- Erythema
- Local warmth
- Swelling
- Purulent discharge
- Fever
- Delayed or stalled healing
- Malodor
- Wound breakdown or dehiscence
- Induration
- Elevated white blood cell count

Signs and Symptoms of Infection Chronic Wounds

- New, increased or altered pain
- Erythema extending from wound edges
- Local warmth
- Swelling
- Increase or altered purulent exudate
- Delayed or stalled healing
- Distinctive malodor
- Wound breakdown or dehiscence
- Induration
- Elevated white blood cell count
- Peri-wound edema
- Bleeding or friable (easily damaged) granulation tissue
- Wound bed discoloration
- Pocketing/bridging

Wound Bed

Granulating: Healthy red tissue which is deposited during the repair process of full thickness wounds; presents as pinkish/red colored moist tissue and comprises of newly formed collagen, elastin and capillary networks. The tissue is well vascularized and bleeds easily.



Epithelialization: Process by which the wound surface is covered by new epithelium, this begins when the wound has filled with granulation tissue. The tissue is pink and occurs as the primary closure mechanism of partial thickness wounds and atop of healthy granulation tissue in a full thickness wound.



Slough: The presence of devitalized yellowish tissue. Slough is formed by an accumulation of dead cells and should not be confused with pus.

Necrotic: Wound containing dead tissue. It may appear hard, dry and black. Dead connective tissue may appear grey. The presence of dead tissue in a wound prevents healing.

Hyper-granulation: Granulation tissue grows above the wound margin. This occurs when the proliferative phase of healing is prolonged and is usually the result of increased moisture.



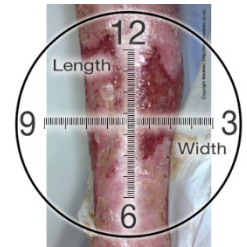
Wound Measurement

Wound measurements are an essential component of wound assessment. It should be done on the initial visit and at regular intervals. Various methods are available to measure wounds and it is important to use the same method each time, with the patient in the same position.



Depth: Measure in centimeters. Depth is most commonly measured by gently inserting a cotton tipped applicator into the deepest point of the wound bed. Place a gloved forefinger on the swab at skin level and holding the finger in place, remove the swab and place next to a centimeter ruler.

Tunnelling or Undermining: Clinicians should envision the face of a clock over the wound when the patients head is at the 12:00 o'clock position and the feet are at 6:00 o'clock position. Gently advance the cotton tipped applicator into the area of tunnelling or undermining, and measure the extent in centimeters.



Length/Width: There are a number of methods for measuring wounds, ranging from simple linear measurements with a paper ruler to more advanced methods using computer software. For more day-to-day practice, we will discuss the techniques used by most home care clinicians. The simplest is using a disposable paper ruler. Multiplying the length and width will give you the estimated surface area OR longest length x greatest width perpendicular to each other. The measurements are taken in head to toe orientation. Wounds change shape as they heal and the head to toe orientation ensures the length and width remain the same. Tracing is another method. It is easy and provides more information on the shape of the wound. <http://www.wounds-uk.com/wound-essentials/wound-essentials-10-2-wound-assessment-part-1-how-to-measure-a-wound>

Exudate

Exudate is produced by all acute and chronic wounds as part of the natural healing process. It plays an essential part in the healing process. Exudate contains nutrients, energy and growth factors for metabolizing cells. It also contains high amounts of white blood cells and cleanses the wound. Exudate also maintains a moist wound environment and promotes epithelialization. It is usually amber or straw colored similar to plasma and is important to assess and document the type, amount and odour of exudate to identify any changes. Too much exudate leads to maceration of the skin and hypergranulation of the tissue, while too little can result in the wound bed becoming dry.

One challenge in wound management is to find a dressing that manages exudate...neither too dry nor too wet.

