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## Levels of Evidence

### RNAO's

#### Assessment and Management of Venous Leg Ulcers Interpretation of Evidence

##### Levels of Evidence (1)

- A** Evidence obtained from at least one randomized controlled trial or meta-analysis of randomized controlled trials
- B** Evidence from well-designed clinical studies but no randomized controlled trials
- C** Evidence from expert committee reports or opinion and/or clinical experience or respected authorities. Indicates absence of directly applicable studies of good quality

### RNAO's

#### Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients

##### Levels of Evidence (2)

- Ia** Evidence obtained from meta-analysis or systematic review of randomized controlled trial
- Ib** Evidence obtained from at least one randomized controlled trial
- IIa** Evidence obtained from at least one well-designed controlled study without randomization
- IIb** Evidence obtained from at least one other type of well-designed quasi- experimental study, without randomization
- II** Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies
- IV** Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

**RNAO's**  
**Integrating Smoking Cessation into Daily Nursing Practice**  
**Levels of Evidence (3)**

- A** Requires at least two randomized controlled trials as part of the body of literature of overall quality and consistency addressing the specific recommendations.
- B** Requires availability of well conducted clinical studies, but no randomized controlled trials on the topic of recommendations.
- C** Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality.

**NICE and Scottish Intercollegiate Guidelines**  
**Surgical Site Infection – Prevention and Treatment of Surgical Site Infection**  
**Levels of Evidence (4) (5)**

- 1++** High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias
- 1+** Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
- 1-** Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
- 2++** High-quality systematic reviews of case-control or cohort studies; high-quality case-control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal
- 2+** Well-conducted case-control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal
- 2-** Case-control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal
- 3** Non-analytical studies (for example, case reports, case series)
- 4** Expert opinion, formal consensus

## 1. Objectives

The objectives of the development and implementation of these resources is to help Health Care Providers to:

- Find practical, evidence-based resources to use when caring for individuals that have a surgical wound
- Understand the importance of encouraging patient self-management in care
- Perform a holistic patient assessment
- If surgical wound is on a lower limb, arrange for a complete Lower Leg Assessment (LLA) including ABPIs in order to identify patient's ability to heal or need for referral to vascular surgeon. If patient is a diabetic, toe pressures should also be obtained.
- Perform accurate wound assessment including progress towards healing
- Recognize signs & symptoms of infection and identify treatment interventions
- Increase the use and implementation of evidence-based surgical wound treatment plans including pain management using pharmacological and non-pharmacological interventions
- Identify and implement appropriate topical wound care
- Implement surgical wound education in patient's initial and continuing care plan
- Improve the coordination and communication between care providers/care institutions regarding the transfer/discharge plan for patients with surgical wounds

## 2. Background

From April 2013 until March 2014, surgical wound care costs in Waterloo Wellington region doubled from the previous year costing the Community Care Access Centre 1.5 million dollars. A significant number of nursing visits were required for over 1544 patients with surgical wounds at an average cost per client of almost \$1000. The average length of stay requiring community wound care for patients with surgical wounds in Waterloo Wellington was 53 days. (6)

It is estimated that 75% of all surgical procedures are performed on an outpatient basis. With shorter lengths of stay, increased acuity, patients with multiple comorbidities, higher body mass indexes and people living to advanced age, the community resources are being strained.

“Surgical site infections are the third leading cause of hospital-acquired infections in Canada.”

(7)“Wound infections increase hospital-related nursing costs by up to 50 percent and inpatient hospital costs directly related to the wound by almost \$4000 per infection.” (7) The ability to treat wounds using evidence-based best practices and to identify signs of infection in the community is paramount. (7)

### Best Practices for Assessment and Treatment of Surgical Wounds

In 2010, Orsted, Keast et al developed *Best Practice Recommendations for the Prevention and Management of Open Surgical Wounds* in Wound Care Canada. *Woundpedia* has developed evidence-informed recommendations for surgical wounds using evidence-based research findings. (8) In 2008, the National Institute of Health and Clinical Excellence (NICE) in the United Kingdom commissioned *Surgical Site Infection – Prevention and treatment of surgical site infection* clinical guideline to be developed. The following guidelines utilize these best practice recommendations as well as those recommended by the Waterloo Wellington Community of Practice Collaborative.

