Wound Debridement

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Learning Objectives

1. Develop an understanding of the significance of necrotic tissue

2. Review therapeutic interventions for necrotic tissue including:
    1. Mechanical debridement
    2. Enzymatic debridement
    3. Sharp debridement
    4. Autolytic debridement
    5. Biologic Debridement

3. Review the outcome measurements of debridement and referral criteria

Photographs and Illustrations

Images/illustrations obtained via Google Images, unless otherwise stated

SIGNIFICANCE OF NECROTIC TISSUE

Necrotic Tissue[1-4]

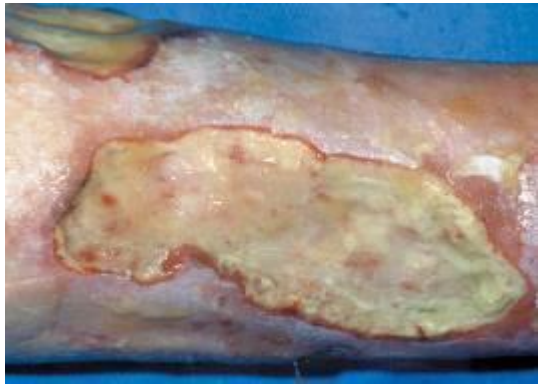
- Necrotic tissue impairs wound healing as it is a physical barrier to:
  - Granulation tissue formation
  - Wound contraction
  - Re-epithelialization

- Necrotic tissue may also harbor bacteria, which could lead to wound infection, thus impairing wound healing

- The more necrotic tissue there is in a wound, the[1, 5]:
  - More severe the damage is
  - Longer it will take the close the wound

Necrotic Tissue[1]

- As tissues die they change in:
  - Color
  - Consistency
  - Adherence



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Necrotic Tissue: Color[1]

- As the depth/severity of the wound increases, the color of the necrotic tissue changes:
  - White/gray
  - Tan/yellow
  - Brown/black

White/Gray

Yellow

Black

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Necrotic Tissue: Consistency[1]

- As the tissues dry out, the consistency of the necrotic tissue changes:
  - Mucinious
  - Soft, stringy
  - Soft, soggy
  - Hard

Mucinious

Soft, stringy

Soft, soggy

Hard

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Consistency Continued

- Consistency of necrotic tissue is related to its moisture content and refers to its cohesiveness[1]

- Consistency also varies as tissue damage worsens/deepens[1,5-6]:
  - Slough: yellow/tan, thin, mucinious or stringy → partial thickness damage
  - Eschar: brown/black, soft of hard → full-thickness damage

Necrotic Tissue: Adherence[1]

- Adhesiveness of the debris to the wound bed and the ease with which the two are separated

- Necrotic tissue tends to be more adherent:
  - The deeper or more severe the damage is
  - The less moist the wound is

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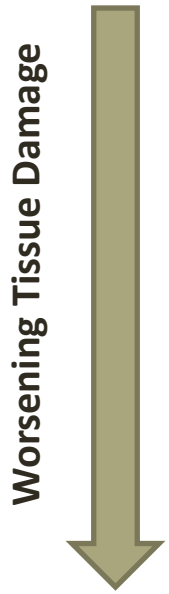
Summary of Necrotic Tissue Characteristics



Color	Consistency	Adherence
White/gray	Mucinous	Clumps
Yellow fibrinous	Soft, stringy	Loosely attached
Yellow/tan (slough)	Soft, soggy	Attached at the base only
Black/brown (eschar)	Hard	Firmly adherent to base and edges

Types of Necrotic Tissue

- Predominant types of necrotic tissue include:
  - Slough
  - Fibrin
  - Eschar
  - Gangrene
  - Hyperkeratosis

Description of Necrosis Types

Slough	Fibrin	Eschar	Gangrene	Hyperkeratosis
• Mucinious • Soft, stringy • Soft, soggy	• Mucinious • Soft, stringy • Soft, soggy	• Soft, soggy • Hard	Hard	• Soft, soggy • Hard
White/yellow	White/yellow	Black/brown	Black/brown	White/gray
• Clumps • Loosely attached • Attached at base	• Clumps • Loosely attached • Attached at base	• Attached at base • Firmly attached	Firmly attached	Firmly attached
25-100% covered	25-100% covered	50-100% covered	50-100% covered	Surrounds wound edges
				

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Type of Necrosis By Wound Etiology

- Arterial/ischemic wounds:
  - Dry gangrene
  - Thick, dry, desiccated black/gray appearance
  - Firmly adherent
  - May be surrounded by an erythematous halo

- Neurotropic wounds:
  - Do not present with necrotic tissue in wound typically
  - Have hyperkeratosis surrounding wound

- Venous leg ulcers:
  - Eschar or slough
  - Usually yellow fibrous material

- Pressure Sores:
  - Relates to the depth of the injury

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DEBRIDEMENT: INTERVENTION FOR NECROTIC TISSUE

What is Debridement?