Type	Color	Consistency	Significance
Serous	Clear, straw colored	Thin, watery	Normal. Increase volume may indicate infection
Serosanguinous	Clear pink	Thin, slightly thicker than water	Presence of red blood cells. May indicate capillary damage after surgery or traumatic dressing removal.
Sanguineous	Red, bloody	Watery	Trauma to blood vessels
Purulent	Opaque, milky, yellow or brown. Occasionally green.	Viscous, sticky	White blood cells, bacteria, slough or from enteric or urinary fistula. Bacterial infection (<i>Pseudomonas aeruginosa</i>).
Haemopurulent	Reddish, milky	Viscous, thick	Established infection. May contain neutrophils, dying bacteria, inflammatory cells, blood leakage due to dermal capillaries.

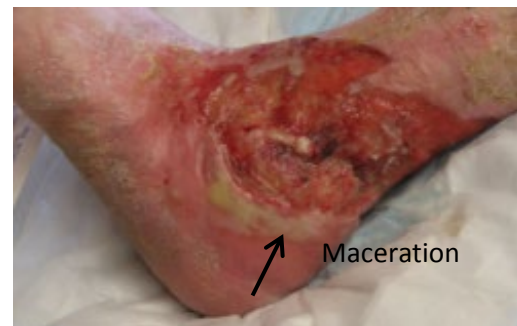
Wound Edges

Healthy wound edges present as pink epithelium growing over mature granulated tissue.

- **Color** - pink edges indicate growth of new tissue; dusky edges indicate hypoxia; and erythema indicates physiological inflammatory response or cellulitis
- **Raised** - wound edges (where the wound margin is elevated above the surrounding skin) may indicate pressure, trauma or malignant changes
- **Rolled** - wound edges (rolled down towards the wound bed) may indicate mechanical damage, wound stagnation or wound chronicity
- **Contraction** - wound edges are coming together, signs of healing
- **Sensation** - increased pain or the absence of sensation should be noted



Proper assessment of surrounding skin is crucial to wound care and treatment.



Surrounding Skin

The surrounding skin should be examined carefully. Tissue may present as:

- Healthy
- Macerated
- Dry/flaky
- Eczematous
- Black/blue discoloration
- Fragile
- Erythema
- Induration (hardening)
- Cellulitis

Pain

Pain associated with chronic wounds can be underestimated. It is important that pain scores are captured accurately and regularly to ensure that patients have a more active role in dealing with their pain. Effective pain relief can be achieved, and documentation of pain interventions and patterns should be captured. Numerous evidenced based pain assessment tools are available including the 0-10 pain scale, Wong Baker faces, and the FLACC Scale. Pain scores should be clearly documented and reported to the provider. It is important to have an accurate assessment of pain before, during and after dressing changes and may provide vital information for further wound management.

In patients who are immunocompromised and/or who have motor or sensory neuropathies, symptoms may be less obvious. For example, a diabetic patient that has an infected foot ulcer and peripheral neuropathy, symptoms may be less obvious. In arterial ulcers, previously dry ulcers may become wet when infected and in Charcot's arthropathy, the patient may have inflammation that is not associated with infection.

SBAR for Wound Care Management

Purpose: To facilitate effective communication and collaboration between the practitioner in the management of the patients wound. SBAR organizes essential elements of a conversation in the transfer from one to another and promotes completeness of information and helps prevent omissions.

Goal: To incorporate evidence based research on the science of wound management, and to integrate new understanding of the wound healing process into current practice. Research shows that advanced wound care products provide better outcome for patients and as such should be incorporated into practice. This tool will assist the practitioner to effectively communicate recommendations based on current research.

How to use the SBAR tool:

Before calling practitioner: Complete a full assessment on the patient. Review patient chart. Note any changes, labs, recent falls/injuries/procedures, etc. Also, have answers to questions such as: *Is the wound healing? Is it moist? Is necrotic tissue present? What is the condition of peri-wound skin? What are the measurements and depth of the wound?* Be sure to have all necessary information to communicate effectively.

Situation: Your name, patient's name and the current issue (what about the patient's condition warranted the call?)

Background: Report information relevant to current issue, i.e. diagnosis, vital signs, lab results, physical assessment findings, skin/wound condition, etc.