All clinicians are expected to use best practices to assess and treat surgical wounds to improve patient outcomes. The framework used in this guideline was applied from the Registered Nurses Association of Ontario (RNAO). The RNAO Clinical Best Practice Guidelines “Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients” (2010) (2) was also used for self-management section. A complete list of references used can be found in the appendices.

[Link to Orsted/Keast Recommendations](#)

[Link to Woundpedia Surgical Wound Site](#)

[Link to NICE Guidelines](#)

[Link to RNAO’s Self-Management Strategies](#)

- a. Best Practice Recommendations for the Prevention and Management of Open Surgical Wounds. Canadian Association of Wound Care (CAWC)
- b. Clinical Best Practice Guidelines Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients
- c. CAWC Best Practice Enabler and Quick Reference Guide

## d. Wound Bed Preparation Paradigm

The wound bed preparation (WBP) paradigm is used to assess, diagnosis, and treat wounds while considering patient concerns. (7) It links evidence-based literature, expert opinion, and clinical experiences of respected wound care specialists. The framework is beneficial because the components are interrelated and can be re-evaluated if the wound deviates from the care plan. Furthermore, the interprofessional team is able to collaborate together through shared discussion to classify a healable, maintenance, and non-healable wound.

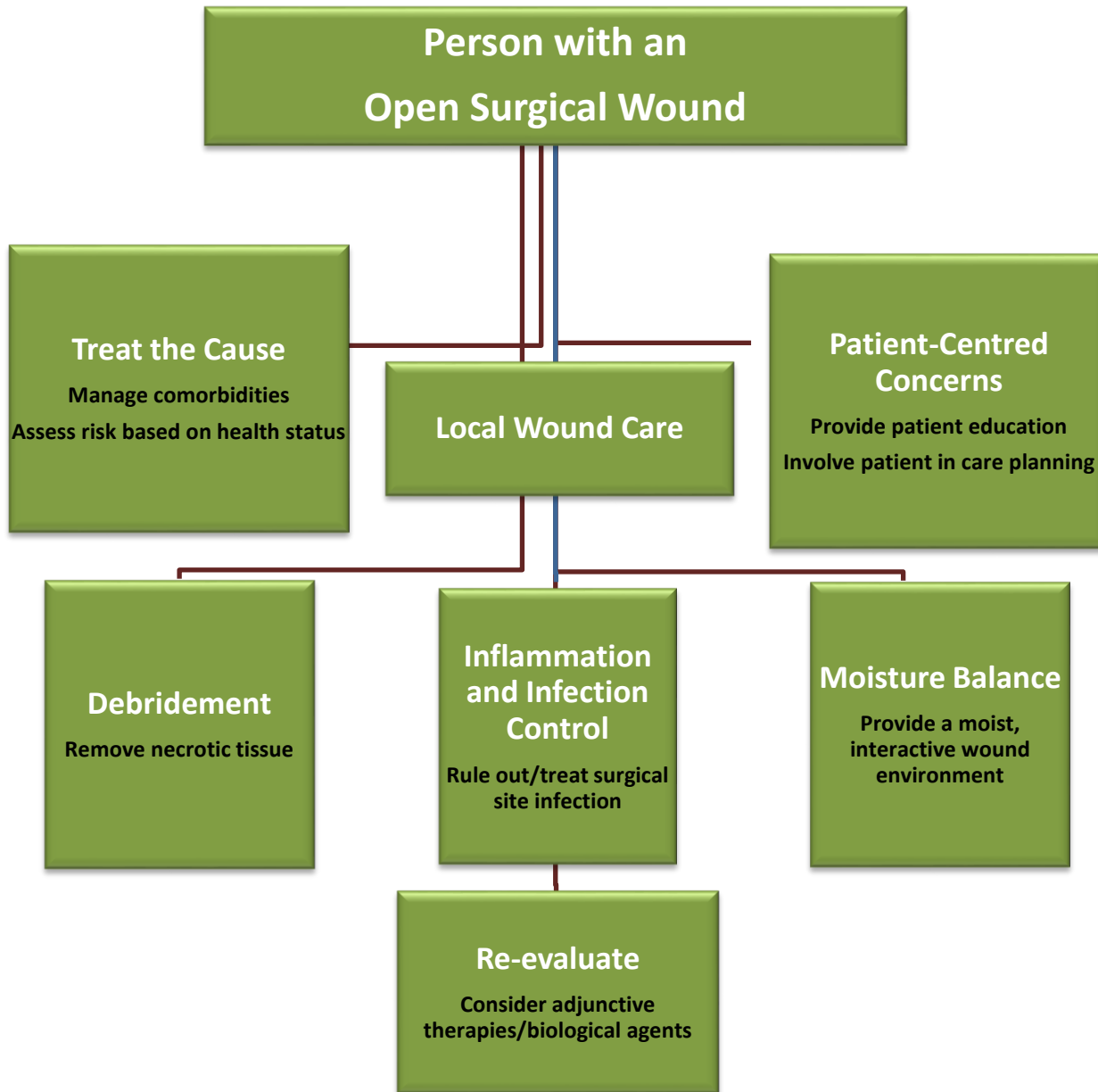


Figure 1: Adapted from:  
Orsted et al, Best Practice Recommendations for the Prevention and Management of Open Surgical Wounds,  
Wound Care Canada, Volume 8 Number 1, 2010

### 3. **Address Patient-Centered Concerns (3) (7) (9)**

Level B, C: RNAO's Assessment and Management of Venous Leg Ulcers

Level Ia, Ib, III: RNAO's Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients

#### **a Assess Psychosocial Needs /Pain and Quality of Life (QOL)**

**“For patients with open surgical wounds, comfort is paramount to support the activities of home and work life while supporting the patient psychosocially” (7)**

- Communicate with patients, their caregivers and significant others to identify patient-centered goals to determine realistic expectations for healing or non-healing outcomes.
- Assess pain and in collaboration with patient and caregivers, create a pain relief plan (9)
- Assess quality of life (QOL) (see Toolkit Item #10a and #10b for assessment forms) and screen for mental health concerns (i.e. depression see Toolkit Item #11 for assessment forms)
- Encourage and provide ongoing support for smoking cessation if applicable (see Toolkit Item #7a for Smoking, Chronic Wound Healing, and Implications for Evidence-Based Practice – McDaniel and Browning, Toolkit Item #7b for Checklist to readiness to quit smoking, see Toolkit Item #7c for Applying 5 A's to smoking cessation, see Toolkit Item #7d for WHY test, see Toolkit Item #7e for smoking cessation medication comparison chart and see Toolkit Item #7f for Strategies to avoid relapse). (3)

RNAO BPG Assessment and Management  
of Pain

RNAO BPG Integrating Smoking Cessation into  
Daily Nursing Practice



**b Socioeconomic Determinants of Health** (see Toolkit Item #5 for Canadian Nurses Association *Social Determinants of Health and Nursing: A Summary of Issues*)

- Provide education to patients, caregivers and significant others for care and the management of a surgical wound.
- Assess for the presence or absence of social support system for treatment of surgical wounds.

Health is a resource for everyday life and is influenced by the determinants of health: income, social status, support networks, education, employment and working conditions, health services, healthy child development, physical environment, gender, culture, genetics, and personal health practices. (10) Unemployment, lack of sick benefits, job insecurity, low income, and homelessness can deter healing and cause more stress. For example, money is needed to purchase adequate food that is vital for wound healing. Patient may need a referral for a social worker to assist with finances.