- The process of removing dead, contaminated, or adherent tissue and/or foreign material from a wound

- Five primary methods:
  - Mechanical Debridement
  - Enzymatic Debridement
  - Sharp Debridement
  - Autolytic Debridement
  - Biologic Debridement

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Mechanical Debridement[1]

- "The use of some outside force to remove dead tissue", i.e.:
  - Wet to dry gauze dressings
  - Wound irrigation
  - Whirlpool

- Wet to dry gauze continues to be the most commonly used debridement technique despite it's multiple disadvantages

Click on the picture of the Versajet for a video of jet lavage

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Mechanical Debridement Continued[1]

- Advantages:
  - Familiar to health care providers
  - Wound irrigation can reduce bacterial burden
  - Whirlpool may soften necrotic debris

- Disadvantages (wet-to-dry gauze):
  - Non-selective
  - Rarely applied correctly
  - Painful
  - More costly (labor and supplies)
  - May cause maceration
  - Releases airborne organisms and causes cross-contamination[9]

Enzymatic Debridement[1]

- "Applying a concentrated, commercially prepared (proteolytic) enzyme to the surface of the necrotic tissue, in the expectation that it will aggressively degrade necrosis by digesting devitalized tissue"
- Requires a physician order and must be used according to the manufacturers instructions
- Cannot be used on dry wounds … any eschar present must be cross hatched

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Enzymatic Debridement Continued[1]

- Advantages:
  - Selective
  - Effective in combination with other debridement techniques

- Disadvantages:
  - Enzymatic use is prolonged more than necessary, increasing costs
  - Can be slow – 3-30 days to achieve a completely clean wound bed (it is faster than autolysis however)
  - Requires a specific pH range (may cause local irritation due to pH changes)
  - May be inactivated by contact with heavy metals (zinc or silver)
  - Risk of maceration and infection
  - Requires frequent dressing changes (1-3 times per day)

Sharp Debridement[1]

- Performed either one time (surgical) or sequentially (conservative)
- Surgical sharp debridement:
  - Use of scalpel, scissors, or other sharp instruments
  - Removal of viable and non-viable tissue
  - Most rapid and effective
  - May convert chronic wound into an acute wound
  - Requires analgesics and availability of cautery equipment
  - Indicated for removal of thick, adherent and/or large amounts of non-viable tissue and when advancing cellulitis or signs of sepsis are present
  - Requires a certain level of expertise, education and skill
  - Risk of bleeding

Click here for a video of surgical debridement

Sharp Debridement Continued[1]

- Conservative sharp wound debridement (CSWD):
  - Use of scalpel, scissors, or other sharp instruments
  - Rapid and effective
  - Used in combination with enzymatic, mechanical, and/or autolytic debridement to speed the removal of non-viable necrotic debris/tissue
  - Can be performed in any health-care setting by non-physician clinicians (if they have the knowledge, skill, judgment and authority to do so)
  - Does not require transfer to an acute facility

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Autolytic Debridement[1]

- "The process of using the body's own mechanisms (enzymes) to remove nonviable tissue"
- The collection of fluid at the wound site, "promotes rehydration of the dead tissue and allows enzymes within the wound to digest necrotic tissue"
- May be accomplished by the use of any moisture-retentive dressings, i.e. hydrocolloids, hydrogels, hypertonic dressings/gels, and/or transparent films

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Autolytic Debridement Continued[1]

- Advantages:
  - Painless in the majority of people with wounds
  - Effective, versatile, and easy to perform
  - Selective
  - Low cost
  - Can be used in conjunction with other debridement techniques

- Disadvantages:
  - Slow
  - Caregiver education required for compliance

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Biologic Debridement[1]

- A.k.a. larval/maggot debridement therapy (use of medical grade green bottle fly larvae/maggots)
- Controlled "application of disinfected maggots to the wound to remove the nonviable tissue"[10]
  - Regulated by the FDA as a prescription only medical device
- Maggots are left in the wound for 2-3 days . They secrete "proteolytic enzymes that break down necrotic tissue and then ingest the liquefied tissue"[10]
- The secretions also have antimicrobial properties, promote growth of human fibroblasts and improve granulation tissue formation[11-12]