Assessment: Focus on current wound. If necessary, refer to previous assessments to highlight changes from the past. Take this time to use critical thinking skills to elaborate on details pertaining to current issue such as nutritional intake, wound deterioration/failure of wound healing, pre-albumin value, hydration. What has led you to the recommendation of a treatment option specific to THIS patient's needs at this time. Is it that the wound bed is dry? Does it have slough? Is there an odor? Is the peri-wound skin reddened?

Recommendation: Use key phrases such as "I recommend...", "What I have available is...", or "As per our formulary, I suggest using..." AVOID phrases such as, "What do you think," "What would you like to do," and "I don't know." Back up your request with information such as "Wet-to-dry dressing causes tissue destruction and is traumatic to the patient." Use generic product names, rather than brand names. Ex: Hydrocolloid, not *Duoderm*.

Scripting can assist the healthcare provider when discussing recommendations with the ordering practitioner. Here are a few examples of how scripting can assist the healthcare provider:

"Based on my assessment of the patient and the condition of his/her wound, I recommend using _____"

"As per our formulary, I suggest using _____ treatment on the patients wound, as it is most adequate at this point in the wound's healing process."

OTHER LANGUAGE THAT MAY BE USEFUL:

"Evidence-based research shows that wet-to-dry dressing is no longer considered the standard of care. It is non-selective and removes both infected AND healthy tissue. It is detrimental to the wound bed and causes pain upon removal. Wet-to-dry dressings also need to be changed much more frequently, interrupting the temperature of the wound bed, which is key in healing a wound."

"By treating the wound with a hydrocolloid dressing, the wound bed will remain covered and protected from bacterial penetration, and autolytic debridement will take place while maintaining a moist wound environment."

"Foam absorbs small to moderate amounts of drainage, promotes a moist wound environment, provides thermal insulation for the wound bed and aids in hyper-granulation of tissue."

"Hydrofibers or foams are ideal for wounds with moderate to excessive slough/drainage because they effectively debride the wound, while keeping it moist, and promote tissue granulation."

"Alginate dressings are an effective barrier to bacterial penetration in moderate to heavily draining wounds. Alginates absorb drainage and promote a moist wound environment."

"Monofilament cleansing pads are effective at cleansing wounds of biofilm and loosen necrotic debris on wound surfaces."

Please feel free to utilize the SBAR tool created by the Great Plains Quality Innovative Network. This can be adapted for your use and we encourage you to make this unique for your agency. This can be downloaded for your use or can be used electronically. A chart with various tools and resources are listed at the end of this document.

Wound Cultures

Sampling techniques include wound swabbing, needle aspiration, and wound biopsy. Wound swabbing is most widely used, but may mislead by detecting surface colonization rather than more deeply sited pathogens. Wound biopsy provides the most accurate information about type and quantity of pathogenic bacteria, but is invasive and often reserved for wounds that fail to heal despite appropriate treatment. A wound culture competency tool is available for download and use at the end of the document.

The Levine technique may be the most useful swabbing technique. In general, sampling should take place after thorough wound cleansing (and if appropriate, debridement), and should concentrate on the areas of the wound of greatest clinical concern. A swab is rotated over a 1cm² area of the wound with sufficient pressure to express fluid from within the wound tissue.

Another technique is called the “Z” technique. This technique involves rotating the swab between the fingers in a zigzag fashion across the wound without touching its edge. Not validated as efficaciously as Levine.

Research suggests the Levine method detects significantly more organisms because it samples a greater concentration of microorganisms from both the surface and slightly below the surface of the wound. [Angel ED, et al. The clinical efficacy of two semi-quantitative wound-swabbing techniques in identifying the causative organism\(s\) in infected cutaneous wounds. International Wound Journal \(2011\) 8: 176-185](#)

Recommended basic principles from the Wound Ostomy and Continence Nursing Society exist for obtaining a wound culture and no single guideline is used universally. Whatever technique you decide to use, certain basic principles apply:

- Always obtain culture from thoroughly cleansed and prepared tissue to avoid obtaining only a culture of surface contamination.
- Collect culture before topical or systemic antibiotics are initiated.
- Obtain a swab culture from a viable wound bed. Don't culture avascular tissue. It is recommended that you irrigate the tissue with normal saline solution, moisten a swab with normal saline solution, and swab a 1cm² area of viable tissue for 5 seconds with enough pressure to produce exudate.