The following questions could assist in assessing your patient's financial concerns:

- Do you have benefits from any other sources to cover cost of compression stockings, medical drugs, parking fees, food allowance (e.g. work place or private Insurance, Veterans Affairs Canada, Aboriginal Affairs, Workers Safety and Insurance Board (WSIB), Trillium Drug Plan, Ontario Disability Support Program (ODSP))
- Are you the sole bread-winner in your family?
- How often have you used the food bank or soup kitchen this month?
- Do you have sick-time benefits or unemployment insurance?
- Would you like a referral to Meals on Wheels or information on food bank/soup kitchen?

### Social Supports

There is evidence to suggest that strong supportive networks improve health and healing. Patients who have limited social support are more at risk for depression, greater risk for complications, decreased well-being, poor mental health and physical health. Furthermore, patients who are disabled, migrants from other countries, ethnic minorities and refugees are vulnerable to racism, discrimination and hostility that may harm their health. Patients who have stigmatizing conditions such as mental health, addictions (street drug use, methadone patients and cigarette smokers), and diseases such as HIV/AIDS suffer from higher rates of poverty and limited supports.

The following questions could assist in assessing your patient's support system:

- ▮ Do you have someone to help you? Friend, family, neighbor and/or church member?
- ▮ Do you feel down or depressed?
- ▮ Have you ever had thoughts of harming yourself?
- ▮ Do you have transportation to receive medical follow-up and to obtain groceries?
- ▮ Do you have someone to help you with your personal care such as showering?
- ▮ Do you have someone to get your groceries, housekeeping and other necessities?
- ▮ Are you afraid of your partner or family member?
- ▮ Would you like a referral to a social worker or case worker?

Canadian Nurses Association Social Determinants of Health and Nursing: A Summary of Issues

### c. Self-management

- Assess level of patient's self-management skills

The focus of self-management is to allow the patient to self-identify concerns and to address concerns collaboratively with nurses and health professionals. Fostering and promoting independence is strongly encouraged but the patient and caregiver will need to be assessed by health professional for cognitive and physical ability.

Review for independence or need for ongoing assistance with the following:

- Barriers to participate (poor eyesight, physical limitations, transportation, socioeconomic, social environment, cognitive ability, other co-morbidities)
- Decreased sensory perception
- Review importance and potential barriers to smoking cessation at every visit
- Adequate hygiene skin exposed to moisture, perspiration
- Home Environment
- Wound care
- Nutrition
- Equipment (IV, NPWT etc)
- Post op medical device application and removal (compression, binders etc.)
- Social/medical/family/employment obligations

Ensure that coping strategies have been implemented into care

- Patient's concerns and fears
- Promoting independence to avoid practitioner/caregiver dependency
- Signs of anxiety or other mental health issues (eg. delusions, hallucinations, paranoid behaviour)
- Depression screen using Geriatric Depression Scale assessment form –GDS15