Biologic Debridement Continued[1]

- Widely used in parts of Europe and South America

- Advantages:
  - Reduces bacterial burden
  - Growth-stimulating effects
  - Selective

- Disadvantages:
  - Limited number of studies
  - 'Yuck factor'
  - Availability of sterile medical grade maggots
  - Lack of policies and procedures

Click on the maggots to see a short video on this therapy

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Review of Types of Debridement

Debridement Type	Definition	Examples
Mechanical	Use of an outside force to remove non-viable tissue	Wet-to-dry gauze, wound irrigation, whirlpool, pulsed lavage
Enzymatic	Application of a concentrated, commercially prepared enzyme to digest non-viable tissue	Collagenase
Sharp	Use of sharp instruments to remove non-viable tissue	Scalpel, scissor, curette use
Autolytic	Use of the body's own enzymes in wound fluid along with moisture retentive dressings to degrade non-viable tissue	Use of hydrocolloids, films, hydrogels, and/or hypertonic dressings
Biologic*	Application of medical grade maggots to remove non-viable tissue	Larval debridement therapy

Why Debride?

- To remove the physical barrier to epidermal resurfacing, contraction, or granulation
- To reduce bacteria burden by removing necrotic tissue
- To convert a chronic wound to an acute wound by stimulating the healing cascade
- To facilitate earlier coverage of the wound with active dressings or biologicals

Who Can Debride?

- Under the 1991 Regulated Health Professions Act (Ontario), debridement is within the controlled acts authorized for nursing

- An RN or an RN(EC) who meets certain conditions, i.e. has the knowledge, skill, judgment and authority, can initiate and/or provide an order for an RN or RPN to perform care of wound below the dermis or mucous membrane, which includes cleansing, soaking, irrigating, probing, **debriding**, packing, dressing[8]

Who Can Debride: CSWD

- The Long Term Care Homes Act and the Public Hospitals Act do not allow a nurse to **initiate** CSWD in the absence of a physician order

- There is no Act that precludes nurses in the community from performing CSWD in the absence of a physician order, but it is STRONGLY suggested that the nurse communicates her intent to perform CSWD to the primary care physician **BEFORE** doing so

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Who Can Debride Continued

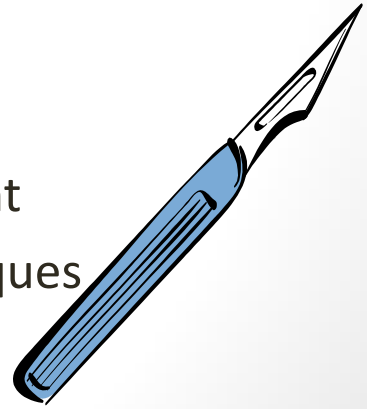
- Specialized practice skills such as CSWD are not generally included in the RN's basic preparation; therefore additional instruction and supervision are necessary to ensure the individual is competent to perform the identified skills or acts

Who Can Debride Wounds

- The nurse who performs CSWD is expected to have:
  - A good knowledge of relevant anatomy
  - The ability to identify viable tissue
  - Access to adequate equipment, lighting and assistance
  - The capacity to explain the procedure and obtain informed consent
  - The ability to manage pain and discomfort prior to, during, and following the procedure
  - The skill to deal with complications such as bleeding
  - The ability to recognize their skill limitations and those of the technique
  - Knowledge of infection control practices
  - The ability to utilize secondary debridement techniques if needed

How Do We Debride?

- After a thorough holistic assessment of the person and their wound, and determination that debridement is indicated, you must first choose the most appropriate type(s) of debridement. This is dependent on the:
  - Knowledge, skill and authority of the health care practitioner
  - Availability of required resources
  - Overall condition of the person with the wound, and their 'healability'
  - Characteristics of the wound and wound tissue
  - Presence of wound related pain
  - Required speed and tissue selectivity of debridement
  - Costs associated with available debridement techniques
  - Presence of wound infection
  - Physical environment



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Choosing How to Debride[7]

TABLE 6

Key Factors in Deciding Method of Debridement

	Surgical	Enzymatic	Autolytic	Biologic	Mechanical
Speed	1	3	5	2	4
Tissue selectivity	3	1	4	2	5
Painful wound	5	2	1	3	4
Exudate	1	4	3	5	2
Infection	1	4	5	2	3
Cost	5	2	1	3	4

Where 1 is most desirable and 5 is least desirable

Adapted from Sibbald RG, Williamson D, Orsted HL, et al.[1]

Canadian Association of Wound Care

Red/Yellow/Black System

- The type of non-viable tissue present can help identify the phase of wound healing and as such, the most appropriate debridement options[13]:

Red	• Wound bed is clean and wound tissue is red/pink • Goal: maintain moist wound healing environment
Yellow*	• Wound bed has slough/fibrin present and tissue may be a combo of red/pink + ivory/canary yellow/green (depending if infection is present) • Not all yellow is bad – granulation grows through yellow fibrin. Healthy tendon may appear white/yellow • Goal: maintain moist wound healing environment whilst managing excessive exudates and removing slough via sharp, mechanical, enzymatic, and/or autolytic debridement
Black*	• Wound bed has non-viable tissue present. Tissue combo may be dark brown/ grey/ black +/- red/pink +/- ivory/canary yellow/green. • Goal (healable wound and eschar is not stable and on heel): remove non-viable tissue via sharp, mechanical, enzymatic and/or autolytic debridement

*If more than one color of tissue is present in the wound bed, target treatment based on the tissue type that is present in the greatest amount

OUTCOME MEASUREMENTS OF DEBRIDEMENT AND REFERRAL CRITERIA

Outcome Measures[1]

- Three appropriate characteristics for evaluating the effectiveness of debridement are the:
  - Type of necrotic tissue
  - Amount of necrotic tissue
  - Adherence of the necrotic tissue to the wound

Amount of Necrotic Tissue[1]

- Amount should diminish progressively if therapy appropriately
- Can be measured:
  - Using linear measurements (length x width)
  - By determining percentage of wound bed covered
  - By photography
- Estimate percentages in the following way:
  - <25% wound bed covered
  - 25-50% wound covered
  - >50 and <75% wound covered
  - 75-100% wound covered

Type of Necrotic Tissue[1]

- Type of necrotic tissue should change as the wound improves, when conservative methods of debridement are used
- As necrotic tissue rehydrates its appearance will change from dry/black, to soggy/soft/yellow, to mucinous easily dislodged tissue
- Can rate the type of necrotic tissue as:
  - White/gray nonviable tissue and/or non-adherent yellow slough
  - Loosely adherent yellow slough
  - Adherent soft black eschar
  - Firmly adherent, hard black eschar

Adherence of Necrotic Tissue[1]

- Adherence of necrotic tissue should decrease as debridement proceeds

- Necrotic tissue may initially be firmly attached, then starts lifting (usually at edges first), and eventually disengages from the base of the wound

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Referral Criteria[1]

- Dry gangrene or dry ischemic wounds
- Elevated temperature
- No wound improvement
- Evidence of cellulitis or gross infection
- Exposed bone or tendon
- Evidence of abscess

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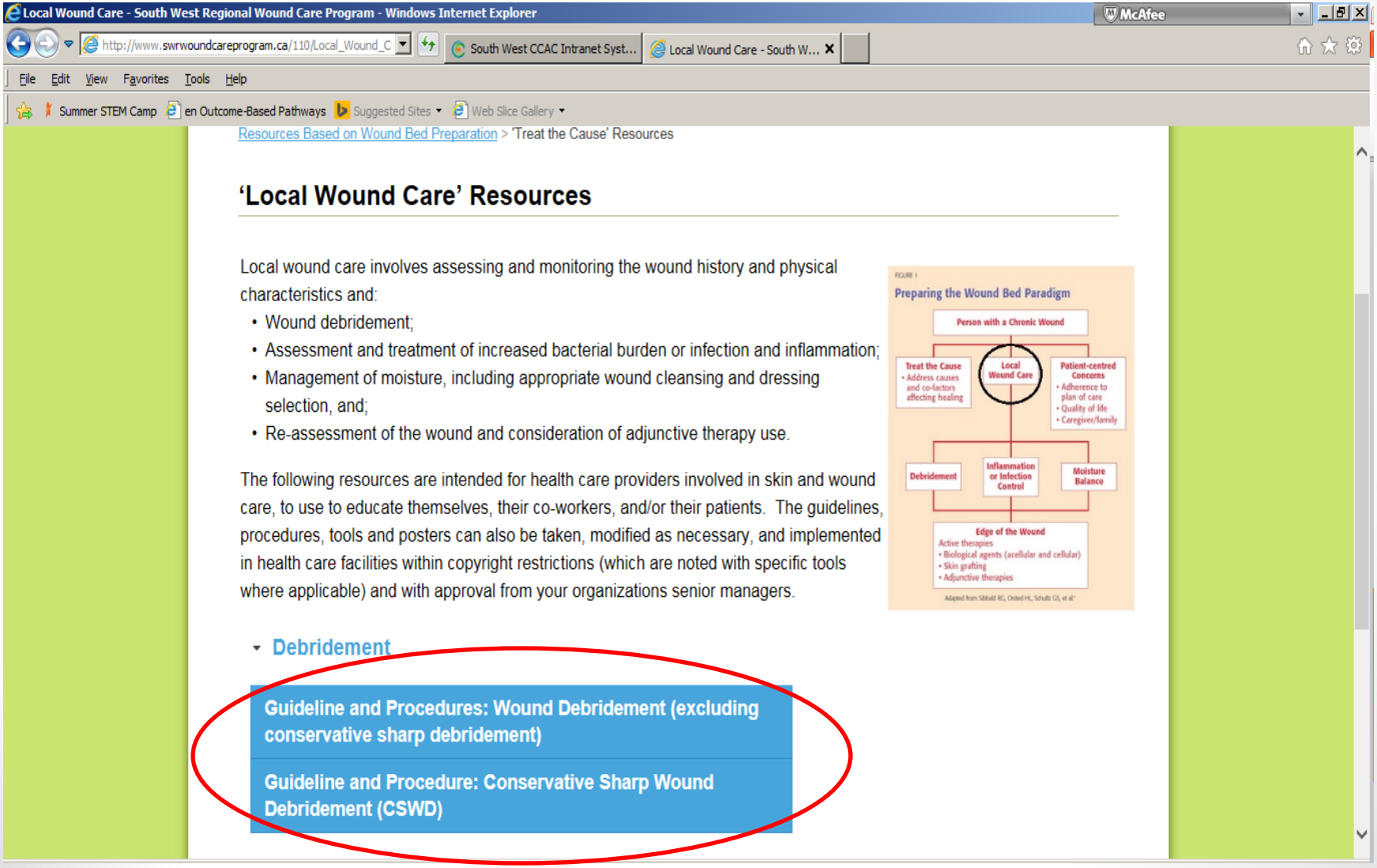
SWRWCP Debridement Resources



