

Advanced Wound Care Certificate


2021

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If you have any questions, please contact us here in HLLN at 416 736 2100 X22170 or hlln@yorku.ca. Thank you, Tania Xerri



Tania Xerri, Director, Health Leadership and Learning Network

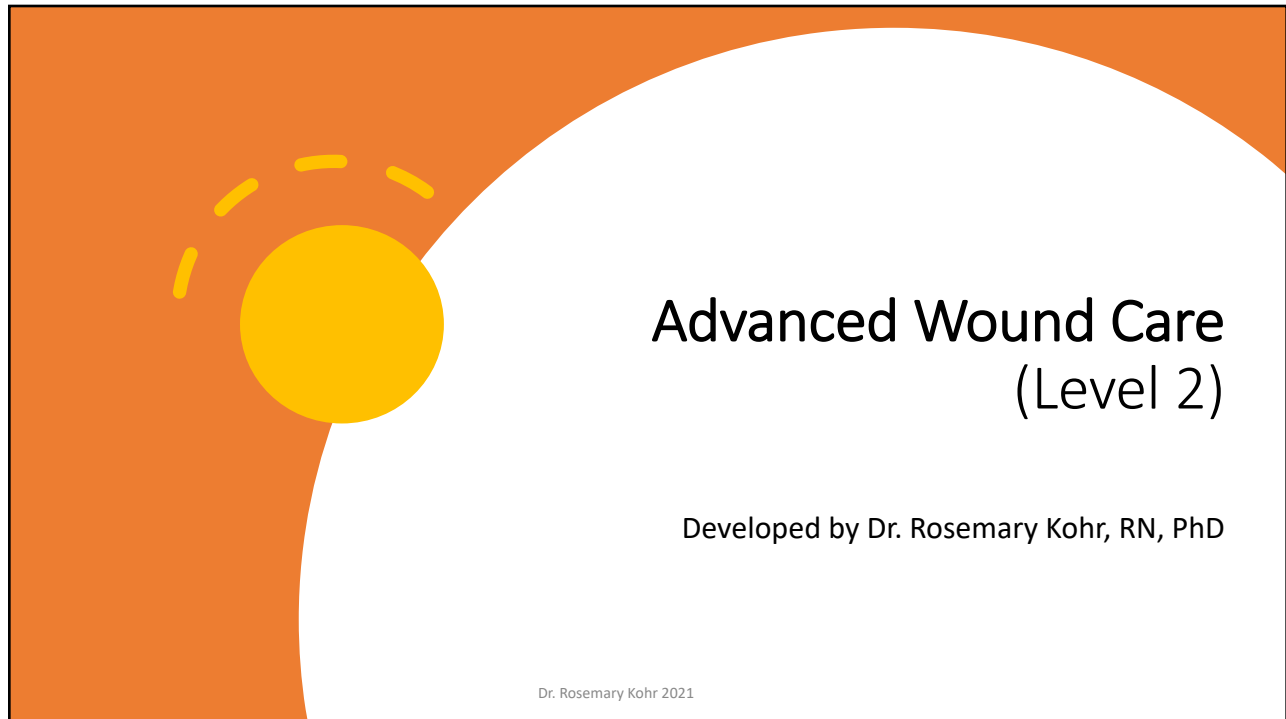
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The slide has a white header with a yellow and black geometric design on the left. The title "Zoom orientation" is in black text. The main content area has a light gray background and contains a bulleted list of instructions for using Zoom. At the bottom center, in small text, it says "Dr. Rosemary Kohr 2021".

Zoom orientation

- I hope you have read the information from York on how to use Zoom.
- At the start, your audio will be automatically muted– but you can unmute (see the microphone icon)
 - I will do a Roll-call, so you can unmute or post (chat) for that.
- Video: remember, we can SEE you and what you are doing! My preference is that you to keep your video ON– you will see all the participants arranged in a gallery/tile across the top of the screen.
- The Chat function: you can post to the whole group or to anyone privately (just make sure if you do, that you remember to check the private function before you send that comment!)

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Introductions!!

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Introductions!!

Agenda:

Lesson 1: Health disparities (TULC)

Lesson 2: Diabetes

Lesson 3: Nutrition

Lesson 4: Managing wounds

Lesson 5: Infection

Lesson 6: How to treat the wound

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Agenda (continued)

Lesson 7: Tips in dressing selection

Lesson 8: Evaluate, educate & document

Lesson 9: Complex patient, complex wounds

Lesson 10: What's New: diagnostics,
treatments, products

Wrap-up

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Why Level 2 Wound Care

- Issues around wound healing include:
 - Lack of education/knowledge on the part of clinician
 - Information gaps for our patients and their families
 - Limits to appropriate treatment
 - Life-style choices
- Clinicians should have a good understanding of:
 - Their patient population
 - The importance of nutrition
 - Biofilm
 - New/emerging technologies and treatments

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TULC that!! (Treat the Underlying Cause)

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- *A health care system – even the best health care system in the world – will be only **one** of the ingredients that determine whether your life will be long or short, healthy or sick, full of fulfillment, or empty with despair.*
- – the Honourable Roy Romanow, 2004



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Social Determinants of Health: what does this mean?

Primary factors that shape the health of Canadians:

- not medical treatments or lifestyle choices but rather the living conditions they experience.
- these conditions have come to be known as ***the social determinants of health***.
- importance to health of living conditions was established in the mid-1800s and has been enshrined in Canadian government policy documents since the mid-1970s.

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Canadians are largely unaware of the impact on our health:

- shaped by how income and wealth is distributed,
- whether or not we are employed,
- the working conditions we experience.
- also determined by the health and social services we receive,
- our ability to obtain quality education, food and housing, and other important factors



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Health disparities in Canada

- Socioeconomic status, Aboriginal identity, gender (female) and geography (rural and northern communities)
- Most affected: lowest 20% on the socioeconomic scale and Aboriginal peoples, including First Nations and Inuit populations.
- Needs of the chronically ill and an aging population, especially at a time of fiscal constraint.

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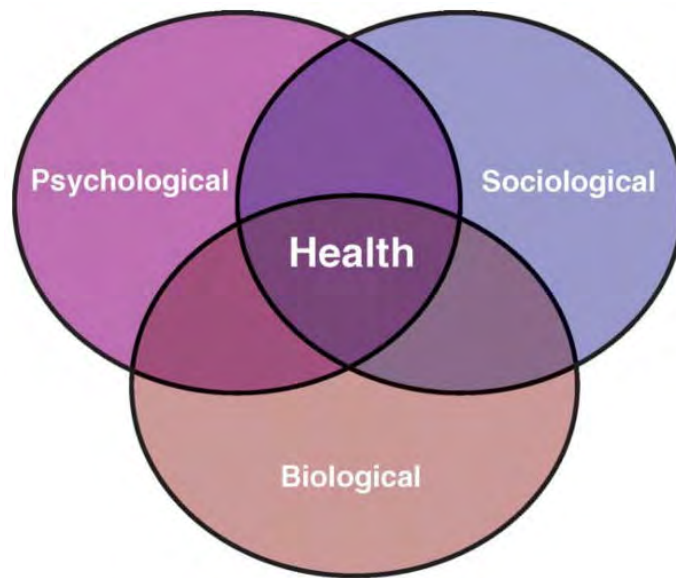
What is the environment like?

- Decreased quality of care, compared with the acute illness patient
 - both patient experience and healthcare outcomes.
- Gaps in communication:
 - Healthcare providers don't share info across the continuum of care (including medications)
 - Coordination of treatment plans & appointments
 - Over-use of Emergency Departments to manage problems (multiple problems and care-providers)
- Increasing numbers:
 - increase in the next two decades as the baby boomer population continues to age and develop chronic diseases.
- Major users of health systems:
 - 5% accounts for over 65% of Ontario's combined hospital and nursing home costs, as well as 84% of combined acute care and home-care resources.

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Bio-psycho-
social model
of healthcare
Dr. George
Engel (1977)



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Bio-psycho-social model

- takes into account the patient, the social context (environment) and the complementary system of healthcare and providers to deal with illness.
- disruptions in the Biological and psychological well-being are what can drive patients to seek out healthcare system help.
- sociological and psychological factors can contribute to the ability of the patient to access and/or adhere to treatment.
- taken individually and/or collectively, these factors (societal, psychological, and biological), influence disease morbidity and mortality
- the biopsychosocial model is an appropriate framework through which **health disparities** can be addressed.

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Who among your patient population needs help to overcome healthcare system barriers?

- racial and ethnic minorities,
- low-income individuals and families,
- women,
- children,
- young adults,
- the elderly,
- residents of rural areas,
- individuals with disabilities or special health care needs (such as childhood cancer survivors transitioning to adulthood)

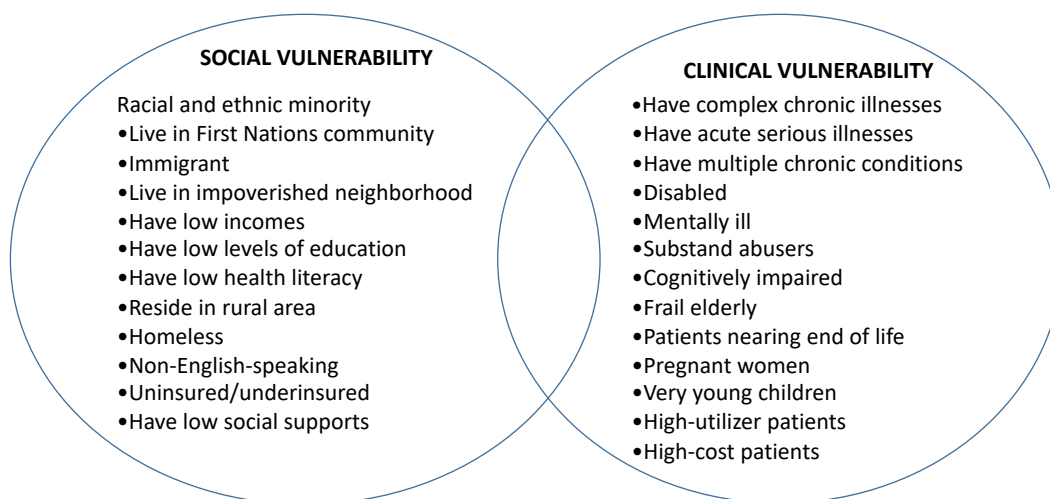
The biopsychosocial approach can provide a method of assessing your patient's needs.

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Treating the Underlying Cause.

Vulnerable patients: Socially and Clinically vulnerable.



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Think Prevention and early up- take of information:

- bridge the gaps related to **compliance** with evidence-based guidelines
- facilitate access to the system for underserved populations by connecting them to resources most appropriate for each patient's individual needs.
- immigrants and those with lower incomes, with less education/language skills, and without a primary health care provider.
- Know your screening guidelines (family history and personal risk factors)
- improve compliance by increasing patients' knowledge and understanding of risk.

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What about health care access?

- **Access to care** refers to entry into or use of the health care system, or the factors influencing entry or use.
- **System factors:** proximity to health care settings/primary care provider;
- **Patient perceptions** of access to health care services (ie, difficulties or delays in obtaining care or receiving appointments for care as soon as desired);
- **Actual use** of health care services (e.g., MD visits, ambulatory care/walk-in clinics or inpatient care).



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Providing access and coordination:

- Know your system and environment barriers that may impact your patients.
- **Discussion: What are barriers to support optimal wound healing in your setting/community?**

Breakout Rooms

- **Coordination of access to services** by focusing on the vulnerable individual's needs: facilitating communication and cooperation between providers; providing clear information and support to ensure access to care and compliance with prescribed therapies.

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Skin breakdown: Skin tears are the “slippery slope”

- More attention is being paid to skin tears:
- Fragile skin
- Risk factors
- Outcome:
 - Further breakdown
 - Infection
 - hospitalization



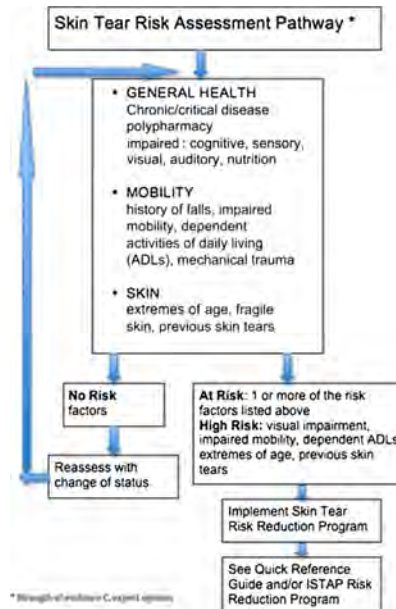
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The International Skin Tear Advisory Panel (ISTAP) was formed to raise international awareness of the prediction, assessment, prevention, and management of skin tears.

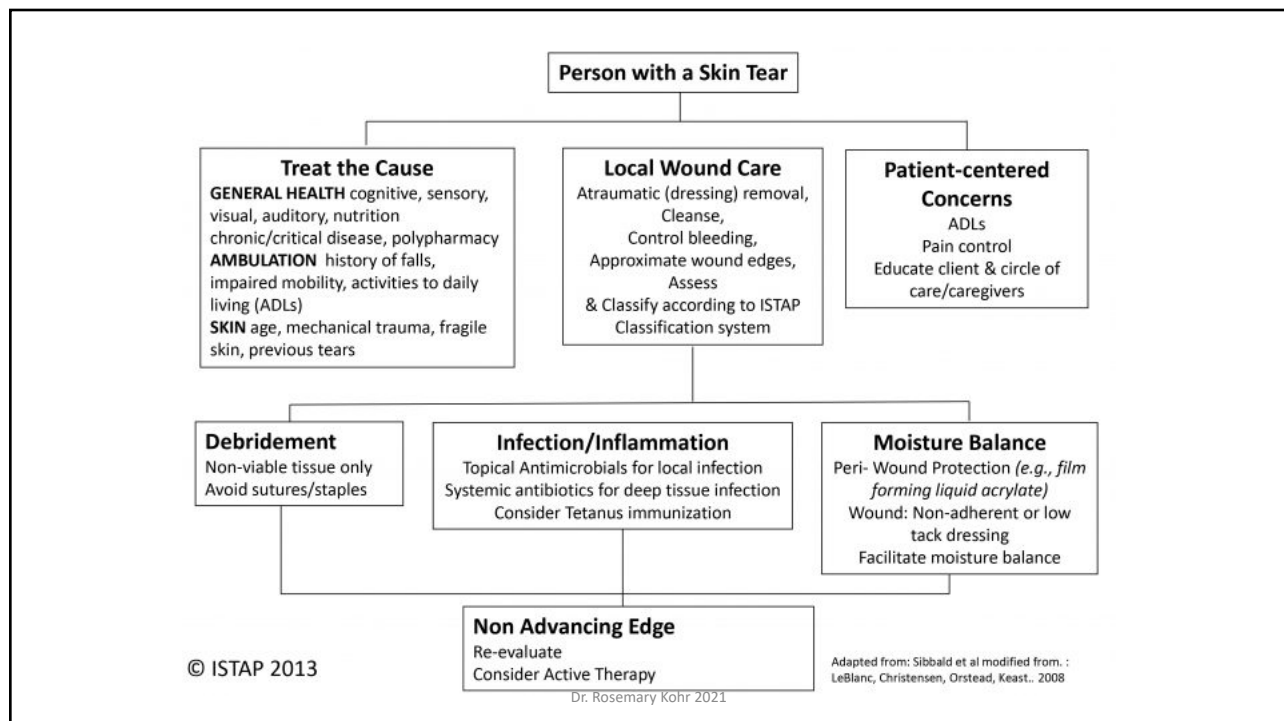
The ISTAP Panel includes a broad range of healthcare professionals representing: North America, South America, Europe, Asia, the Middle East, Australia/New Zealand, and Africa.

www.skintears.org



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All of these factors are part of the underlying cause of skin breakdown...