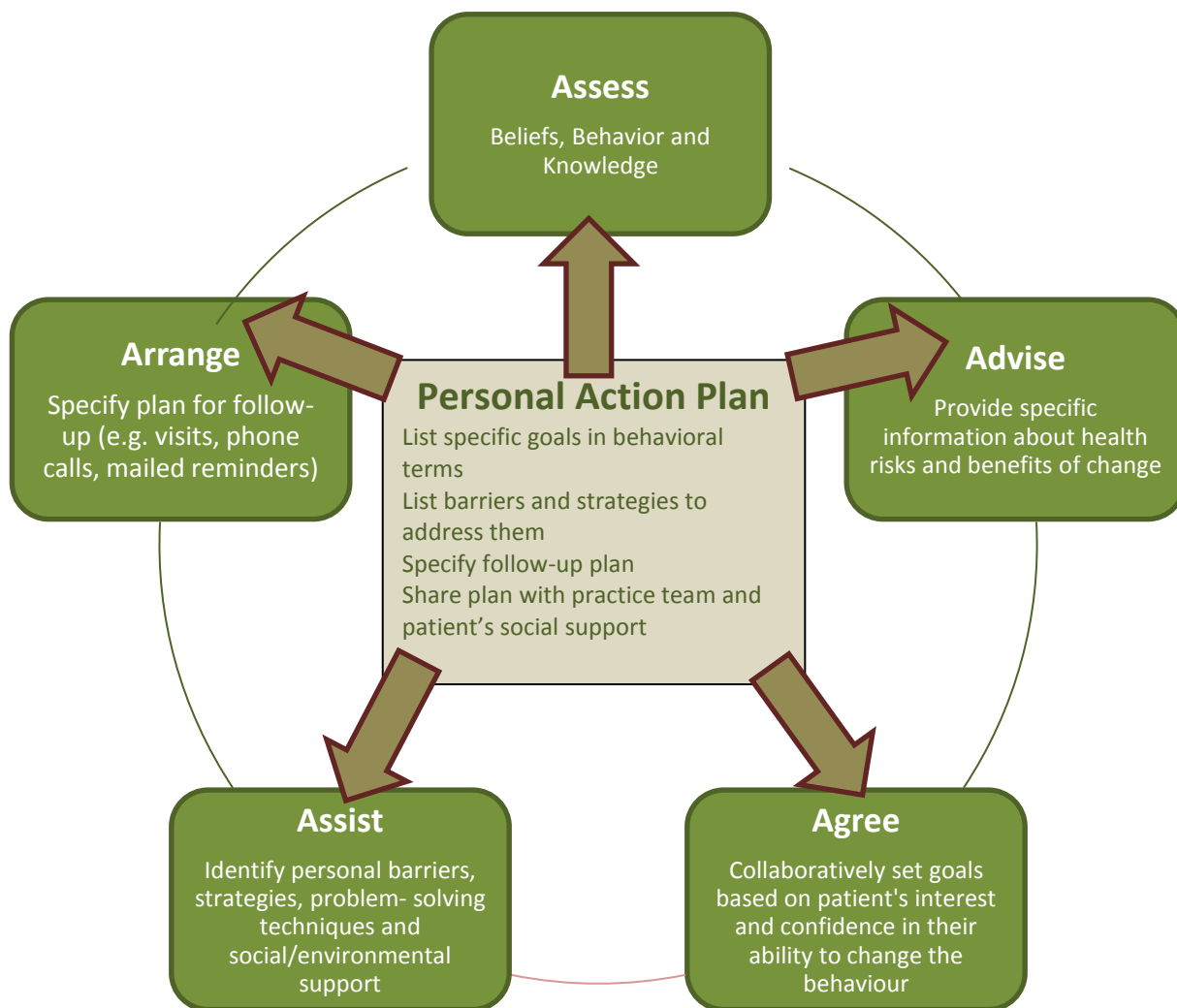
- Suicide assessment if applicable
- ETOH and illicit/recreational drug use
- Check for availability for financial funding (e.g. private insurance, ADP, veterans medical benefits, Ontario Disability Support Program –ODSP, Non-Insured Health Benefits -NIHB and Southern Ontario Aboriginal Diabetes Initiative – SOADI for First Nations people and Inuit)

The Self-management Initiative, through the Ontario Ministry of Health and Long-Term Care (MOHLTC), is an integrated, comprehensive strategy aimed at preventing and improving management of chronic conditions in Ontario. The goal of this cost-free program is to provide education and skills training workshops to both health care providers and patients with chronic conditions. For more information, please call 1-866-337-3318 or [www.wwselfmanagement.ca](http://www.wwselfmanagement.ca).

Self-Management Initiative  
Link for Patients

Self-Management Initiative  
Link for Health Care Providers

## 5 A's of Behavioural Change



These activities are not necessarily linear with each step following the other sequentially. The goal of the 5 A's, in the context of self-management support, is to develop a personalized, collaborative action plan that includes specific behavioural goals and a specific plan for overcoming barriers and reaching those goals. The 5 A's are elements that are interrelated and are designed to be used in combination to achieve the best results especially when working with patients in complex health and life situations.