Bacteria are usually identified using culture techniques. When rapid identification is required, such as in sepsis, a Gram Stain may be useful in guiding early antimicrobial therapy. Samples sent for analysis should be accompanied by full clinical details to ensure that the most appropriate staining, culture, and antibiotic susceptibility is performed. To learn more about wound culture techniques, many different videos, journals, and publications are available such as the one listed here.



<https://www.youtube.com/watch?v=n4Jp6jl3HWc>

Clinical Connections-Wound Culture Techniques

Indications for Wound Specimen Collection

- Acute Wound with signs of infection
- Chronic Wound with signs of spreading or systemic infection
- Infected chronic wound that have not responded to treatment or that are deteriorating despite antimicrobial treatment

Wound Treatments

Types of Wound Treatments

- Advanced Dressings & Supplies
- Vacuum Assisted Closure
- Electrical Stimulation
- Ultrasound Wound
- Surgical Treatment and Debridement

Advanced Dressings & Supplies: Supplies such as calcium alginates, hydro fiber, foam dressings, hydrocolloids, and wound gels. These dressings provide antimicrobial activity, improved fit over difficult anatomical areas, faster healing, and improved patient comfort.

Vacuum Assisted Closure: While some agencies shy away from the advanced technologies to assist with wound healing, vacuum assisted closure therapy is a complex wound management system used in homecare settings that promotes angiogenesis while preparing the wound bed for closure

Electrical Stimulation: E-Stim is another edge in the treatment of difficult to heal wounds. This wound care modality is recommended by the Agency for Health Care Policy and Research and by Medicare for certain types of wounds. E-Stim has multiple effects on a wound site including increasing collagen tensile strength and increasing protein synthesis. This ultimately results in new tissue growth or granulation

Ultrasonic Wound Therapy: Ultrasound is also used to accelerate wound healing. Ultrasound can cause degranulation of mast cells, releasing histamine, and attracting neutrophils and monocytes. Ultrasound can also cause targeted heating that will improve circulation resulting in the progress of wound healing.

Surgical Treatment and Debridement: Debridement is the removal of foreign material and dead or damaged tissues. It is well demonstrated that wound healing cannot occur when necrotic material is present. Devitalized tissue is an excellent medium for infection. Debridement is needed in all types of wound, both acute and chronic. Necrotic tissue inhibits phagocytosis and prevents an accurate assessment. Debridement reduces the number of germs and toxins in the wound bed. There are many forms of debridement and factors to consider when debridement is necessary. There are 3 basic types of debridement:

- **Mechanical-** this includes surgical/sharp techniques, wet to dry techniques, pressure lavages, monofilament pad cleansing, and negative pressure therapy (wound vacuum assisted closure).
- **Autolytic Debridement-** This principle is to use the body's own warmth and moisture to promote the breakdown of necrotic tissue. Autolysis is accomplished by maintaining the wound moist with retentive occlusive dressings, (hydrocolloids), foams, or non-occlusive (alginates), hydro-fibers, and hydrogels. This is a slower method of debridement and can be difficult to accomplish in immune-compromised patients.
- **Enzymatic-**This is removal of necrotic tissue through the application of prescription enzymatic debriding agents that break down the necrotic tissue through a chemical process.

The choice of whether or not to debride is done by the physician, Debridement should not be done when the wound is clean, non-infected, free of necrotic tissue, foreign matter or fibrin, when there is no tender fluctuation, erythema. A heel pressure ulcer presenting as a dry eschar, can be treated without debridement if there is no drainage, pain, or erythema. The eschar provides a natural protection until the edges begin to open. Stable heel eschar should be maintained intact until vascular status of the lower extremity can be determined.