- Need to ensure the bio/psycho/social factors are part of the equation as we start with our patient visit/wound assessment.

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What do we want to know about these legs?
Always be thinking about discharge disposition...

1. Person's history:
 - a. Physical
 - b. Environmental
 - c. Cultural
 - d. Psycho/social
2. Resources
3. The wound:
 - a. Location
 - b. Duration
 - c. Healable?
4. Treatment



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What do we want to know about this wound?
Always be thinking about discharge disposition...

Think: how could these factors affect the outcome?

If I go directly to #4 (Treatment), how *successful will it be?

*how do I define “success”?

1. Person's history
2. Resources
3. The wound
4. Treatment



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What do we need to address to have a successful outcome?

- HISTORY:
- RESOURCES:
- THE WOUND:
- THE TREATMENT OPTIONS:




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Once we
have taken
the time to
do this...

What disease processes might be an underlying cause?

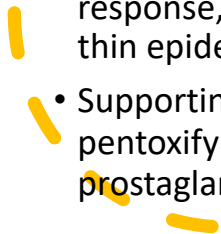
- Diabetes
 - Cardio-vascular diseases
 - Peripheral Vascular Disease
 - Medications
 - Stroke
 - Mobility, proprioception, nutrition
 - Cancer
 - Radiation/medications
 - Fungating tumour
 - Nutrition, mobility
 - surgery
- 

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The effect of drugs on wound healing

- Patients with wounds are often given medication as treatment for wounds and/or for the medical condition they may have.
 - These medications can **promote** wound healing or actually **hinder** healing.
 - For example, Steroids and NSAIDs, given long-term and at high dose, can negatively affect wound healing (e.g., decrease inflammatory response, fibroblast activity, epithelial regeneration and over time, thin epidermis & inhibit wound contraction).
 - Supporting wound healing: hemorheological agents (e.g., pentoxifylline), hormones (estrogen), phenytoin (e.g., Dilantin), prostaglandins, zinc, Vitamin A, Vitamin C.
- 

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So what about...

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- Phenytoin (Dilantin)? Studies have shown topical phenytoin will stimulate fibroblast proliferation, support collagen deposition, glucocorticoid antagonism, and antibacterial activity.
 - Can be applied as a cream, a lotion, or a medication-impregnated dressing
- Salbutamol (Ventolin): appears to reduce scar formation and appearance, while supporting normal wound healing.
- Pentoxifylline (Trental): anti-oxidant, vasodilator, increase in microcirculation & O2 delivery (used in PAD)– useful for venous leg ulcers (in conjunction with compression).
- Cannabis: research in early stages demonstrates topical application can decrease pain and enhance wound healing (Dr. V. Maida).

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And what about...?

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- Nitroglycerine patch: induces vasodilation; however, no studies have demonstrated actual increase in blood flow/wound healing potential for chronic wounds.
- Estrogen (HRT): promotes re-epithelialization & fibroblast activity (lays down the matrix for wound healing)– but needs more research.
- Testosterone: “Testicular paste” had some effect on wound healing, but further research into oxandrolone (oral testosterone medication) has not proven to improve wound healing (more studies?).
- Turmeric (curcumin) does appear to have anti-inflammatory & analgesic properties. Used in South Asia as medication.

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Careful patient history:

- History of: drug sensitivity, contact dermatitis, connective tissue disease, asthma/eczema, previous wound healing delays;
- Detailed accurate medication history: dose, intervals, start/stop date;
- Accurate documentation of use of all Over The Counter (OTC) meds;
- HERBAL “natural” medications (e.g., St. John’s Wort, Echinacea):
 - Route of ingestion: teas, liquid extracts, capsules, etc
 - Use of any topical natural or herbal products on wound bed or skin
 - Spacing of herbal ingestion away from other meds to avoid drug interactions/metabolism issues (e.g., St. John’s Wort, ginkgo biloba)

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Careful patient history (continued):

- Recent vaccinations or contrast dye media
- Any “red-flag” Rx meds: e.g., warfarin (e.g., Coumadin– blood thinner); digoxin (cardiac meds), cyclosporine (immunosuppressant), protease inhibitors (HIV/Hepatitis C)
- When healing is stalled, consider:
 - Presence of malnutrition (high in the elderly population)
 - Protein insufficiency
 - Fatigue, pain, mouth ulcers?
 - Chronic diseases affect kidney function(creatinine clearance), liver function (enzymes)
 - *Depending on site/appearance, could this be cancer?*

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Practical implications:

- Educate patients and families (and colleagues) re: **polypharmacy**– excess and unnecessary medications, using more than one pharmacy to fill Rx or purchase OTC medications, purchasing and using herbal remedies without consultation with qualified health-care professional.
- **It is essential to remain NON-JUDGEMENTAL!!**
- Collaborate with pharmacist, MD, RD, etc to continually assess and “de-prescribe” medications



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What factors can affect wound healing:

Local factors:

- Ischemia
- Infection
- Surgical technique
- Edema
- High tissue pressure

Systemic factors:

- Diabetes
- Cancer
- Immunodeficiency
- Malnutrition

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Diabetes

Why the concern with “Diabetic Feet”?

LESSON 2

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Diabetic Feet



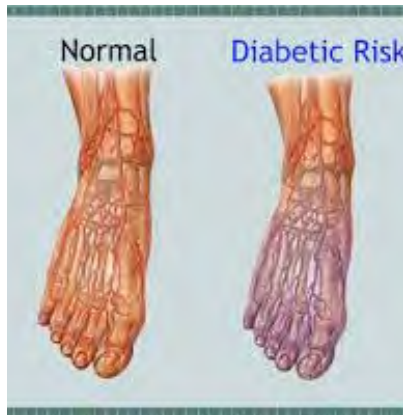
- **Why the concern?**

According to the Canadian government, **there are more than 60,000 new Type 2 cases yearly.**

- Approx. 15-30% of those with diabetes will develop a foot ulcer;
- Leading cause of diabetic lower extremity amputation (85%);
- One amputated limb puts stress on 2nd limb;
- High risk for 2nd amputation;
- Mortality rates high within 5 years (70%)

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What are the risk factors for DFUs?

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Recap of risk factors contributing to diabetic foot ulcers:



- Pressure (callus development)
- Neuropathy
 - Sensory (loss of protective sensation)
 - Motor (muscle atrophy → clawed toes)
 - Autonomic (dry, cracked skin; loss of ability to sweat)
- Previous ulcer/amputation
 - 70% risk of developing new ulcer after 5 years
- Infection (impaired host response)



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Recap of risk factors contributing to diabetic foot ulcers (continued):

- Elevated blood glucose(HbA1C measurement)
- Limited joint mobility → high foot pressure
- Structural deformities (e.g., hammertoes, Charcot foot);
- Hypoxia (impaired tissue perfusion)
 - Ischemia, peripheral edema.



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Footwear IS
so
important!



Offloading Devices



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Treatment “gold standard”

- **Health Quality Ontario Reviewed Fiberglass Total Contact Casting, Removable Cast Walkers, and Irremovable Cast Walkers to Treat Diabetic Neuropathic Foot Ulcers**
- In Ontario in 2015, there were approximately 1.5 million people with diabetes. Estimates indicate that 2% to 3% of people with diabetes experience a foot ulcer each year. Devices that assist in reducing pressure improved ulcer healing. However, cost, comfort, and convenience are concerns for patients.
- The 5-year budget impact of fully funding total contact casting, removable cast walkers, and irremovable cast walkers would be \$17 to \$20 million per year. However, the health system would be expected to save money because fewer people would need amputations.

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Next steps:

- The Ontario Health Technology Advisory Committee recommended that fibreglass total contact casting, removable cast walkers, and irremovable cast walkers be publicly funded in patients presenting with a **neuropathic diabetic plantar foot ulcer**.
- The recommendation has been accepted!!
- **These casts are now FUNDED in Ontario for patients with DFU.**



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What's going
on here?



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Charcot Foot:



- Peripheral neuropathy → loss of sensation/pain/temperature
- Loss of protective function of sensation → repetitive foot trauma
- Preserved/exaggerated peripheral neurovascular reflexes & arterio-venous shunting → increased bone reabsorption and osteopenia (decreased bone density)

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Surgical treatment of Charcot Foot:

- Consider if non-responsive to offloading or instability or recurrent ulceration
- Correction of deformities that can't be accommodated with off-loading devices/footwear
- Resection of infected bone, etc, lengthening of the Achilles tendon
- Use of an external frame to fixate
- Still will require appropriate casting/footwear post surgery.



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What's going on here?



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Atherosclerosis (diabetic)

- Develops at a much younger age and is more extensive and distal.
- Not uncommon for a diabetic to have a critically ischemic foot in the presence of a normal popliteal pulse due to occlusion of the crural arteries.
- In addition to disease of the major arteries, capillary basement membranes thicken, impairing oxygen diffusion to the tissues of the foot.

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Amputation

- Peripheral vascular disease & diabetes account for majority of L.L. amputations;
- 1/2 of these are due to diabetes.
- Prognosis is poor.
 - Within 3 years, (30%) 2nd limb amputation
 - Within 5 years, mortality: 50-70%.



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Amputation complications:

- Infection
- Tissue necrosis
- Pain
- Dehiscence/wound breakdown
- Problems associated with the surrounding skin
- Bone erosion/osteomyelitis
- Haematoma
- Stump edema.



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Management for those with Diabetes:

PREVENTION is the key!

How do you talk with your patient/client with diabetes?

- **Health Literacy: keep this in mind**
- careful foot care: hygiene, inspection, footwear
- Good diabetic control (sugars within range)
- Localised infections: debridement (if viable) & topical infection management;
- Osteomyelitis: X-rays, MRI to determine
 - Systemic antibiotics along with topical treatment & pain management

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- Consider: Access to care, poverty, other health stressors/issues, age...
- Teamwork: who needs to be part of the team.
 - Patient and their family (positioning, foot care)
 - Dietitian
 - Diabetic Educator
 - MD/RN
 - PT/OT
 - Family & Support Services
- **Educate yourself** re: treatment options:
 - Canadian Diabetic Foot Wound Management Guide, etc.

Management...
think of the
impact of the
determinants of
health to
ensure success.

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Nutrition

Why the concern?"?

LESSON 3

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Impact of hospital malnutrition: study (2013)

- Canadian Malnutrition Task Force examined nutrition status and prevalence of malnutrition in hospitalized patients;
- Impact of malnutrition on length of stay, 30-day readmission and mortality rates;
- Prospective cohort study: 1022 patients, include 18 academic/community/small & large centers, from 8 provinces.

Results:

- **Prevalence of malnutrition ~45%**
- Nutritional status deteriorates in hospital for some
- Food intake <50% and malnutrition are independent predictors of Length of Stay (LOS)
- Malnutrition is an independent predictor of mortality
- Malnutrition results in inefficiency, as 25% of these patients return to hospital

• <http://www.dietitians.ca/Downloads/Public/Interprofessional-Approach-to-Malnutrition-in-Hosp.aspx>

Nutrition and wound healing are closely linked:

Nutrition deficiencies or malnutrition impede the normal process of wound healing:

- Inflammatory phase is prolonged,
- Decreased fibroblast proliferation
- Alteration in collagen synthesis
- Decrease in wound tensile strength
- Increase risk of developing chronic wounds and chronic non-healing wounds.



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Consider Nutritional requirements at all stages of wound healing.

- **Cells:** platelets, neutrophils, monocytes, macrophages, fibroblasts, epithelial cells, endothelial cells
- **Raw materials:** collagen, fibrin, fibronectin, proteoglycans
- **Communications:** cytokines, growth factors
- **Clean up:** proteolytic enzymes (i.e., MMPs)



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Unintentional Weight Loss is common in elderly individuals

- Adult males should consume approx. 2,080 calories and females 1,762 calories
- A typical older adult (over 65) doesn't consume the recommended calories or protein
- Elderly men and women are at risk by decreased caloric intake (as much as 1,000 calorie/day)
- The challenge is to offer foods that pack calories and protein into smaller portions.

With thanks to Chris Fraser, HBSc, RD and Mary Ellen Posthauer, RDN, CD, LD, FAND for content of this section.

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Supporting nutrition for wound healing:

- The challenge is encouraging older adults to consume the meals. The frequent comment is "this is too much food" or "I am not hungry"
- Elderly individuals living at home are often dealing with food insecurity or difficulty preparing meals.

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Key Nutrients for wound healing:

1. Energy (calories) from non-protein sources(carbohydrates and fats)
2. Protein
3. Fluid
4. Vitamins and minerals

1. ENERGY:

- General Surgical population: 25-35 kcal/kg
- Pressure ulcers: 30-35kcal/kg
- Dependent on weight status, intake, activity level, medical issues (e.g., infection, underlying disease, medications, etc)

Example: 60 kg (132 lb) person needs 1800 kcal/day

Key nutrients:

2. PROTEIN:

- 1.25-1.5g/kg/day
- Depending on age, organ functions (kidney, liver), medical conditions
- Additional supplementation may be used in burn patients(assessed by dietitian)

3. FLUID:

- Water is also an essential nutrient:
- Adequate water intake is necessary for perfusion and oxygenation of healthy and healing tissues.
- 1-1.5ml/calorie or 30mL/kg. **Minimum of 1500ml/day (1.5L)**
- Amount of fluid may be increased, based on fluid losses, signs and symptoms of dehydration
- Needs adjustment with impaired renal function, congestive heart failure, etc.

Key nutrients: Vitamins & Minerals:

- Standard multivitamins with minerals are recommended for patients with wounds and if deficiencies are confirmed or suspected.
 - Vitamin A and C, and Zinc may need supplementation when deficient.
 - Avoid excessive intake from supplementation
 - Need to adjust for impaired renal function
- Vitamin A:**
- ↑macrophages and monocytes in the wound during inflammation
 - ↑epithelialization and collagen deposition by fibroblasts.
 - Routine supplement is adequate unless deficiency is present

Vitamin C & Zinc

Vitamin C:

- Involved in the collagen synthesis
- Acts on fibroblast proliferation, capillary formation and neutrophil activity.
- Vitamin C deficiency results to poor wound healing
- 500-1000mg/day for 10-14 days when deficiency is suspected
- Excessive vitamin C may increase the risk of kidney stone formation, particularly in individuals with renal failure.

Zinc:

- Required for protein and collagen synthesis
- Plays a role in immune function
- Serum Zinc may not reflect body Zinc status in acute illness
- No benefit to supplementation, if there is no Zinc deficiency
- Excessive and long-term oral Zinc supplementation should be avoided– can adversely affect Copper status & may result in anemia and impaired healing.