Review

1. The significance of necrotic tissue

2. Therapeutic interventions for necrotic tissue including:
    1. Mechanical debridement
    2. Enzymatic debridement
    3. Sharp debridement
    4. Autolytic debridement
    5. Biologic Debridement

3. Outcome measurements of debridement and referral criteria

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For more information visit: swrwoundcareprogram.ca

References

1. Bates-Jensen BM, Apeles NCR. Management of necrotic tissue. In: Sussman C, Bates-Jensen B., eds. Wound Care: A collaborative practice manual for health professionals. Third Ed. Baltimore: Lippincott Williams & Wilkins, 1997:197-214.
2. Alterescu V, Alterescu K. Etiology and treatment of pressure ulcers. Decubitus. 1988;1:28-35.
3. Winter G. Epidermal regeneration studied in the domestic pig. In: Hung TK, Dunphy JE, eds. Fundamentals of Wound Management. New York: Appleton-Century-Crofts; 1979:71-111.
4. Sapico FL, Ginunas VJ, Thornhill-Hoynes M, et al. Quantitative microbiology of pressure sores in different stages of healing. Diagn Biol Infect Dis. 1986;5:31-38.
5. Shea D. Pressure sores: Classification and management. Clin Orthop. 1975:112:89-100.
6. Witkowski JA, Parish LC. Histopathology of the decubitus ulcer. J Am Acad Dermatol. 1982;6:1014-1021.
7. Sibbald RG, Williamson D, Orsted HL, et al. Preparing the wound bed: Debridement, bacterial balance and moisture balance. Ostomy/Wound Management. 2000;46(11):14-35.
8. College of Nurses of Ontario. Decisions about procedures and authority. Pub. No. 41071. Toronto. Last retrieved October 21, 2014 from: http://www.cno.org/Global/docs/prac/41071_Decisions.pdf
9. Lawrence JC, Lilly HA, Kidson A. Wound dressings and airborne dispersal of bacteria. Lancet. 1992;339(8796):807.
10. Zacur H, Kirsner RS. Debridement: Rationale and therapeutic options. Wounds: Compendium of Clinical Research and Practice. 2002;14(7Suppl E):2E-7E.
11. Prete PE. Growth effects of Phaenicia sericata larval extracts on fibroblasts: Mechanism for wound healing by maggot therapy. Life Sci. 1997;60(8):505-510.
12. Mumcuoglu KY. Clinical applications for maggots in wound care. Am J Clin Dermatol. 2001;2(4):219-227.
13. Krasner D. Wound care: how to use the red-yellow-black system. Am J Nurs. 1995:95(5):44–47.