Types of Dressings

Wound care has become more advanced and a variety of wounds are treated in the home every day. A wound will require different management and treatment at various phases of healing. No dressing is suitable for all types of wounds; therefore, frequent assessment of the wound is necessary. An appropriate dressing should maintain a moist environment and manage exudate, while being cost effective. A moist environment is ideal for most wounds; however, a wet environment is not. The dressing should not stick to the wound, shed fibers, or cause trauma to the wound or surrounding skin on removal. Protecting the wound from the outside environment and providing a bacterial barrier is necessary in infection prevention. When appropriate, consider using dressings that have an antimicrobial incorporated into the dressing and one those that can stay in place for several days. The ideal dressing should adhere to the skin, aid in debridement, if there is necrotic debris or slough in the wound. Wounds need to be kept close to normal body temperature for adequate healing to occur. Advanced dressings offer more than just a covering for the wound. They are important in avoiding infections, improving comfort and safety, aid in reducing the length of stay in hospitals and at times delay daily dressing changes. This saves time and money. Although many of these products seem costly, when all factors are considered, they can prove to be a cost effective measure for agencies. We have created a stand- alone tool for your convenience at the end of the document. Many organisms are now resistant to antimicrobials like silver, so use caution when selecting the proper dressing.

Transparent film dressings: Waterproof and impermeable to bacteria and contaminants. Provides a moist, healing environment, promotes autolytic debridement, and protects from mechanical trauma on intact skin and bacterial invasion of wound tissue. Applying a skin protectant to surrounding skin is advised. Visualization is possible with transparent dressings. They are flexible making them easy to conform to difficult locations like the heels and elbows. Not advised for wet wound as they do not absorb.

Uses: IV sites, donor sites, lacerations, abrasions, and select partial thickness wounds.

Examples of products: Tegaderms, DermaView, Opsite, Polyskin, Hydrofilm, Repara, Bioclusive Plus and Select

Impregnated Dressings: Gauzes and non-woven sponges, ropes, and strips that are saturated with a solution, hydrogel, emulsion, or oil. Commonly saline, zinc salts, oil, petrolatum, xerofoam and scarlet red. Not for use with dry wounds. **DO NOT USE OVER EXPOSED BONE OR TENDON.** Change daily.



Uses: Full –thickness chronic wounds such as stage II-IV pressure ulcers, tunneling wounds, and non-infected wounds.

Examples of products: Curad oil emulsion gauze such as xerofoam non-occlusive, mesalt sodium chloride impregnated, and cuticell

Hydrogels: Available in sheets or gels, water or glycerin based. Maintains moisture and provides autolytic debridement. Sheets protect wound borders.

Uses: Full or partial thickness wounds, necrotic wounds, non-exudating wounds, radiation damaged tissue. Easy application and removal. Requires secondary dressing.

Examples of products: Normlgel, Dermagel, Clearsite

Collagens: Interact with exudate to form a gel, requires secondary dressing.

Uses: Partial and full thickness pressure ulcers, venous ulcers, donor sites, surgical wounds, vascular ulcers, diabetic ulcers, second degree burns, abrasions, and traumatic wounds.

Examples of products: *Promogran Prisma Matrix, Promogran, Endoform*

Calcium Alginates and Hydrofibers: Dressings made from seaweed. Can absorb 15-30 times their weight. Easy and effective to use. Secondary dressing is required. Absorbs drainage while keeping wounds moist. Maceration may occur if extends onto skin. Cut to fit wound bed.

Uses: Moderate to highly exudating wounds, pressure ulcers, venous stasis ulcers, tunneling, venous ulcers, packing wounds, or use AG (silver impregnated) for infected wounds.

Examples of products: *Aquacel AG, Sorbion, Medihoney, Repara, Restore, Maxsorb, Silvervel, Kaltostat, Tegaderm, Sorbion, Medihoney, Calcium Alginate*

Composites: Wound covers that combine distinct components into a single product to provide multiple functions such as a bacterial barrier, absorption and adhesion. May function as a primary or secondary dressing on a variety of wounds.