Obese patients and nutrition:

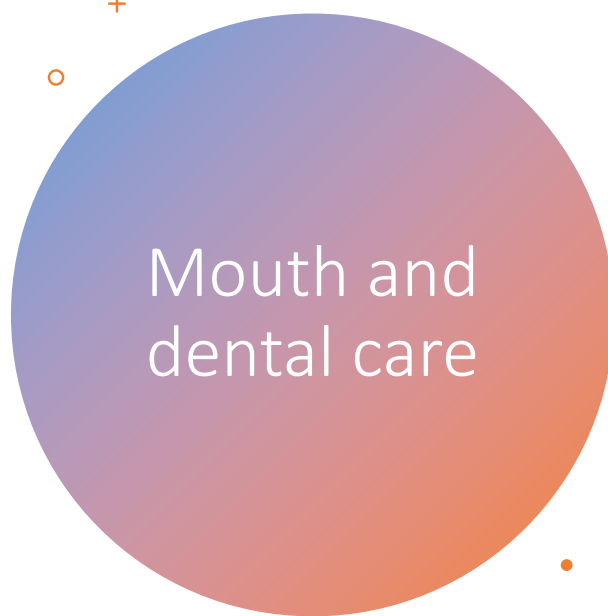
- 1 in 4 Canadian adults are considered obese (Stats Can 2018 data using BMI projections)
- Obese patients may be malnourished
- There are no specific recommendations to manage obese patients with chronic wounds re: nutrition

However--

- The goal is to maintain body weight and optimize protein hydration and micronutrients status
- Ensure adequate fluid (water) intake
- Diet soda has been linked to weight gain in obese individuals

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Dental care is an important part of overall health:

- Lack of attention to oral health
 - **Pneumonia:** an infection in the mouth or particles of food remain in the mouth, aspiration to the lungs can occur
 - **Diabetes:** Oral infections can raise blood sugar; pre-existing diabetes can lead to gum disease, infection, and tooth decay
 - Heart disease (**Endocarditis**): An infection in the mouth can travel to the inner lining of the heart
 - **Oral cancer:** first warning sign is usually a growth or a sore in the mouth that does not heal. This type of cancer is strongly linked to smoking and chewing tobacco

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Oral hygiene is essential:



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- Brush teeth twice/day
- Floss daily

Dentures:

- Clean/brush dentures daily with mild soap/cleanser
- Keep moist overnight (e.g., in glass of water)

Ensure any issues re: gum disease, tooth decay or ill-fitting dentures are treated by Dentist or denturist

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Practical Considerations to improve nutritional intake

- Med passes with nutrient-dense supplements (see next slide)
- Liberalization of diet restrictions if intake poor
- Address impairments in dentition: poorly fitting dentures (or no dentures at all) may impact on ability to eat
- Address impairments in swallowing
- Supplement dysphagia diets if necessary
- Conduct supplement/snack audits & encourage small, frequent meals.

Handout: Tips for dental care

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The Med Pass Program

- The provision of medications with a 2-calorie per mL formula
- 1 can/day = 500 calories, 20 grams protein, + vitamins and minerals
- Can use pudding supplements, thickened liquid supplements
- Obtain MD order; enter on medication record
- Limits taste fatigue, decreases product wastage; small portions multiple times/day; improves tolerance, improves nutritional status
- Specialized formulae for wound healing available



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Practical Considerations

- Address physical/cognitive impairments related to condition/disability
- Incorporate snacks/supplements/fluids into therapy/recreation sessions
- Encourage family/friends to bring favourite food/beverages/sauces/spices
- Consider alternate means of nutrition/hydration (e.g. g-tube).



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Absence of optimal nutrition: wounds won't heal... or will break down again.

Regularly scheduled weight measurement provides a consistently reliable method of nutritional stability/instability.

Easy to do; non-invasive & simple for the patient.



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Some specifics about
protein & vitamins

- Food sources
- Deficiencies

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Food Sources of Protein

- Meat, fish, poultry
- Eggs
- Dairy products (milk, cheese, yogurt)
- Legumes
- Seeds
- Grains



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Protein Deficiency

- Reduced collagen synthesis
- Protein destruction at the wound site
- Prolonged inflammatory phase of the healing process

Signs/Symptoms:

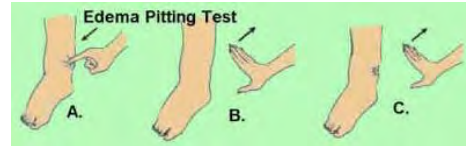
- Impaired wound healing and immune function
- Dry/flaky skin
- Peripheral edema
- Sparse, easily pluckable, dyspigmented hair
- Muscle wasting and cramps

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Protein Deficiency - Peripheral Edema

- May mask muscle/fat loss
→ unidentified malnutrition
- Increases distance over which
nutrients/oxygen must travel to wound



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Iron Deficiency

- Impaired cell proliferation
involved in wound
debridement/healing
- Iron deficiency anemia = delayed
wound healing
- Tissue healed in the presence of
deficiency is weaker



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Symptoms of Iron Deficiency

- Loss of energy (fatigue----exhaustion)
- Pallor
- Sore tongue
- Digestive tract disturbances
- Brittle, spoon-shaped nails
- Appetite disorders
- Assess blood work closely and supplement appropriately



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Food Sources of Iron



- Meat, poultry, fish
- Liver, organ meats
- Eggs
- Legumes/nuts
- Dried fruit
- Leafy green vegetables
- Fortified breads/cereals/or pastas

Animal sources are better absorbed by the body than plant sources

A meal that contains a source of vitamin C enhances the absorption of the iron contained in that meal

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Zinc Deficiency

- Delayed wound closure
- Decreased tensile strength of collagen
- Impaired immune response
- Increased susceptibility to recurrent infections

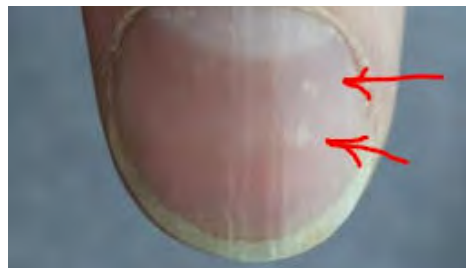


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Symptoms of Zinc Deficiency

- Impaired wound healing
- Impaired immune response
- Impaired taste/smell sensations
- Risk of respiratory infections
- Seborrhea-like dryness/redness



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Food Sources of Zinc

- Meat, poultry, fish/seafood (especially oysters)
- Liver
- Eggs
- Milk
- Legumes
- Whole wheat products and wheat germ
- Dark chocolate



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Vitamin C Deficiency

- Slow/delayed wound healing
- Breakdown of healed tissue
- **Stress from wound serves to increase the body's requirement for Vitamin C.**

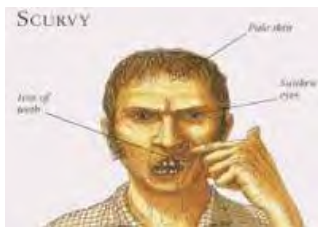


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Symptoms of Vitamin C Deficiency

- Bruising
- Swollen, spongy, bleeding gums
- Purpura
- Petechiae around hair follicles



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Food Sources of Vitamin C

- Citrus fruits and juices (**caution: fruit juice is high in sugar content**)
- Strawberries
- Tomatoes
- Sweet peppers (especially red)
- Potatoes
- Broccoli, cauliflower, brussels sprouts
- Cantaloupe



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Symptoms of Vitamin A Deficiency



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- Night blindness
- **Leading cause of blindness in developing nations**
- Dry skin
- Impairments in taste and smell
- Corneal or conjunctival dryness
- Follicular hyperkeratosis ("goose-flesh")

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Food Sources of Vitamin A

- Liver
- Milk/dairy products
- Egg yolk
- Fish oils

Beta carotene is converted to vitamin A in the body

Food sources of beta carotene = yellow & dark green leafy vegetables, deep yellow & orange fruit, carrots, sweet potato, tomato, peppers, squash, cantaloupe, broccoli, apricots, peaches

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Precautions and Contraindications for Nutrient Supplementation

Contact your Registered Dietitian!



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What we need to know: Managing wounds

LESSON 4

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1

Common Chronic Wounds: Management

- **Treat the underlying cause (TULC):**

- Deal with disease
- Establish good nutrition/hydration
- Manage incontinence/moisture
- Address patient's goals

- **Pressure Injury/Diabetic Foot Ulcers:**

- Off-load the pressure
- Get rid of necrotic/devitalized tissue
 - Make sure the debridement technique is within your scope
 - Make sure it's a healable wound: otherwise, dry & protect

- **Venous Leg Ulcers:**

- Apply compression
 - Make sure you assess for venous sufficiency: ABPI or vascular flow studies

- **Arterial Leg Ulcers:**

- Keep dry and free from infection

ABCDs of wound healing:

Healable Wounds need:

Absorption (not too wet/not too dry)

Bacterial Load reduction;

Clean-up: Removal of debris/devitalized tissue

Dry wound: keep clean & protected

Skin tear: protect & avoid adhesives

Plus "the 2 EEs":

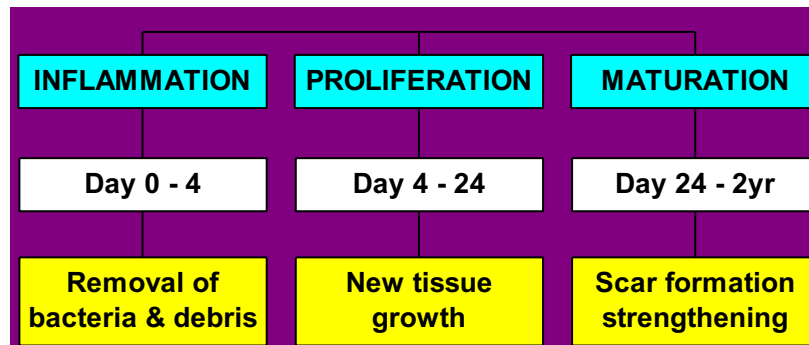
Educate

Evaluate

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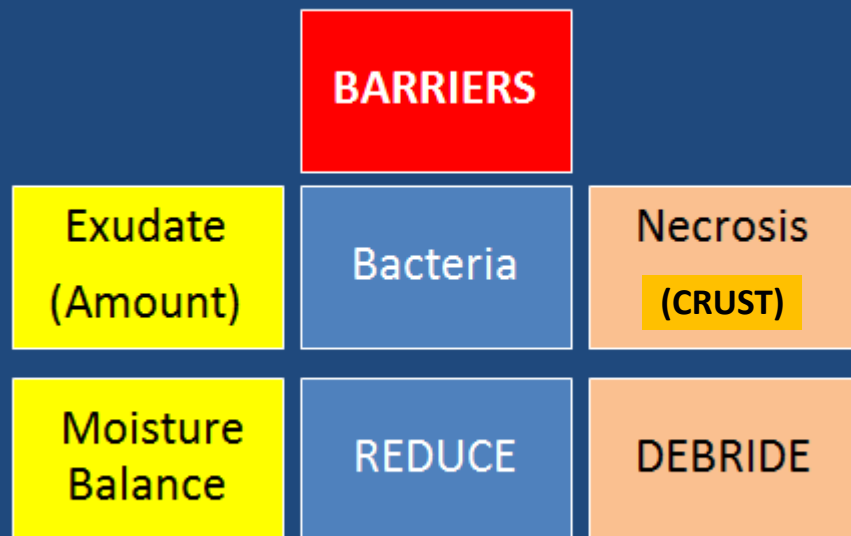
Reminder: Three Phases of Wound Healing



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Manage the WOUND



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4

Case examples

BREAKOUT ROOM/DISCUSSION

5

What's going on here?



6



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Inner aspect of Right foot. Currently treated with "NS + gauze b.i.d."



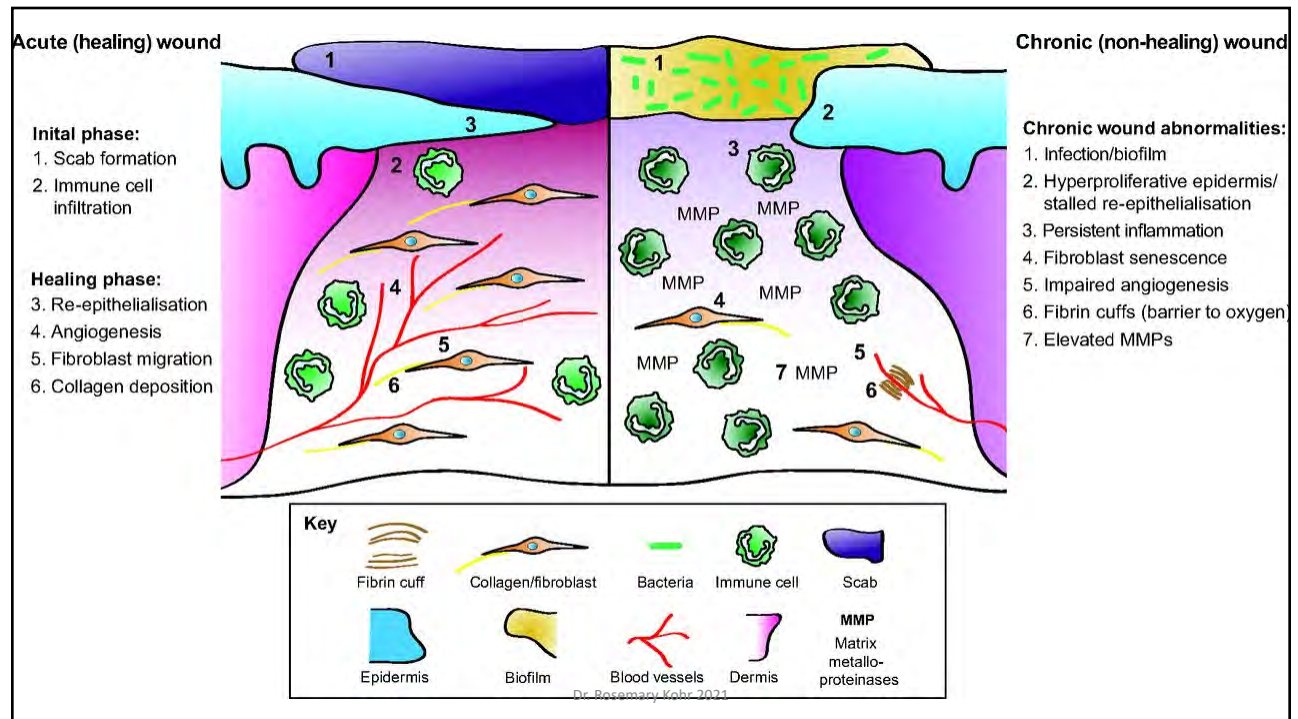
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Acute vs. Chronic Wound





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Lesson 5: Wound infection

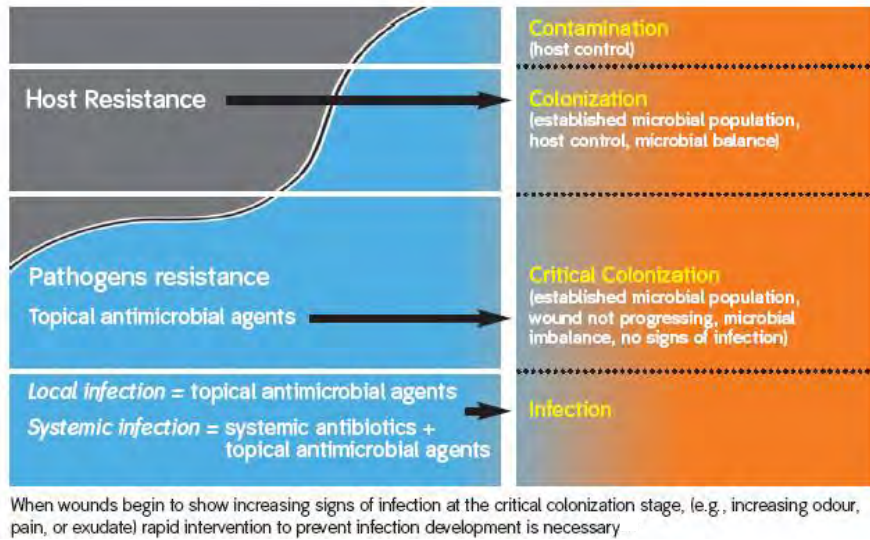
- How do you identify wound infection?