Figure 2: RNAO Clinical Best Practice Guideline: Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients (2)

## 1. ASSESS

Beliefs, Behavior and Knowledge

- Establish rapport with patients and families
- Screen for depression on initial assessment, at regular intervals and advocate for follow-up treatment of depression
- Establish a written agenda for appointments in collaboration with the patient and family, which may include:
  - a) Reviewing clinical data
  - b) Discussing patient's experiences with self-management
  - c) Medication administration
  - d) Barriers/stressors
  - e) Creating action plans
  - f) Patient education including assessing learning style
- Consistently assess patient's readiness for change to help determine strategies to assist patient's readiness for change to help determine strategies to assist patient with specific behaviours
- Identify patient specific goals

## 2. ADVISE

Provide specific information about health risks and benefits of change

- Combine effective behavioural, psychosocial strategies and self-management education processes as part of delivering self-management support
- Utilize the "ask-tell-ask" (also known as Elicit-Provide-Elicit) communication technique to ensure the patient receives the information required or requested
- Use the communication technique "Closing the Loop" (also known as "teach back") to assess a patient's understanding of information
- Assist patients in using information from self-monitoring techniques (e.g., glucose monitoring, home blood pressure monitoring) to manage their condition
- Encourage patients to use monitoring methods (e.g., diaries, logs, personal health records) to monitor and track their health condition
- Identify community resources for self-management (e.g., support groups)

## 3. AGREE

Collaboratively set goals based on patient's interest and confidence in their ability to change the behaviour

- Collaborate with patients to:
  - a) Establish goals
  - b) Develop action plans that enable achievement of SMART goals (see below)
  - c) Establish target dates for success of goals and reassessment
  - d) Monitor progress towards goals

## SMART Goals

### **Specific**

A specific goal is detailed, focused and clearly stated. Everyone reading the goal should know exactly what you want to learn.

### **Measurable**

A measurable goal is quantifiable, meaning you can see the results.

### **Attainable**

An attainable goal can be achieved based on your skill, resources and area of practice.

### **Relevant**

A relevant goal applies to your current role and is clearly linked to your key role responsibilities.

### **Time-limited**

A time-limited goal has specific timelines and a deadline. This will help motivate you to move toward your goal and to evaluate your progress

[College of Nurses SMART Goals Link](#)

## 4. ASSIST

Identify personal barriers, strategies, problem-solving techniques and social/environmental support

- Use motivational interviewing with patients to allow them to fully participate in identifying their desired behavioural changes
- Teach and assist patients to use problem-solving techniques
- Be aware of community self-management programs in a variety of settings, and link patients to these programs through the provision of accurate information and relevant resources

## 5. ARRANGE

Specify plan for follow-up (e.g., visits, phone calls, mailed reminders)

- Arrange regular and sustained follow-up for patients based on the patient's preference and availability (e.g., telephone, email, regular appointments). Nurses and patients discuss and agree on the data/information that will be reviewed at each appointment and share with other interdisciplinary team members involved
- Use a variety of innovative, creative and flexible modalities with patients when providing self-management support such as:
  - a) Electronic support systems
  - b) Printed materials
  - c) Telephone contact
  - d) Face-to-face interaction
  - e) New and emerging modalities

- Tailor the delivery of self-management support strategies to the patients' culture, social and economic context across settings
- Facilitate a collaborative practice team approach for effective self-management support
- Share with caregiver/family members/circle of care

## Stages of Change Model

Stage in Transtheoretical Model of Change	Patient Stage
<b>Pre-contemplation</b>	Not thinking about change May be resigned Feeling of no control Denial: does not believe it applies to self Believes consequences are not serious
<b>Contemplation</b>	Weighing benefits and costs of behavior, proposed change
<b>Preparation</b>	Experimenting with small changes
<b>Action</b>	Taking a definitive action to change
<b>Maintenance</b>	Maintaining new behavior over time
<b>Relapse</b>	Experiencing normal part of process of change Usually feels demoralized