Uses: Primary dressings over sutures and skin tears or as a secondary dressing with impregnated gauze or wound fillers.

Examples of products: *Opsite post-op, Stratascorb, Repel, Telfa, DremaDress, Mepore, Suresite*

Contact layers: thin, non-adherent sheets designed to protect the wound bed from direct contact with other dressings, conform to shape of wound, allows exudate to flow through to secondary dressings.

Uses: Partial and full thickness wounds, under compression wraps, donor sites, infected wounds, use with topical medications.

Examples of products: *Mepitel one, Profore WCL, Adaptic touch, DACC WCL*

Elastic Bandages: Stretch and conform to body contours, made of cotton, polyester, rayon, or nylon. Can provide absorption as a second layer or dressing, hold wound cover in place, apply pressure or cushion wound.

Uses: Secure IV's and dressings, splints, or provide mild compression for strains, sprains, and edema.

Examples of products: *Coban, ACE wraps, Co-flex, abdominal binders*

Foam Dressings: They are capable of absorbing exudate and can be used as primary or secondary dressings. Many foam dressings have silicone adhesives that are waterproof and have a silicone border that can be reapplied if needing to assess wound. It is important to keep foam inside the wound bed if using Negative pressure. If outside, this can cause maceration.

Uses: Moderate to highly exudating wounds, infected wounds, protection of bony prominences, used under compression dressings. Not for use in dry; lite versions should be used in superficial wounds.

Examples of products: *Mepilex & Lite, Allevyn & Lite, Restore, Polyden, Xtrasorb, Optifoam, Hydrofera Blue*



Hydrocolloids: Used for light to moderately exuding wound. Wafers made from cellulose, gelatin, pectin and elastomers. The wafer is fixed to a semipermeable sheet and applied directly to the skin. They are waterproof and wear time can be up to 7 days. Mold well. Comfortable for patients unless rolling occurs which requires a dressing change.

Uses: Partial thickness ulcers, bony prominences, necrotic wounds, under compression raps, pressure ulcers and venous ulcers

Examples of products: *Duoderm, Comfeel, Medihoney, Xtrasorb, Exderm, Nuderm, Restore*

Wound Cavity Fillers: Maintains moist environment and manages exudates.

Uses: Full and Partial thickness wounds, infected wounds, draining and deep wounds that require packing.

Examples of products: *Aquacel Ag, Polyden WIC, Curad plain packing strip, Mesalt ribbon*

Disclaimer

Reference in this publication to any specific commercial product is for general informational purposes only and does not constitute an endorsement or recommendation of any kind by Great Plains Quality Innovative Network. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer.

Dry Wound	Minimal Exudate	Moderate Exudate	Heavy Exudate
Non adherent island dressing	Hydrogel	Calcium alginate	Hydrofiber
Hydrocolloid	Hydrocolloid	Hydrofiber	Foam
Films-Semi Permeable	Silicone absorbent	Foams	SupraAbsorbent dressings
		Hydrocolloid: paste/powder	Ostomy bags/Wound Managers ⁿ
			Negative Pressure Wound Therapy

Future of Wound Care

Early recognition along with prompt, appropriate and effective interventions in prevention of wound infections are more important than ever in reducing its economic and health consequences especially in the context of antibiotic resistance. Technology has changed and continues to evolve in the diagnosis and treatment of various conditions.

Telemedicine in wound care can be done utilizing a smart phone, video camera, webcam, and electronic medical records to exchange information. Home health agencies should be diligent in following their facility policy and procedures when using telemedicine and smart phones when assessing wounds and transferring data. The home health nurse can take pictures on her smart phone and transfer that data to the clinician for further guidance. The provider may be on a two-way cam, or can receive securely transmitted information. From there, a plan of care is developed, all done from the convenience of the patient's home. Wound care apps are available for use and many of these are free, while others require a paid subscription. Wound apps can be very helpful for guidance in the home health setting. Trying to find the correct resource may take some time, but well worth the time spent.