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How infection develops in chronic wounds:



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Contamination Colonization Critical colonization Infection

- **Contamination:** presence of non-replicating microorganisms within the wound
- **Colonization:** symbiotic bacterial load that does not cause tissue damage -- replicating microorganisms which do not cause injury to the host:
 - *staph epidermis*,
 - *corynebacterium sp.*
 - both of these organisms have been shown to increase rate of wound closure
- **Critical colonization:** microorganism population increasing with evidence of infection
- **Infection :** increased bioburden that impairs wound healing.

Remember: Infection = $\frac{\text{bacterial dose} \times \text{virulence}}{\text{Host Resistance}}$

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Bacterial control.

- on intact skin: can be accomplished with a variety of antimicrobial agents such as alcohol, iodine, and mercurochrome (non-viable squamous epithelial cells).
- **in the wound environment : living cells in tissue are susceptible to harm from the antimicrobial agent**



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Diabetic wounds: infection

- Impaired host response (e.g., diabetes) may exhibit only subtle signs of infection
- Swab may come back “false negative”
- Raised blood sugar may be indicator of local or systemic infection

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When/how to swab a wound:

- **When:** if topical treatment is not effective or if systemic treatment required.
- **How:**
 - cleanse wound (normal saline)
 - Pick “cleanest” area (1cm square)
 - Firmly swab area (press for depth)



Medical
Biofilms: Are
everywhere...

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Bacterial proliferation in wounds

- Planktonic bacteria grow in laboratory test tubes, culture media
- Planktonic Bacterial life is linear and relatively responsive to anti-bacterials
- Biofilms are naturally occurring environments, which serve to protect and support bacterial proliferation

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Evidence of Biofilm:



- Failure to progress towards closure, despite use of evidence-informed treatment
- High levels of drainage/odour
- Sloughy, shiny, slimy wound bed
- On-going necrotic tissue
- No response to antimicrobials
- Microbiology indicative of polymicrobes.

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So what's with Biofilm, anyway?

- Biofilm is the **matrix**, composed of a number of components that bind together, creating an interactive environment for bacteria to proliferate through reaction and adaptation.
- In a biofilm, organisms can withstand nutrient deprivation, pH changes, Oxygen radicals, disinfectants and antibiotics far better than planktonic organisms.
- Biofilms provide the quorum-sensing and defensive environment that enables bacteria to form colonies, work together to share resources because they are heterogeneous (e.g., if limited O₂ diffusion, can have pockets of anaerobic bacteria; also bacteria & fungi mix).
- Genetic transfer (pili provide encoded transmission as go-betweens) with the exchange of anti-biotic resistant determinants in this close environment.

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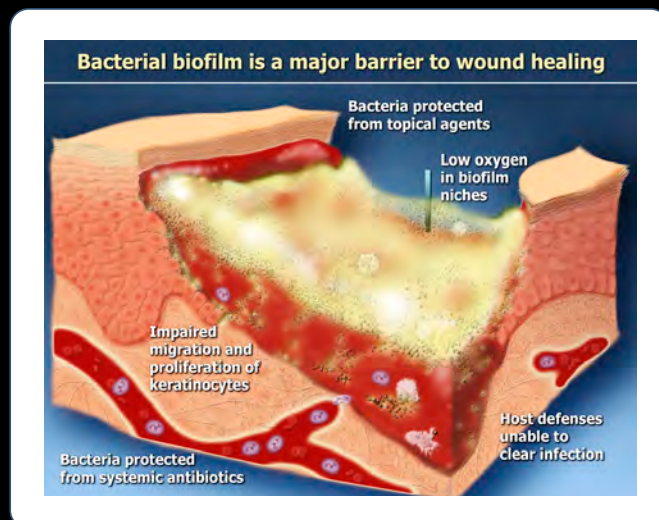
- The body is a great host– nutrient-rich, relatively stable: water, oxygen, temperature.
- Biofilm provides the environment for bacteria to set up micro-colonies and spread in the host, based on sensing availability of exopolysaccharides (EPS)/glucose (among other things) in the host.
- Biofilm seems to be the default mode of growth for some bacteria (e.g., *P. aeruginosa*, staphylococci, *pseudomonas*) :
 - Cells can sense a solid surface to which they can attach
 - ? How do they detect opportunity for adherence?
 - Changes in osmolarity?
 - ? Should be asking what triggers planktonic mode?
- [the Father of Biofilm Research Dr. Bill Costerton](#)
- [Unbelievable Bacteria](#)

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Impaired healing of chronic wounds

- Elevated pro-inflammatory cytokines
- Elevated protease activity – MMPs
- Diminished activity of growth factors
- Degraded receptor sites



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Treating Biofilm

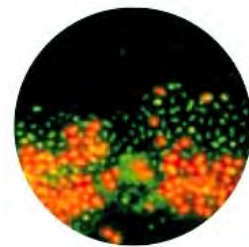


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Biocides vs. Biofilm: do they work?

- Dakins (bleach)
- Peroxide
- Acetic Acid
- Biofilm resists biocides
- Bacteria remains inside the biofilm
- In 1 minute, biocides will kill 100% of host defences & host healing cells.



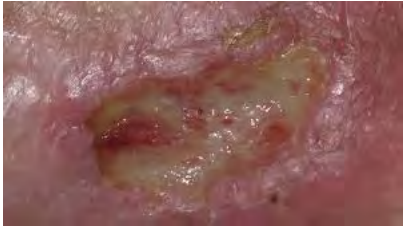
AFTER 60 MINUTES of exposure to bleach, many cells in this biofilm were dying (green), but many others, especially in the interior, still remained active (red).

Costerton Sci Am Vol 285, 2001

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What's new in treatment options??

- Betaine & polyhexamethylene biguanide hydrochloride (PHMB) as a cleaning agent
 - Hydrofera Blue
 - Medical Grade Honey
 - Cadexomer Iodine
 - Witch Hazel
- 
- “Certain topical applications in development have a direct effect on bacterial cell function. These topical applications include lactoferrin, xylitol, dispersin B and even honey. Researchers have demonstrated that the quorum sensing inhibitor *Hamamelis virginiana*, extract from the common witch hazel plant, prevents staphylococcal bacteria from attaching and forming biofilms”.
 - [Article: Combating Biofilms](#)

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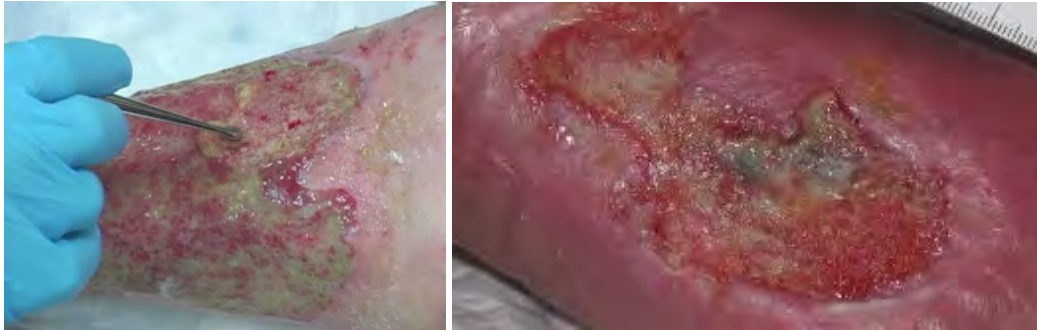
Antibiotics vs Biofilm

- Biofilms resist treatment with antibiotics due to a number of mechanisms that create phenotypic resistance— the antibiotics just don't work on the bacteria that is “hiding” in the biofilm (it can't get through)
- this in turn causes persistence of biofilm infections in spite of antibiotic exposure which predisposes to antibiotic resistance development or mutation of the bacteria, which appears to be enhanced or supported by the biofilm
- Understanding the complexity of the biofilm environment is key to beginning to understand the effect on antibiotics and how (if) they can become effective in treatment of biofilm infections.

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Must get rid of Slough



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Biofilm Based Wound Care

- **Debridement**- Frequent and aggressive
- **Selective biocides**
 - Silver, Iodosorb, Hydrofera Blue
- **Antibiofilm Agents**
 - Lactoferrin, Xylitol (toxic for pets)
 - Plant Products (e.g., witch hazel),
 - Fatty Acid Gel (linoleic acid)
- **Antibiotics**
 - Adjunct
 - Strong and long



Multiple Concurrent Strategies

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More biofilm fighters:

- Product name re: wound cleanser with surfactant claiming to inhibit microbial adhesion: **Prontosan**
- Product: Prontosan
- Kerlix AMD (gauze impregnated with PHMB):
“substituting a gauze impregnated with PHMB for regular gauze is a simple solution that does not require a change in existing clinical protocols”.
 - As a prophylactic dressing, the AMD gauze has been demonstrated to decrease the frequency of SSI by approx. ½ by simply using Kerlix AMD rather than “plain” gauze.



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The Biofilm Surprise



Biofilm appears as an “innocent”
slime on the surface of a wound...
But it develops quickly as an
environment that supports bacteria
to flourish.

COULD BE THE BUNNY, NOT THE WOLF!!

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LESSON 6: How to treat the wound

- **1. PREPARE & PROTECT**

- Use warmed NS or (treated) tap water or a commercial wound cleanser
- Irrigate the wound to get rid of loose debris
- Gently cleanse with dampened non-woven gauze



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Irrigate (prepare)

- **Tap water** is more effective in preventing infection in chronic wounds than normal saline (Cochrane Review 2010)
- PSI required:
 - Between 8-15psi
 - Syringe or prepared bottle
- Warmed solution better than cool



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Why cleaning/irrigation is important:



Patient had been coming in regularly to clinic for care of ? Wounds (not healing) What was the underlying cause?
NEEDED A GOOD CLEAN!!

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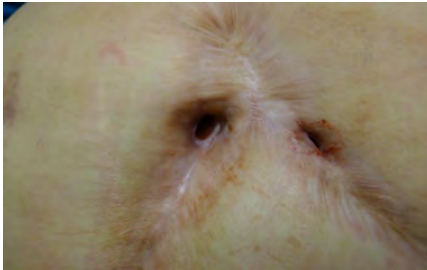
Irrigating wounds



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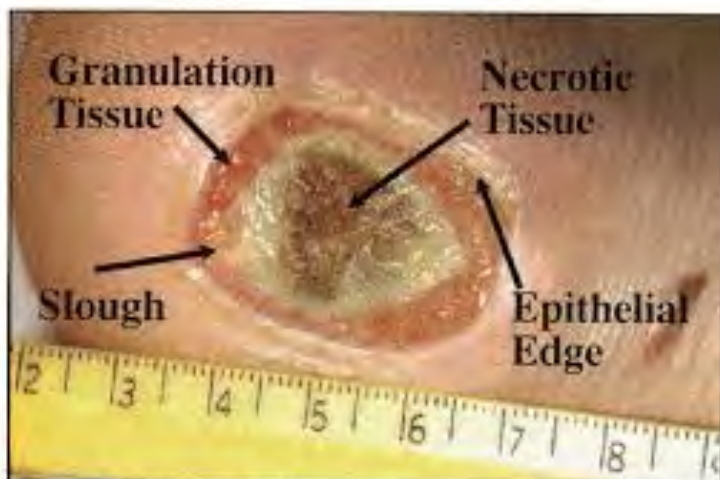
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When do you NOT irrigate a wound?



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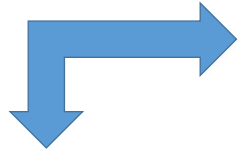
2. Get rid of
sloughy,
necrotic
tissue

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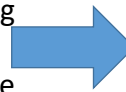
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Preparing the wound bed:

- Irrigation
- Removal of devitalized tissue



Treat the
underlying
cause;
Determine
healability



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2. Protect the peri-wound skin to avoid maceration.

- Wipe barrier film lightly over the peri-wound tissue (not in the wound bed):
 - Example: No-sting



NOT REQUIRED IF SILICONE BASED DRESSING USED (e.g., Mepilex)



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Wound edges

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

- **Colour** - 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 tissue) may indicate pressure, trauma or malignant changes
- **Rolled** - wound edges (rolled down towards the wound bed) may indicate 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

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Case example:



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How to choose a dressing: **A B C D**

- **A AMOUNT (of fluid):** *how much drainage/exudate?*
 - *Increased drainage may mean bacterial over-load*
- **B BACTERIA:** *is the wound infected or tipping into infection?*
- **C CRUST:** *is there sloughy material covering the base of the wound?*
- **D DRY:** *moving towards healing? Just needs a cover dressing to protect?*

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*Choosing the dressing...ABCDs:

Base Dressing Selection on A = Absorption, B = Bacteria, C = Crust, D = Dry , S = Skin Tear	What are our dressing options ?
A	
A + B	
A + C	
A + B + C	
B	
B + C	
C	
D (just needs protection)	
S (Skin Tear)	

Dressing type: Polymer fibre, Foam, Absorbent Acrylic, Hydrocolloid, Hydrofibre, Contact Layer, Calcium Alginate, Hypertonic Sodium, Island Dressing, Barrier, Silver, Iodine, Honey dressings, Hydrofera Blue.

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Lesson 7: TIPS in dressing selection

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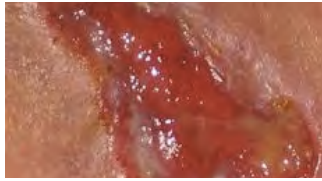


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ADDING MOISTURE TO A DRY WOUND: GELS

- Use a hydrogel
- E.g., *Intrasite gel* to support autolytic debridement.
- Moist wound bed is optimal for debridement and healing.
- ONLY A SCANT AMOUNT REQUIRED.

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But watch for...hypergranulation

- Appears as beefy red tissue extruding beyond the surface of the skin: also called "proud flesh"
- Can occur when an occlusive dressing has been used to cover granulating tissue once sloughy material has been successfully autolytically debrided
- Wound bed continues to proliferate granulation (instead of moving to epithelialization)
- Treatment: gentle mechanical debridement, hypertonic sodium dressing, NO occlusive dressing!

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What's
wrong with
this picture?

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Dressing
options?

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Specialty Dressings: What & When to use

SALT:

- Hypertonic Sodium Chloride Impregnated Dressing (e.g., *Mesalt*): osmotic wicking action draws fluid & debris out
- WHEN: can be used on heavily draining or infected wounds
- **NOT for dry/minimal drainage wounds**
- **Goes on DRY**
- **Change daily: requires a cover dressing**

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Specialty Dressings: What & When to use

SILVER:

- Many examples: anything **AG**
- Use according to manufacturer since silver action differs (3, 5 or 7 days)

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Before



After 3 days with silver dressing

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Aquacel AG EXTRA has threads running through it to keep the dressing together.