Table 1: RNAO Clinical Best Practice Guideline: Strategies to Support Self-Management in Chronic Conditions: Collaboration with Clients (2)

## **There are 3 self-management strategies that health professionals can use to promote self-management in patients with surgical wounds (2)**

### **1. Motivational Interviewing** (assess patient-centered concerns) (See Toolkit Item #6 for worksheet)

The following questions could assist in assessing your patient's concerns:

- What is your most important problem or concern? (It may not be related to the wound)
- Do you have a history of depression? Are you depressed now?
- What has worked in the past and what did not work?
- Why do you want to change and how hard are you willing to work?
- Are you willing to make the changes in your lifestyle to improve your health?
- What might prevent you from working hard on this (e.g., barriers that are present)

Choose the areas that you would like to work on:

- Improve physical activity
- Self-management of wound care
- Practice leg exercises
- Purchasing, wearing and caring for my prescribed garments/devices
- Donning and doffing prescribed post-surgical garments/devices
- Nutrition
- Leg elevations
- Skin care
- Control weight
- Stop smoking
- Prevention of new ulcers
- Managing co-morbidities
- Alternative therapy modalities
- Work modifications
- Increase social activities
- Signs and symptoms of infection
- Control pain

How willing are you to set goals and make changes in lifestyle on a scale of 1-10?

What is it that you find most difficult about living with a surgical wound and how can I help you?

### **2. Goal Setting**



- Provide specific health information and health risks requested from patient and family.
- Collaboratively develop with patient and multidisciplinary team a Personal Action Plan
- Set **SMART** Goals (**S**pecific, **M**easurable, **A**chievable, **R**elevant and **T**imely)
- Try to make goals small enough to achieve success

### Personal Action Plan

1. List specific goals in behavioral terms
2. List barriers and strategies to address them
3. Specify Follow-up Plan
4. Share plan with practice team and client's social support

### 3. Problem Solving

- Assist with problem solving to help identify barriers and enlist family/social support
- Ascertain financial barriers
- Arrange for follow-up visits to review goals and discuss challenges
- Encourage healthy coping such as yoga, music, counselling, friends, and family support

[College of Nurses SMART Goals Link](#)

[RNAO BPG Self- Management Link](#)

### 4. Identify and Treat the Cause

#### Level C: RNAO's Interpretation of Evidence (1)

#### 4.1 Assessment of Surgical Site infections (SSI)

#### Classifications of Surgical Wounds (7)

##### Clean (1-2% infection rate)

- Surgery does not enter colonized viscus or body cavity and there are no breaks in surgical technique

##### Clean-contaminated (6-9% infection rate)

- Surgery does enter colonized viscus or body cavity but under elective or controlled conditions

##### Contaminated (13-20% infection rate)

- Gross contamination at the operative site in the absence of clinical infection or there are breaks in surgical technique