Apps are becoming more useful and pertinent in home care. The Wound Care app from Advanced Tissue displays the figure of a human body. You then select the part of body on which you have a wound. Once you click, filters are available to input the depth and moistness among other factors. The app then suggests a type and size of dressing with a description.

The Mobile Wound Analyzer, also from Advanced Tissue is designed for management of pressure and diabetic ulcers among other types of wounds. It is more in-depth and allows the user to learn about the wound type and how to care for it.






Smart bandages are also being developed and researched. These dressings are capable of gathering data and report wound healing to clinicians. This technology is still in its infancy but trials are slated to begin in 2018. These bandages work through microscopic sensors that have the ability to recognize complications, including infection and blood clots. When the dressings detect an issue, they send an alert to the clinician through a smartphone app.

In summary

There are many obstacles to performing wound care in the home and much research is needed. Clinicians may be dealing with unsanitary conditions or dealing with patients who cannot pay for supplies and living unhealthy lifestyles. Health care providers typically use a clean versus sterile technique and carry their own supplies including soap, alcohol-based sanitizer, gloves and dressings. Soiled dressings should be double bagged and disposed of properly. Wet-to-dry dressings are rarely used and moist wound healing is recommended in most situations. The use of wet-to-dry dressings, except in rare cases where debridement may be necessary are not typically recommended. Advanced therapies now include the use of calcium alginates, foam dressings and gels, and negative pressure therapy. All of which reduce the frequency of visits and dressing changes. Physicians rely on the home health clinician to accurately report and assess possible infections as soon as observed. The use of telemedicine and new apps are being used to report to physicians and allows the physician the ability to directly observe the wound. Please follow your agency policy on wound procedures and documentation.

There are many resources available to assist clinicians in wound assessments and for patient use. We have listed just a few of these resources for clinicians to use in your practice.

Tools/Resources

Website:	Examples/Descriptions:
https://www.cdc.gov/mrsa/pdf/SHEA-mrsa_tagged.pdf	Provides evidence-based clinical information/resources for MRSA. 
https://www.health.state.mn.us/diseases/staph/mrsa/book.html	Patient handout-MRSA Changing Bandages Easy to read with pictures 
http://www.health.state.mn.us/divs/idepc/diseases/mrsa/book.html	MRSA booklet for patients. Available in many languages. 
https://s3.amazonaws.com/aawc-new/memberclicks/AAWC-Infection-brochure_03.06.pdf	How to Prevent Infections-Patient Handout 
https://s3.amazonaws.com/aawc-new/memberclicks/ABC-brochure_03.30-for-Web1.pdf	ABC's of Wound Care-Patient Handout 
https://aawconline.org/resources/	Association for Advancement of Wound Care provides

	education for healthcare providers and patients.
SBAR Communication Tool	SBAR Communication Tool-Staff
Wound Culture Competency	Wound Culture Competency-Staff
Wound Dressings Staff Handout	Wound Dressings-Staff
http://www.thewoundinstitute.com/twifile/MSPE-47-0616-UE%20Transitions%20of%20care%20resource%20guide%202-8.pdf	Transitions of Care –Smith and Nephew- Staff Discharge Planning and Wound Care Zone Tool
http://www.wocn.org/	Professional nursing society promoting education and clinical guidance for wound, ostomy and incontinence.
http://www.presentwoc.com/	Online medical education for Nurses and Therapists who treat wound. No charge. Multimedia online lectures that simulate the lecture hall experience, discussion forums, chat rooms, and email e-zine publications.
http://www.thewoundinstitute.com/resource_center/TheSENSEProgramMaterials.pdf?dl=1	Nurse aide education on using your senses in looking for signs of pressure ulcer.
http://www.npuap.org/	The National Pressure Ulcer Advisory Panel (NPUAP) serves as the authoritative voice for improved patient outcomes in pressure injury prevention and treatment through public policy, education and research.

References

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