THESE ARE ABSORBENT DRESSINGS, USED WHEN WOUND IS **DRAINING**

DRESSINGS WITH "AG" CAN STAY IN PLACE X 7 DAYS—
wound exudate effectively maintains silver download to wound bed.



Contact layer with silver: for painful, wounds requiring a contact layer (need a cover dressing).



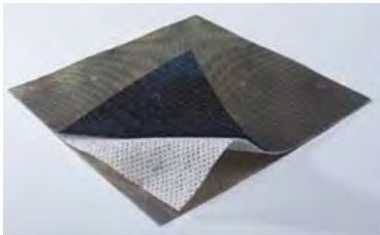
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Silver fabric: (Acticoat®)

Needs fluid to
activate

NOT absorbtive



Silver Foam (AG)
Absorbs & wicks
away drainage



Silver hydrofibre as a pad
with border:
becomes a gel (A + B)

Silver hydrofibre:
becomes a gel (A + B)



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Inter Dry Ag

- knitted polyester textile impregnated with silver complex
- designed to manage moisture, odor and inflammation in skin folds and other skin-to-skin contact areas
- effective antimicrobial action for up to five days
- wicks moisture away to keep skin dry
- provides a friction reducing surface
- Not for open wounds

©Fungal or yeast
rash:
Solid rash with multiple
satellite lesions
Grows on warm, moist
skin
Decrease moisture by
using dry cloth or
gauze in folds
(InterDry Ag)
Treat rash



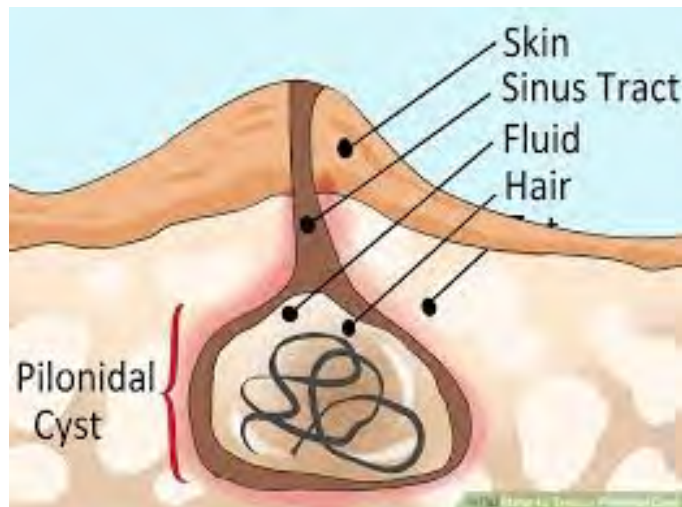
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HONEY in wound healing

- Naturally antimicrobial:
 - Hyperosmolar: restricts fluid available to bacteria; pulls fluid from bacteria (re: sucrose)
 - Increases drainage
 - Acid pH: 3.2-4.5: inhibits bacterial growth
 - Glucose oxidase enzyme: produces hydrogen peroxide (at low concentration –doesn't damage tissue)
 - Phytochemical factors (e.g., from leptospermum/ Manuka honey)

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Figure 1. Day 1: metoidy de-
quaration is noted in a patient
after 6 weeks of radiation therapy
for breast cancer recurrence.

Figure 2. MEDIHONEY® HCS sheet
dressings are initiated.

Figure 3. Day 3 of treatment: Impres-
sive healing after just 24 hours. The
dequaration wound completely re-
solved after 3 more days of treatment.

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Figure 1. (A-E) Case 1. Diabetic neuropathic ulcer with 3 weeks time to healing.




Figure 2. (A-C) Case 2. Varicose ulcer with 6 weeks time to healing.
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Application


Ready

Select and apply the appropriate dressing size to ensure the dressing will cover the entire wound. With **Hydrofera Blue Ready**, no hydration is required.




Set

Simply set in place and secure with gauze wrap or tape.



Go

Dressing can be left in place up to 7 days. Can be used in conjunction with compression wraps and total contact casting.



Wet wound = increased bioburden

Hydrofera Blue:

- Polyvinyl alcohol foam containing Methylene Blue & Gentian Violet
- Broad spectrum antimicrobial activity, effective against a variety of bacteria & yeasts
- For wounds with exudate with S&S of local wound infection
- Can be used with enzymatic debridement/growth factor products
- **Dressing must remain moist**
 - *Ready* version is pre-moistened
 - *Classic* version must be moistened prior to use
- When the dressing colour is white... "it's finished the fight" (needs to be replaced).

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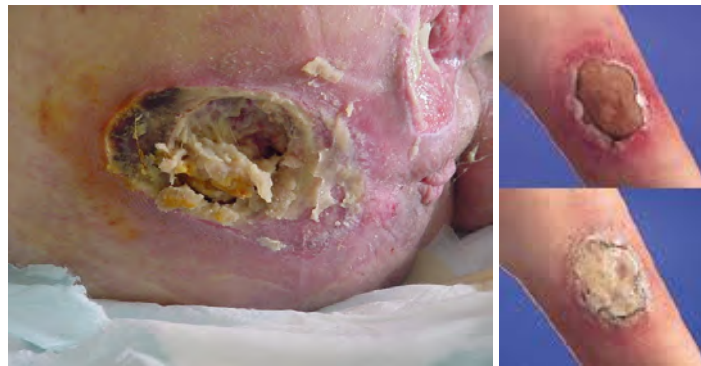
IODOSORB™ or INADINE™

- Cadexomer Iodine based product helping to remove bacteria, slough and debris
- Provides sustained antimicrobial therapy for 72h
- Reduces bacterial load including MRSA & VRE.
- Helps prevent new pathogen invasion
- Helps decrease odour
- Iodosorb can be mixed with hydrogel (scant amount) to improve application

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Changes
colour when
Iodine
downloads
into wound:

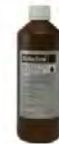


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What about:
Povidone-iodine
Chlorhexidine
Hydrogen
peroxide
Isopropyl
Alcohol
Dakin's Solution

- Povidone-iodine (e.g., Betadine)
 - Not for use in wounds where healing is possible
 - Cytotoxic: not for use full strength on healthy, healing tissue.
 - Useful for gangrenous wounds, ++ odour
 - Will dry out wound (good to use to maintain stable eschar)
- Chlorhexidine:
 - Best for intact skin/pre-surgical wash
 - Cytotoxic in open wound tissue
- Hydrogen peroxide:
 - Concentration is too high to be selective re: bacteria (unlike product from medical-grade honey)
- Isopropyl Alcohol:
 - Not for open wounds
 - Will dry skin
- Dakin's Solution (Bleach)
 - For wet gangrene or non-healing wound



What treatment options?

Provide rationale for your choice.

Summary of the essentials of wound care: The ABCDs

1. TULC: Treat the Underlying Cause
2. Prepare and Protect
3. Then, and only then, determine need:
 - A: Absorption
 - B: Bacteria
 - C: Crust
 - D: Dry (no ABC, just to keep protected while healing)
 - S: Skin tears

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Summary of Clinical Management of infected wounds

- Be aware of increased drainage or pain
 - Both are potential indicators of infection
- Appropriate dressings:
 - Salt
 - Silver
 - Honey
 - Iodine compounds
 - Hydrofera blue
 - PHMB
- Consider need for an absorbent cover dressing

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Lesson 8: Evaluate and Educate

- **DOCUMENT WHAT YOU DO AND SEE**
- Critical to effect evaluation of the wound's progress:
 - Measurement
 - Describe/photograph
 - Frequency of evaluation

What information needs to be included in your documentation?

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Skin Assessment Tool for PSWs

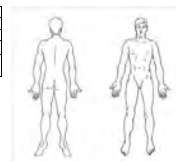
- To be completed after daily care
- Any issue identified, contact LPN or RN
- Just using the assessment tool significantly decreases the potential for skin breakdown (by 60%)

Skin Assessment for Resident Attendants to complete.
(To be completed if any skin issues are noted or once per week)

Date: _____ Resident Name: _____ Room # _____

1. Do you see any of the following?

	YES	NO
1. Reddened areas		
2. Rash		
3. Blisters		
4. Skin tears		
5. Other open areas (describe)		



IF YES TO ANY OF THE ABOVE, CONTACT THE LPN or RN AND DOCUMENT ON THE CHART.

What is the location? (Mark with "X" and add reference number from the list above)

*Is the Resident:

	YES	NO
Incontinent of a. Urine b. Stool		
In bed or a chair most of the day?		
Eating all their meals in a day?		
Drinking at least 8oz. of fluids each day?		
Sliding down in bed or in the chair?		
Complaining of pain?		

*The risk factors associated with Pressure Injury development.

Signature of RA: _____

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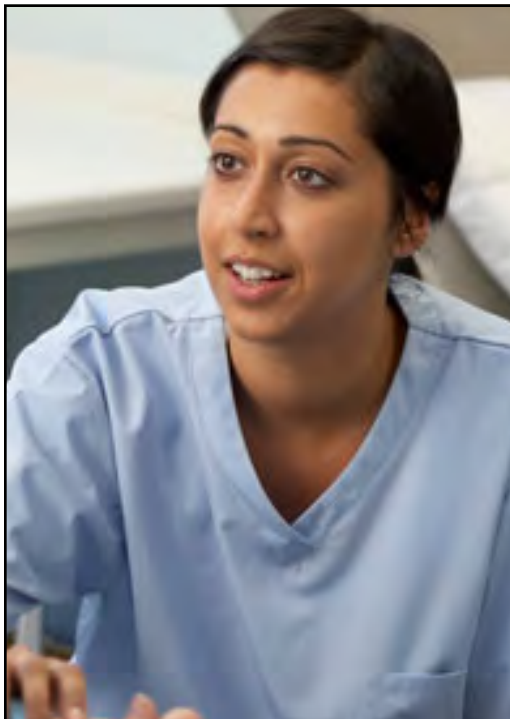
PATIENT/CAREGIVER EDUCATION:

• The basics

- Caregivers/Patients don't have (or need) the same depth of knowledge as clinicians.
- Need to know what LEVEL they are at (capacity to follow instructions)
- Stick to the basics, check in on a regular basis.

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What do they need to know ?

- How wounds heal: off-load pressure, nutrition, moisture management
- How dressings/treatments work (how to use them)
- **infection control** (wash your hands)
- What else??

How do YOU know that they understand what you've told them?

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- Objective, observable change in wound dimensions is strongly correlated with wound healing/closure.
- Expect 30% decrease in wound area (LxW) or volume (LxWxD) in a 3-4 week period.
- Wound measurement should be documented at least once/week if not at every dressing change.
- Using a graph to plot/monitor the change is helpful.





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What's going on here?



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CASE EXAMPLE: DOCUMENTATION WHAT DO YOU NEED TO INCLUDE?

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Deciding on products: What to use?

Evidence-informed decision:

Review the research and the product information

- Consider A, B, C, D or skin tear requirements
- Optimal wear-time (e.g., moisture vapour transfer rate)
- What's realistic in your organization?
 - Aim for "as long as possible" for dressing wear-time, but you may need to still work on resistance of colleagues and/or patient/family
 - Be able to explain WHY this product is optimal (know the product information)
- Patient issues
 - Location of wound (moisture/feces; friction, etc)
 - Compliance
- Cost of product (are there equivalent, less expensive alternatives?)

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Preparing the wound bed:

- Irrigation
- Removal of devitalized tissue



REMINDERS: ALL WOUNDS (with a few exceptions)

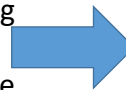
Figure 5.2.3



a. Before Treatment

b. Debridement of necrotic tissue

Treat the
underlying
cause;
Determine
healability



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Common Chronic Wounds: Management

ALWAYS Treat the underlying cause (TULC):

- Deal with disease
- Establish good nutrition/hydration
- Manage incontinence/moisture
- Address patient's goals
- Pressure Ulcers/Diabetic Foot Ulcers:
 - Off-load the pressure
 - Get rid of necrotic/devitalized tissue
 - Make sure the debridement technique is within your scope
 - Make sure it's a healable wound: otherwise, dry & protect
- Venous Leg Ulcers:
 - Apply compression
 - Make sure you assess for venous sufficiency: ABPI or vascular flow studies
- Arterial Leg Ulcers:
 - Keep dry and free from infection

ABCs of wound healing:
Healable Wounds need:
Absorption (not too wet/not too dry);
Bacterial Load reduction;
Clean-up the Crust:
Removal of debris/
devitalized tissue.

**Is the wound: healable?
Infected?**

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Lesson 9: Complex patients, complex wounds

Marginalized patients:

- Mental health
- Homelessness
- Rural/remote
- Bariatric
- Malignant wounds
- Palliative/end-of-life wounds
- Pain in wound management

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- Marginalized patients may present in hospital, clinic or other settings
- Recognize challenges inherent in those with chronic diseases (e.g., diabetes, congestive heart failure) in addition to mental health issues
- Mental health issues: depression, schizophrenia, bipolar condition, cognitive impairment (re: head trauma or dementia)
- Substance abuse issues: may be overt or hidden
 - Can be at any level of society/any age/culture



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- IV or other drug/alcohol use (abuse/addiction)
- Mental health problems
- Homelessness
- Poverty
- Unemployment
- Chronic illnesses (eg, diabetes, CHF)
- Poor nutrition/hydration



3

4

Environment: street-nursing/clinic/emerg

- Clinic setting may have limited resources,
 - Eg, running water, dressing supplies, privacy
- Clients may be unable or unwilling to come for regular follow-up: "I'll do it myself"
- Chaotic lifestyle

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Skin conditions:

- Range from rashes/scabies to abscesses re: IV drug use
- Main issues:
 - Clean skin/wound to provide protection
 - At clinic, use wound cleanser (if available) in a spray bottle—could purchase spray bottles at the dollar store, and fill with tap water (treated, municipal water is safe to use on open skin)
 - Wound cleanser is good when surfactant needed: eg, dried blood or feces—spray on & let "foam" up on area for a minute, then wipe off.

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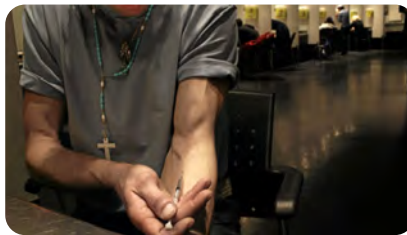
Determine requirements for Skin/wound management

Remember, a wound in this situation may be:

- Contaminated (bacteria present but not problematic)
- Colonized (bacterial load increasing, but not obviously infected)
 - wound may have red, warmer to the touch borders, slightly increased drainage, localized discomfort
- Critically colonized (tipping into infection)
 - The above signs/symptoms but more pronounced
- Infected
 - often client feels unwell, fever, chills, systemic complaints along with wound signs & symptoms

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Injection infections



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What to do...

1. Clean the wound: warm water, sterile/clean gauze—gently. Use surfactant (eg, wound cleanser) if dried-on blood, etc. Allow to soak for a minute or so.
2. Use a good light to assess visually:
 1. Any sign of red streaking up limb?
 2. Black areas?
 3. Pain at the site?
 4. Swelling around wound or extending further?
 5. Pus/drainage?

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What to do (continued)

3. consider client situation:
 - Co-morbidities (eg, diabetes, malnourished, homeless, addictions)
 - Ability to manage care between clinic visits
 - Severity of infection.
4. Does the wound require:
 - just a good cleaning (clean out pus, etc) and a dressing?
 - Antibacterial such as Betadine or Povidone?
 - Topical antibiotic (eg, polysporin) and dressing?
 - Oral antibiotics (can you prescribe?)
 - IV therapy/hospitalization (will the client go?)



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What to do?

Could manage with topical treatments but keep a close eye on these:



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Dog bites

- Clean well (use anti-bacterial cleanser)
- Topical Polysporin or vaseline
- Tetanus shot?
- Rabies shot?



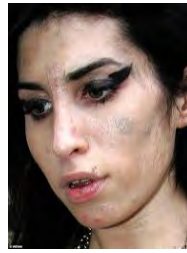
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Rashes re: drug use

Clients may manifest rashes related to drug use:

- Diffuse, patchy red, scaly areas on the body, face, hands
- Blisters
- Consider HIV and STIs (eg, syphilis, herpes)



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Treatment for rashes/blisters

- Clean with warm water/soap & rinse well or wound cleanser with a surfactant;
- Apply antibiotic ointment (eg, polysporin) if the rashes/blisters appear infected;
- Otherwise, apply cortisone cream sparingly to the affected areas;
- If HIV or STIs are possible, discuss with patient re: testing.

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Dry, cracked skin

Feet may be in rough shape re: poor hygiene, poor nutrition, lack of appropriate footwear or socks



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Treatment for dry, cracked feet

- Wash & clean: warm, soapy water, soak briefly
- Dry well
- Use a moisturizer or barrier such as: Vaseline, Atractain or Sween 24 Cream.
- Make sure the basin is cleaned well between clients—use Cavi-wipes to clean the basin or other chemical disinfection.
- If no access to running water, could use unscented baby wipes.



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Products

- Dry, cracked skin:
 - Vaseline (if using a big “tub”, put small amount into plastic/paper medicine cup)
 - Atractain
 - Sween 24 cream
- Infection:
 - Determine if fungal
 - If polymicrobial: Polysporin
- Simple/itchy rash:
 - Cortisone cream

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Overweight/Obesity/morbid obesity (2020 statistics)

- “Obesity” is defined as: abnormal or excessive accumulation of body fat.
- If a person's bodyweight is at least 20% higher than it should be, he or she is considered obese.
- Overweight: Body Mass Index (BMI) is between 25 and 29.9
- Obese: BMI is 30 +
- Morbid obesity: BMI 40+ or 100 pounds over his/her ideal weight.



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Limitations of BMI

Uncertainty about relying too heavily on BMI--not an accurate measure of body fat or health;

- BMI fails to take age and gender into account. Women naturally tend to have more body fat than men of equal BMI, while older people tend to have more body fat than younger people with the same BMI.
- Furthermore, BMI measurements have no way of measuring where body fat is located in the body. E.g., belly fat - the fat surrounding abdominal organs - is more dangerous than peripheral fat beneath the skin in other body areas.



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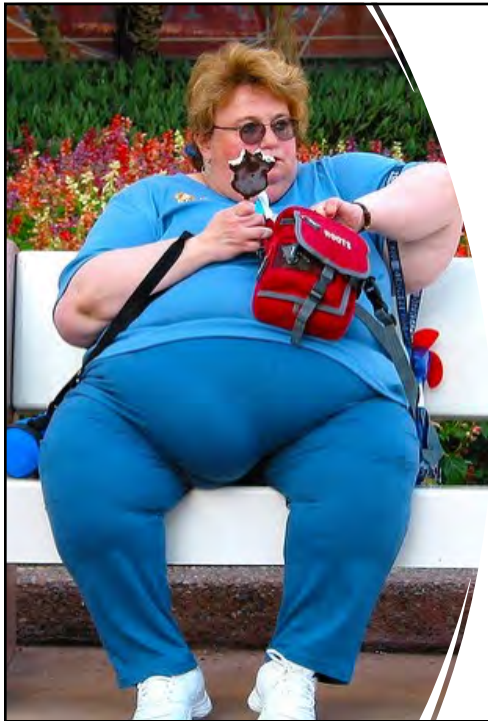
Causes of obesity?...

- **Consuming too many calories.**
- **Leading a sedentary lifestyle**
- **Not sleeping enough:** sleep deprivation may lead to obesity through increased appetite as a result of hormonal changes.
- **Endocrine disruptors, such as some foods that interfere with lipid metabolism.** (e.g., fructose)
- **Lower rates of smoking** (smoking suppresses appetite)
- **Medications that make patients put on weight**
- **Is obesity self-perpetuating?**
- **Obesity gene**



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Meet Mrs. Katherine Howell:

- 55 years old
- Former secretary at lawyer's office
- Lymphedema, cellulitis, osteoarthritis, COPD.
- Morbidly obese

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Lifestyle issues

- Married, 2 adult children (ages 27 & 24)
- Supportive family
- Former smoker (½ pack/day), quit X2 years
- Drinks coffee & caffeinated pop (10-15/day)
- High fat, high sodium diet
- Limited mobility re: obesity & joint pain
- Depressed

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The Medical hazards of obesity

- Increased risk of Stroke
- Major organs at increased risk - including heart, kidneys and liver
- Greater risk of damage to joints
- Likelihood of developing varicose veins

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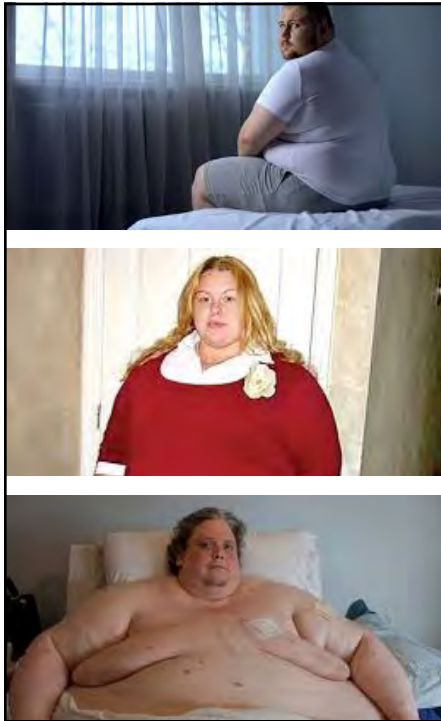


Confounding issues

- Sleep apnea
- Mobility
- Pain
- Edema/lymphedema
- Infection
- Diabetes/kidney problems
- UTIs
- Depression (hidden)

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Treatment

- “see beyond the body”
- Recognize the need to address intake
- Management of skin & skin folds
- Avoid latex, perfumes
- Use No-rinse body wash
- Avoid use of powders/cornstarch
- Use dimethicone based barrier cream
- Always with respect:
 - Privacy
 - Attitude (body language & language)

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Moisture Associated Skin Damage

- Obese individuals at high risk for MASD
- Consider products such as Kerlix AMD or InterDry AG and/or
- Cavilon Advanced Skin Protectant



See handout



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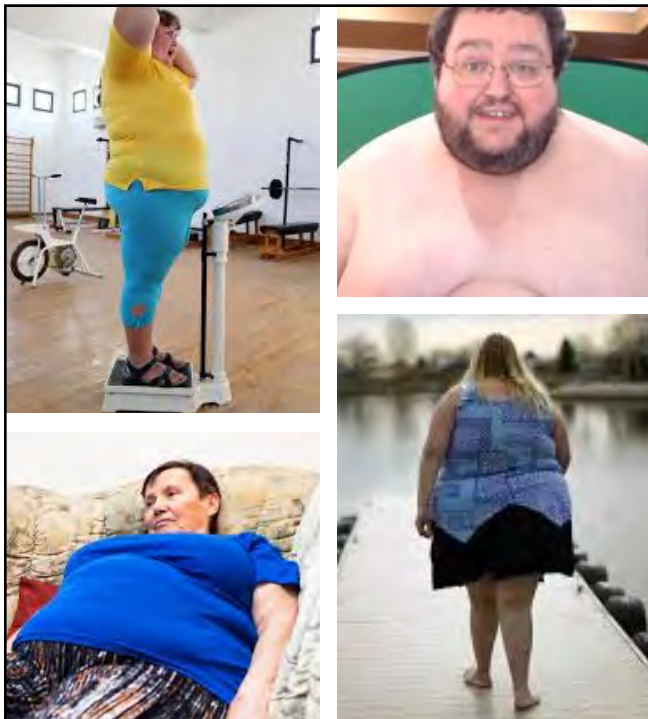


Safety

- Transferring patient requires:
 - Assessment of lift/transfer needs
 - OT assessment
 - Equipment
 - Personnel at the bedside
 - Privacy
 - Attention to skin to avoid bruising/tears
- Seating: chair/wheelchair

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Things to take away with you:

- **Patient-centred care**
 - **Dignity**
 - **Compassion**
- Safety strategies
- **Teamwork**
- Treatment options
- **Evidence-based practice**

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Keep in mind...

- Obesity has its roots in self-esteem
- Physiological predisposition
- Psychological issues
- Social isolation
- Food is not just nourishment for the body
- Change requires personal motivation on the part of the patient & patient's family



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Ethical/religious issues for wound care product use:

Several international studies (Satar, et al, 2004; Erickson et al, 2013) have identified:

- Hindus and Sikhs did not approve of the use of bovine- or porcine-derived products
- Muslims did not accept the use of porcine-derived products
- Christians (including Jehovah's Witnesses), Jews, and Buddhists accepted the use of all animal- and human-derived products (with an exception among Jews who follow a kosher diet and do not eat pork or shellfish)
- Jehovah's Witnesses do not approve of the use of blood-derived products
- Interestingly, the same report found that all religions allowed the use of animal-derived products if there were no alternatives, or an emergency existed
- Products containing collagen (e.g., biologic dressings), glycerin or gelatin (in hydrocolloids) may be contraindicated
- **Important to clarify with patients**

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Helpful Questions Related to Patients' Religion & Lifestyle

Consider asking the following questions to help gain an understanding of patients' spiritual and lifestyle preferences and to foster appropriate communication about concerns that may arise.

- Do you prefer to speak or read a language other than English? What language is spoken at home?
- Are there foods that you do not eat for religious or spiritual reasons?
- Do you have any restrictions related to receiving blood and/or blood products?
- Do you have any restrictions related to the use of products that are made from animals (or from specific animals)?
- Do you wear special items of jewelry or clothing and feel that your well-being might be affected if they are removed? If so, what are these items?
- Do you seek help from anyone other than a Western-licensed medical provider when you are not feeling well, such as a medicine man/Elder or herbalist?
- Will anyone other than you be participating in the decisions affecting your care?
- Do you have documents/information pertaining to your healthcare that we should be aware of?

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Malignant Fungating Wounds

- As cancer treatments have improved outcomes for patients, the potential of “living with” cancer increases the possibility of developing malignant fungating wounds (MFWs) related to the cancer.
- Under-reporting is common since MFW incidence/prevalence is not often recorded consistently.
- Incidence is anticipated to increase rapidly as the number of new cancer cases, particularly in the aging population rises with people living longer because of significant innovations in treatment

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Malignant Fungating Wounds (MFWs)

Occurrence: 6-10% of cancer patients develop cutaneous metastases

Location of Wound

- Breast, head & neck most common
- Chest and abdomen
- Extremities - uncommon except with melanoma
- usually occur via lymph system, bloodstream or directly from the primary lesion
- as the tumour infiltrates the skin, ulcerating and fungating wounds develop

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Metastatic from breast Ca



Back (metastatic)



Breast : fungating malignant wound

Fungating wounds

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Typical conditions in MFWs (HOPES)

- **Hemorrhage/Bleeding:** often from friable, vascular granular tissue
- **Odour:** significant issue for MFWs re: increased bacterial load
- **Pain:** at dressing change/wound cleansing and re: inflammation/nerve involvement
- **Exudate:** vasodilation & increased permeability of tissues + increase bacterial load
- **Superficial infection:** identified by : nonhealing, exudate, red-friable tissue, debris, and smell (NERDS)
- Deeper infection (systemic) appears as: size increase, increased temperature, os or probing to bone, new areas of breakdown in the surrounding tissue, erythema and/or edema, exudate, and smell (STONEES)

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Complicating factors

- **Fistulas**
 - Causes - internal cavities are superficial
 - Mouth, esophagus, bowel
 - Functional difficulties – normal function of the perforated cavity is altered
 - Adequate hygiene is difficult
- **Functional compromise from the location of the wound:**
 - e.g. - blindness,
 - deafness, difficulty - walking, eating, dressing
- **Infection:** keep in mind medications that may decrease ability to fight off infection

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Dressing options?



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Management:

- **Psychological and social issues**

- Use a holistic approach: consider social/spiritual resources, with attention to cultural needs

- **Pain**

- Pain with dressing changes should almost always be eliminated, use non-adherent dressings
- Pain between dressing changes – e.g., topical Ibuprofen in dressing, cannabinoids or opioids
- **Pain at wound cleansing:** warm saline soaks rather than aggressive irrigation may be most appropriate (dependent on patient's tolerance & location of wound)

- **Odour** - Patient may complain of odour even when others cannot detect it.

- Always treat for odour if it concerns the patient

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Management... ODOUR

- Consider cause of odour (bacteria) & use silver, medical grade honey
- If significant drainage (daily dressing) hypertonic sodium (Mesalt)
- Charcoal dressings “may” be useful (but lose potency when wet).
- Rule out infection - swab and treat if present
- May require oral antibiotics
- Topical antibiotics may be helpful, • e.g. 0.8% metronidazole gel,
- Dressings: Aquacel AG (gels when saturated & easily removed)

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Management...

- Exudate
 - Rule out: infection/fistula (may be very small)
 - Control quantity of exudate with effective dressings (see chart)
- Consider drying the wound with Mesalt (dressing containing salt)
- Bleeding
 - Rule out: infection, adherent dressings, anticoagulant therapy, abnormal tumour vasculature, congenital coagulation abnormality

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- The patient symptoms (vertical axis)
- • Some commonly used available dressings (horizontal axis)
- • Warn the patient - as the wound changes the dressings may change
- • Become familiar with the product information (how to use, etc)
- (Biatain IBU in later slide)

Symptom ↓	Periwound skin barrier <i>NoStingSpray, CavilonCream, ProShield Plus</i>	Hydrogel/ Antibiotic gel <i>IntraSite gel/ metronidazole gel</i>	Foam <i>Mepilex, Mepilex Border AG</i>	Hydrofibers/ Calcium Alginate <i>Aquacel AG /Calicare</i>	Specialty Dressings ↓
Pain	Protects periwound skin	If dry/infected	With exudate	With exudate	Biatain IBU
Odour	Protects periwound skin	If dry/infected	With exudate	With exudate	Medi-honey
Exudate	Protects periwound skin	Do not use	Yes	Yes	Super-absorbent
Bleeding	Protects periwound skin	May not be useful	Could be useful	Could be useful	Kaldostat
Dry cracking	Protects periwound skin	Could be useful	With pain	No	
Maceration/ Moisture	Protects periwound skin	Do not use	Yes	yes	Mesorb
Infection	Protects periwound skin	Could be useful	With exudate	With exudate	Hydrofera Blue

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Skin cancers (not a typical “chronic wound”).



Squamous cell carcinoma

Types of Skin Cancers and Precancers



Melanoma



Basal Cell Carcinoma



Squamous Cell Carcinoma



Actinic Keratosis



Atypical Mole



Merkel Cell Carcinoma

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Remember, for Malignant Wounds:



- The underlying cause is a **tumour**.
- These wounds need to be treated as maintenance wounds rather than wounds that will heal.
- Debridement is generally secondary.
- Work to manage odour, drainage, infection and pain.

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Fragile skin at risk



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Treatment:

- Skin flap: if possible, moisten & approximate edges & use autramatic dressing: leave wound surface to reduce interference with healing process.
- Non-viable flap: consult MD or wound care specialist to debride.
- Pain control



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Treatment:underlying factors.

- Cause of the skin tear: injury?
- Underlying/contributing disease
- Steroids or anticoagulant medications
- Tetanus status
- Arterial status
- Mobility/independence
- Extent of injury



[Article: Common Questions about Wound Care](#)

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Prevention is the key!



Recognize fragile skin



Caution during bathing, dressing, transferring



Proper transfer techniques & positioning



Pad hard surfaces, bed, etc.



Use pillows & blankets to protect & support arms & legs



Maximize nutrition & hydration



Long sleeves, pants to add layer of protection



- Apply moisturising cream/agent
- Use emollient, neutral pH soaps & cleansers
- Atraumatic tapes/dressings or stockinette, gauze wrap—**NO ADHESIVES!!**

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Trauma and Pain: Implications for practice in skin and wound care management

- Decreased mobility
- Decreased appetite
- Loss of control
- depression



- Decreased blood flow
- Decreased macrophage activity
- Decreased healing potential

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Problems with adherent dressings or dressings that don't respond to the needs of the wound (ABCD)

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Dressings applied incorrectly...



Necrotic tissue from compression wrap applied incorrectly.



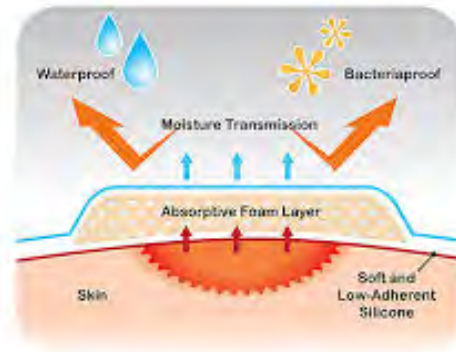
Dressing wrapped around shin despite obvious lower edema (foot/leg) and need for even mild compression.

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Soft-tack silicone products:

- non-adherent to wound bed
- “hydrophobic”: float above the surface of the wound bed
- Contact layer requires cover dressing (watch periwound skin)
- Does not require barrier spray/film
- Difficulty adhering if patient is diaphoretic or incontinent
- Comes in a variety of versions: contact layer, foam dressing, border, finger dressing...
- Can be lifted up and wound assessed– same dressing re-affixed (if not soiled)



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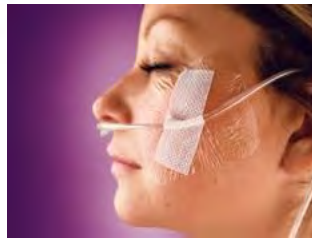
Soft-tack woven contact layer: comfort & protection– only cover dressing need be replaced.

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Examples:

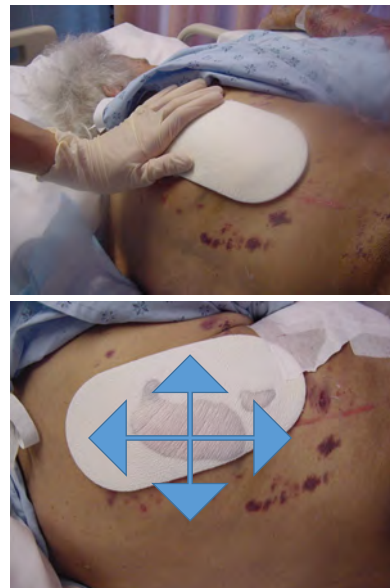
Observe for any edema which could affect circulation to the digit.



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Foam dressings:
Lateral transfer of
wound fluid:
wicks away drainage
from wound bed,
supports Moisture-
Vapour Transfer
(MVT)



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How to remove transparent film/adhesive border dressings:

- Gently stabilize the dressing with one hand;
- Lift & grasp an edge at a corner of the dressing;
- Pull the edge away from the dressing: you will see/feel the border lifting off/rolling;
- Continue slowly around the edge of the dressing to pull away the border from the skin.



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Palliative/ End-of-Life

- Palliative: symptom management [Guide to Palliative Symptom Management](#)
 - Pain
 - Fatigue
 - Pruritus (often related to kidney failure or opioids)
 - Nausea
 - Anorexia
- Things to remember:
 - Consider the whole person/family involvement
 - Dressings: control drainage, infection, odour, pain

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Palliative/end-of-life wound Management and Goals: HOPPES and SPECIAL

(Woo et al., 2018)

HOPPES

- Hemorrhage
- Odour
- Pain
- Pruritus
- Exudate
- Superficial infection

SPECIAL

- STABILIZE wound
- PREVENT new wound
- ELIMINATE odour
- CONTROL pain
- INFECTION prophylaxis
- ABSORBENT wound dressing
- LESS dressings/reduce dressing changes

Handout: Optimizing QoL for people with non-healing wounds (Woo et al, 2018)

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Biatain IBU

- Foam dressing (“Biatain”) with added ibuprofen
- Useful for pain related to **inflammation** in the wound/periwound
- Requires draining wound
- Good information:

[Biatain IBU information \(CLWK\)](#)



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Kennedy Terminal Ulcer



Patient lying on Left side
Right hip/leg /buttock visible

Skin is an organ. At end-of-life, organs (including the skin) are shutting down.

- Location: usually presents on the sacrum
- Shape: pear, butterfly or horseshoe
- Colour: red, yellow, black or purple
- Borders: irregular
- SUDDEN ONSET: end-of-life (within 8-24 hours prior to death)

Named for a Nurse Practitioner, Karen Kennedy who first identified this ulcer in her LTC Skin & Wound team in the early 1980s

Identified in 1877 by Dr. Jean-Martin Charcot as Decubitus Acutus (Acute Bed-Sore)

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Frost-bite: skin exposed to cold temperatures /wind/high altitude

Cause: Blood vessels in extremities constrict, decreasing/cutting off blood supply to underlying tissue & skin

Treatment: re-warm by soaking affected area in warm (**not hot**) water (15 min-30min) & provide analgesic for pain

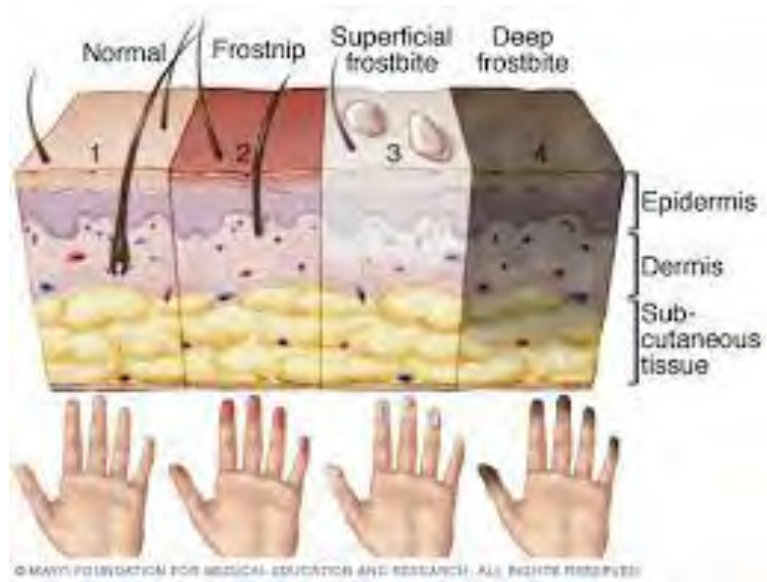
- **Do NOT use heating pads or hot water to re-warm**

Blisters may occur: drain, cover with non-adherent dressing, watch for/treat infection

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Frostbite stages:



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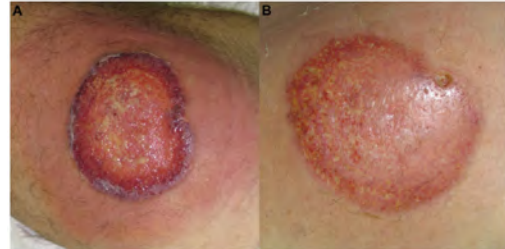


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Pyoderma gangrenosum



Associated with autoimmune diseases such as ulcerative colitis, Crohn's disease and rheumatoid arthritis. Often a flare-up of underlying disease or increased stress leads to development.



Initially look like small bug bites or papules (pimples), and they progress to larger ulcers. Characteristic violet-coloured "violaceous" raised border.

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Pyoderma Gangrenosum. Looks like ... But isn't.



Treated as a venous leg ulcer in the community.

Treatment: **Corticosteroids**. High doses of **corticosteroids** are the mainstay of pyoderma gangrenosum treatment. These drugs may be applied to the skin, injected into the wound or taken by mouth (**prednisone**). Dressings, such as foams, topical antimicrobials, compression, etc are of limited/no benefit. These wounds take a long time to resolve, and recur at different locations on the body– often triggered by stress.

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Some other skin conditions

- **Epidermolysis Bullosa (EB):** cluster of skin diseases, creating skin/mucous membrane fragility due to lack of specific proteins needed for skin integrity. that cause various degrees of skin and mucous membrane fragility.
 - Usually develops in very young children. Treatment involves a team approach.
 - Sick Kids (Toronto) has excellent resources.
[Sick Kids EB Interdisciplinary team](#)
- **Bullous pemphigoid:** immune system attacks the basement membrane of the epidermis, possibly related to medications or disease process (e.g., Parkinson's).
 - Can be treated (often with topical/system strong corticosteroids) & symptoms will diminish over time.
 - Often elderly individuals or those over 50 years
 - Characterized by itchy rash, followed by multiple large fluid-filled blisters
 - Treat blisters (drain if possible/atraumatic dressings/barrier cream)

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What's new in wound care: diagnostics to treatments

Lesson 10

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How close are you to this?




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Assessing/diagnostics
for complex wounds:
what's new?


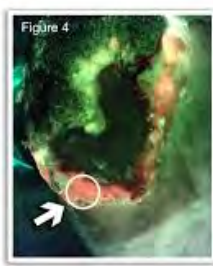

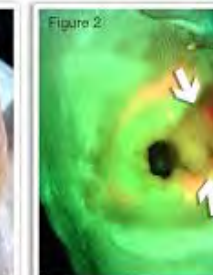
1. Handheld microbial auto- fluorescence technology that 'maps' microbial distribution.
 - Microbial wound mapping to target debridement to reduce microbial load, and measures the wound dimensions
2. Infra-red thermography to detect heat due to inflammation
3. Colour-based detection of host inflammatory markers of infection
 - Wound dressings that respond to bacterial infection mediators or wound parameters such as pH level (acid vs alkaline)


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Visualize bacteria and digital wound measurement at point of care

More information:
www.Moleculight.com

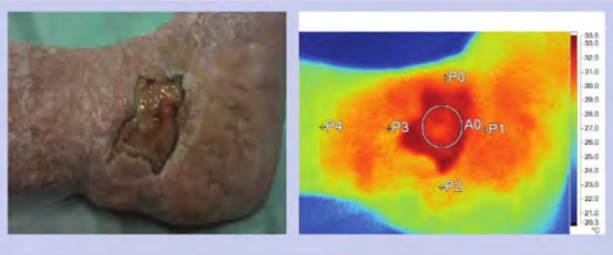



Dr. Ralph DaCosta:
Moleculight Imaging
Diagnostic Tool


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FLIR-ONE: infra-red camera attachment.


- Attaches to a smart phone
- Can also be used in conjunction with a wound measurement app
- Can identify skin/wound temperature variations



Thermal gun as alternative

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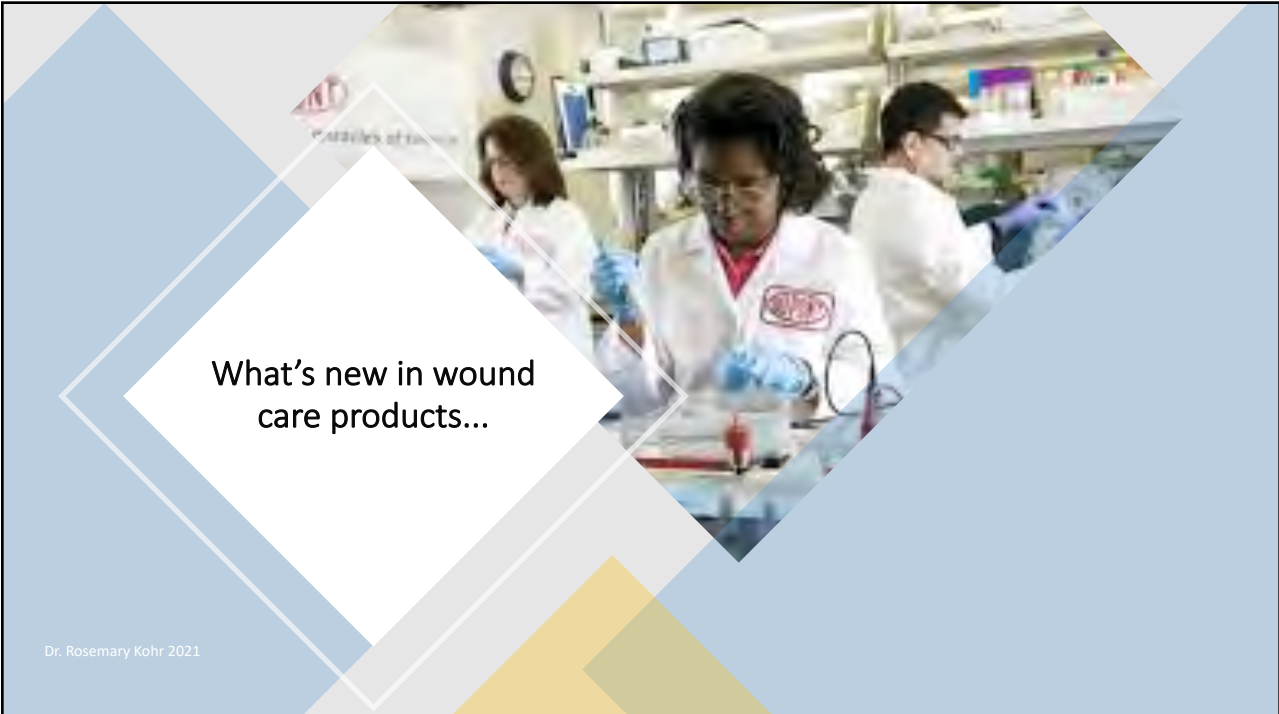


pH-responsive dyes indicating wound healing

- Skin pH is an indication of the skin's physiological condition
- Chronic nonhealing wounds are known to have an elevated alkaline environment, while healing process occurs more readily in an acidic environment.
- pH of wound can be correlated to angiogenesis, protease activity, bacterial infection, etc.
- pH-responsive hydrogel fibers can be used to monitor wound condition.
- Images of the pH-sensing fibers during real-time pH measurement can be captured with a smart phone camera for convenient readout on-site.

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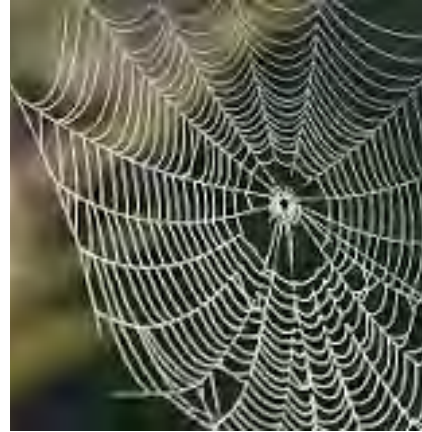
What's new in wound care products...

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Cobwebs for wound healing

- The medicinal properties of spider silk to primarily stop bleeding have been recognized for centuries
- Recently, synthetic spider silk has been developed specifically for wound care that can deliver drugs (such as antibiotics) and be used in regenerative medicine.
- Benefits of spider silk:
 - protein-based, strong, biocompatible and biodegradable;
 - No immune or inflammatory reaction.
- Future as an advanced wound dressing might include replacing the extra cellular matrix that our own cells produce– facilitating growth of the new tissue; a way to deliver antibiotics in a topical/controlled approach.



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Human skin from a 3-D Printer

- University of Toronto researchers as well as other international researchers have demonstrated a **prototype for a 3-D bioprinter capable of creating human skin**
- The layers consist of the epidermis and dermis, which include fibroblasts that produce collagen. Instead of using ink and cartridges, this printer uses injectors with biological components – all controlled by a computer
- The patient's own cells may be used to create autografts, which are especially useful for burns and other wounds. Due to the automation and standardization process, 3-D printing will be less expensive than manual production. Only human cells are used – to avoid use of animal cells – and the skin is bioactive so that it can generate human collagen

[3-D skin printer \(U of Toronto\)](#)

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Spray-on stem cells for burn patients

- Using a stem cell gun to spray on stem cells for the treatment of burns, wounds and other skin disorders is showing great promise.
- Still experimental (not yet FDA approved), researchers are using stem cells from bone marrow, fat and skin cells. The patient's cells are harvested from an unwounded area (usually one square inch), naturally suspended in a water-based solution, and then sprayed on the open wound area.
- One of the most exciting initial findings is that scarring is minimal, compared to traditional grafting techniques (see image, next slide)

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Spray-gun for burn patients:
decrease graft complications/pain.

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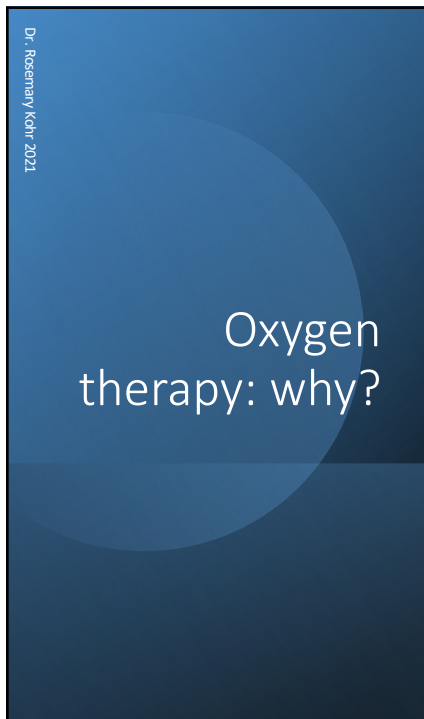
Skin cell “crawling” to enhance wound closure

- Researchers at U of Toronto found that peptide hydrogel prompts skin cells to “crawl” together, to improve wound closure for complex chronic and diabetic wounds
- The hydrogel has a Q – peptide, which supports the survival of stem cells and fibroblasts--the cells that make collagen and connective tissue
- It also provides a substrate – or moist scaffold – for the cells to move across
- Wounds have been shown to close faster because of this improved base

Time from discovery to market application: YEARS!

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- Oxygen delivery is a crucial element involved in wound healing
 - enhances neutrophil killing ability, stimulates angiogenesis, and enhances fibroblast activity and collagen synthesis
- Limited oxygenation can lead to a chronic non-healing ulcer
- Impaired oxygen delivery to a wound can greatly inhibit the healing cascade:
 - the enzyme that generates reactive oxygen species (ROS) to signal propagation and promote healing, ceases to function
 - poor collagen deposition and remodeling (collagen deposition is oxygen dependent)

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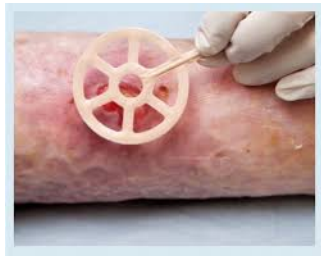


Oxygen therapy: Hyperbaric

- Therapy consists of a chamber with pure oxygen delivery under pressure
- Hyperbaric oxygen therapy (HBOT): a treatment where the patient receives 100% oxygen, with the chamber being pressurized > 1 atmosphere absolute (ATA)
- Pressures applied while in the chamber are usually 2 to 3 ATA, with patients typically receiving 10-30 treatments
- Treatments are typically 1.5-2 hours long, 5 days per week, and require the patient to travel to specialized facilities that are under the supervision of a physician
- Hyperbaric oxygen therapy has multiple mechanisms of therapeutic effect including bacteriostatic effects, hyperoxygenation, and restoration from hypoxia (e.g., divers)

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Topical Oxygen Therapy:

- Low-pressure treatment: oxygen applied directly to the wound site at 1.03 ATA
- Appropriate for wound without necrotic debris
- Petroleum based dressings are contraindicated during treatment since they could create a barrier to oxygen penetration.
- Used continuously until wound closure
- See video for more information re: application
- [Topical Oxygen Therapy application](#)
- Advantages:
 - topical treatment, at home; lower cost than hyperbaric treatments
 - does not involve systemic oxygen, which can place a patient at risk for oxygen toxicity.

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Negative Pressure Wound Therapy

- Consists of vacuum pump, drainage tubing and wound dressing set and source of power (battery/outlet)

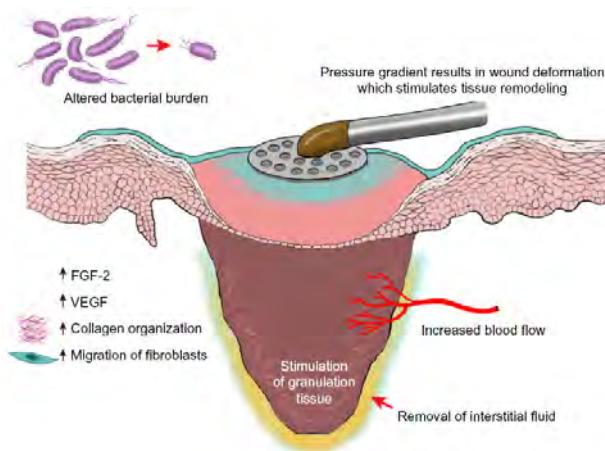
How it works: vacuum draws out fluid from the wound & increases blood flow to the area

- Improves cellular migration and promotes granulation tissue formation
 - may be applied *continuously* or *intermittently*, depending on wound type & clinical objectives
- Contraindications: malignant wounds, untreated osteomyelitis, eschar/necrotic tissue, unexplored fistula, exposed vasculature, exposed nerves, exposed organs, malnourished patients or for pediatric use
- Avoid use of NPWT in patients on anticoagulants or with clotting issues
- Remove negative pressure device prior to MRI procedures.

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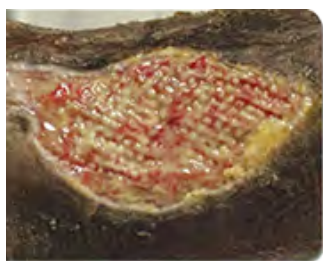
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Negative Pressure Therapy options: depending on the wound size and drainage output



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Oasis dressing

• WHAT IS OASIS?

- A natural extracellular matrix (ECM) derived from a single layer of ***porcine small intestinal submucosa** technology. The technology provides an intact three-dimensional extracellular matrix which allows for host cell migration.

• What to Expect: Caramelization

- Successful absorption of OASIS® Wound Matrix may form a caramel-colored or off-white gel
- **Do not remove this gel by debriding**
- This caramelization contains extracellular matrix, which continues to replace deficient and missing ECM in the wound
- Gently cleanse the wound surface with Normal Saline, then apply new OASIS® Wound Matrix if necessary

***Porcine material may be against religious beliefs (check with patient before using)**

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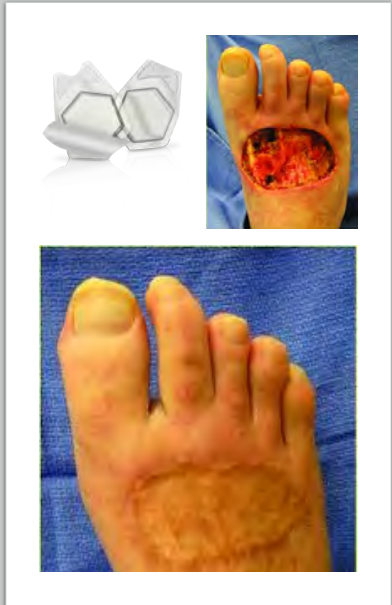
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Oasis wound
matrix:
porcine
based

Components*	Normal Physiological Function in Human Dermis ⁶⁻¹⁰	OASIS® Matrix	Human Dermis
Collagens			
Type I, III, IV, VI	Cell guidance and migration, structure and support	✓	✓
Elastin	Contributes to tissue elasticity	✓	✓
GAGs			
Heparin	Binds growth factors; anticoagulant	✓	✓
Hyaluronic acid	Maintains moisture, decreases inflammation	✓	✓
Chondroitin	Binds growth factors; cell adhesion and proliferation	✓	✓
Glycoproteins			
Fibronectin	Cell proliferation, migration, and attachment	✓	✓
Laminin†	Cell proliferation, migration, and attachment	✓	✓
Entactin	Cell proliferation, migration, and attachment	✓	✓
Proteoglycans			
Decorin	Regulates collagen fibril structure, cell migrators; binds growth factors	✓	✓
HSPG	Binds growth factors	✓	✓

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Promogran Prisma (ORC)

- PROMOGRAN PRISMA™ Matrix is comprised of a sterile, freeze dried composite of 44% oxidized regenerated cellulose (ORC), 55% **collagen** and 1% silver-ORC. Silver-ORC contains 25 % w/w ionically bound silver, a well-known antimicrobial agent.
- In the presence of exudate, PROMOGRAN PRISMA™ Matrix transforms into a soft, conformable, biodegradable gel, allowing contact with all areas of the wound.
- PROMOGRAN PRISMA™ Matrix maintains a physiologically moist microenvironment at the wound surface. This environment is conducive to granulation tissue formation, epithelialization and optimal wound healing.
- Ionically-bound silver is an antimicrobial agent.

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Directions for use:

- For optimal effect, apply directly to the whole wound bed.
- For a wound with low or no exudate apply PROMOGRAN® Dressing and hydrate with saline solution. This will initiate the transformation of the PROMOGRAN® Dressing into a gel matrix.
- After hydration, through exposure to wound exudate or saline, the gel matrix will come into contact with the wound surface.
- The dressing is biodegradable & naturally absorbed into the body over time, so no need to remove any residue during dressing changes.
- In order to maintain a moist wound healing environment, cover with a semi-occlusive dressing or a non-occlusive secondary dressing.
- After initial application, reapply PROMOGRAN® Dressing to the wound up to every 72 hours depending on amount of exudate.

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Increased circulation to enhance wound healing:

- Chronic wounds, including venous, arterial and diabetic ulcers often have impaired blood flow
- Non-healing venous ulcers correlate with impairment of the calf muscle pump
- There is evidence that improved blood circulation results in improved wound healing
- Increasing blood circulation increases Transcutaneous Oxygen Tension (TCpO₂) which is a predictor of tissue viability and ischemic wound healing
- The geko™ device increases venous, arterial and microcirculatory blood flow in the lower limb, reduces edema and increases TCpO₂- promoting conditions favourable for wound healing

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The geko® for hard-to-heal chronic wounds

- A wound has healed less than 30% in 4 weeks of care
- Compression cannot be tolerated or is contraindicated
- Patient has a fixed ankle joint or poor ankle flexion
- Lower limb muscle pumps are impaired or inactive
- Edema management has been a factor in wounds healing
- Wound, ischemia and edema may be the underlying cause of pain
- Patient has an increased risk of Venous Thromboembolism



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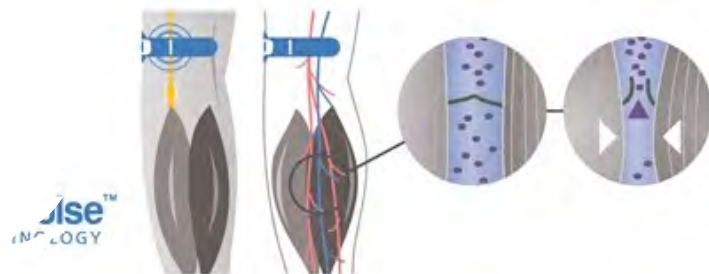
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The geko™ device - how it works

The geko™ device stimulates the common peroneal nerve activating the calf and foot muscle pumps increasing venous, arterial and microcirculatory blood flow.

The increase in blood flow is similar to that achieved by walking, up to 60%.

Small, light and comfortable to wear, the self-contained, battery powered geko™ device:
Has no wires or leads - no tripping hazard or restriction of movement
Weighs just 10g
Is easy and quick to fit
Silent operation

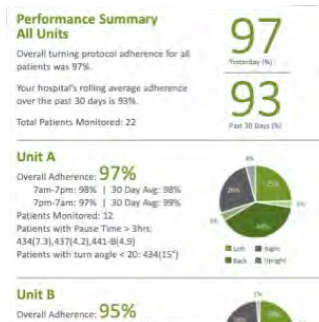


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LEAF® Patient Monitoring System

1. Wearable patient sensor: sitting, standing, lying on side or back, etc., as well as pedometer feature
2. Wireless network relays info from sensors to computer
3. User interface to monitor patient turn status
4. Automatic reports including progress towards mobility goals



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Who needs a Tricorder??



Canadian inventor of CloudDX,
Dr. Sonny Kohli

Sensor scanning, data recording and blood analysis, to list some of the features...

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Late breaking news...

wound healing and the circadian rhythm: daytime wounds heal faster...

Wounds that happen during the active phase of the circadian cycle heal more rapidly because cells are quicker to migrate and repair the damage
(Hoyle et al. 2017 | Science Translational Medicine)

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Something
to think
about...

Wounds occurring between 8pm and 8am took approx. **28** days to heal

Wounds occurring between 8am and 8pm healed in approximately **17** days.

Hypothesis: faster healing in the daytime is due the *body clock*, which moved skin cells faster to the wound site to aid in repair, as well as the heightened activity of proteins during that time of the day (more responsive during the active phase than during the resting phase).

Could there be some correlation with slow-to-heal chronic wounds?

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No matter
what the
future
holds,
follow the
principles.

The phases of the wound healing trajectory/continuum:

- Inflammatory/proliferative/maturation

The goals of wound treatment:

- **to heal IF POSSIBLE**
- If not, to prevent infection
- Prevent from deterioration of the wound
- Protect granulating tissue
- Remove slough/debris
- Reduce the bacterial load
- Maintain appropriate moisture balance ("not too wet, not too dry")
- Treat the **WHOLE** person, not just the **HOLE** in the person.

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Go forth and be enablers of Best Practice in
Wound Healing!



Contact: kohrconsulting@gmail.com

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