##### Dirty/Infected (40 % infection rate)

- Active infection already present during surgical procedure

## Categories of Surgical Site Infections (SSIs)

<p><b>Category 1</b></p> <p><b>Superficial Incisional</b></p>	<ul style="list-style-type: none"> <li>• Involves skin &amp; subcutaneous tissue</li> <li>• Occurs within 30 days of surgery</li> <li>• Has at least 1 of the following:               <ol style="list-style-type: none"> <li>1. Purulent drainage</li> <li>2. Organism isolated from aseptic obtained culture</li> <li>3. At least one of Pain/tenderness, localized swelling, redness or heat</li> <li>4. Superficial incision opened by surgeon unless the incision culture is negative</li> </ol> </li> <li>• Diagnosis of a superficial incisional SSI by surgeon or attending DR/NP</li> </ul>
<p><b>Category 2</b></p> <p><b>Deep Incisional</b></p>	<ul style="list-style-type: none"> <li>• Involves deep soft tissue, including fascia and muscle</li> <li>• Occurs within 30 days of surgery in no implant used or within 1 year if implant is in place</li> <li>• Has at least 1 of the following:               <ol style="list-style-type: none"> <li>1. Purulent drainage</li> <li>2. Deep incision spontaneously dehisces or is deliberately opened by surgeon when patient has at least 1 of the following:                   <ul style="list-style-type: none"> <li>• Fever &gt; 38° C or localized pain</li> <li>• Evidence of infection (e.g. abscess) involving deep tissue found during examination, during re-operation or by histopathologic or radiologic examination</li> </ul> </li> </ol> </li> <li>• Diagnosis of deep incisional SSI by surgeon or attending DR/NP</li> </ul>
<p><b>Category 3</b></p> <p><b>Organ/Space</b></p>	<ul style="list-style-type: none"> <li>• Involves any part of the body that does not include deep tissue, muscle or fascia that has been opened or manipulated during surgery</li> <li>• Occurs within 30 days of surgery in no implant used or within 1 year if implant is in place</li> <li>• Has at least 1 of the following:               <ol style="list-style-type: none"> <li>1. Purulent drainage from a drain that is placed through a stab sound into the organ/space</li> <li>2. Organisms isolated from an aseptically obtained culture</li> <li>3. Evidence of infection (e.g. abscess) involving organ/space found during direct examination, re-operation or by histopathologic or radiologic examination</li> </ol> </li> <li>• Diagnosis of an organ/space SSI by surgeon or attending DR/NP</li> </ul>

### Acute Surgical Site Infection (7) (4)

- Rarely occur in the first 48 hours after surgery
- Fever that may occur during first 48 hours may be due to non-infectious/unknown causes
- Usually occur within 30 days of surgery
- May occur up to a year after surgery if implant was used

### Risks of antibiotic treatment (4)

1. Adverse drug reaction/allergy

2. Risk of C. difficile diarrhea
3. Antibiotic-resistance

#### **First line of antibiotics (4)**

- Also called 'empirical' or 'blind' therapy
- Should cover most likely infecting pathogen
- Identify allergies
- Patient's clinical status including recent antibiotic history
- Broad-spectrum covering staph aureus (most common cause of SSI)

#### **After clean-contaminated surgery with mucosal surfaces (4)**

- Empirical antibiotic regimen that includes:  
Metronidazole, Amoxiclav or Piperillin-tazobactam

#### **Methicillin-resistant staph aureus (MRSA)**

- Should be treated with empirical antibiotic regimen that includes treatment against locally prevalent strains of MRSA

#### **Culture and sensitivity reports**

- After reports have been received, review results to ensure proper coverage of antibiotics

Treatment for Acute Surgical Site Infections		
<p><b>Under 48 hours post-surgery</b></p>	<p>Soft tissue emergency</p> <p>Urgent surgical consult</p> <p>Consultation with pharmacist as necessary</p>	<p>Consider using:</p> <ul style="list-style-type: none"> <li>• Penicillin G and Clindamycin</li> <li>• Cefazolin and Metronidazole</li> <li>• Vancomycin and Metronidazole</li> </ul>
<p><b>Over 48 hours post-surgery</b></p>	<p>Open wound and culture for microorganisms</p> <p>Consider ultrasound to rule out abscess</p>	<p>For procedures conducted above waist consider using:</p> <ul style="list-style-type: none"> <li>• Cefazolin</li> <li>• Clindamycin</li> <li>• Vancomycin</li> </ul> <p>For procedures involving abdomen, perineum, genitourinary tract or lower extremities consider using:</p> <ul style="list-style-type: none"> <li>• Cefazolin and Metronidazole</li> <li>• Cefazolin and Clindamycin</li> <li>• Clindamycin and Ciprofloxacin</li> <li>• Vancomycin and Metronidazole and Ciprofloxacin</li> </ul>

Table 2: Treatment of Acute SSIs (adapted) (7)

### Chronic Surgical Wound (4) (7)

- Deviates from expected sequence of tissue repair
- May include infected or dehisced surgical wounds
- Described as being 'stuck' in prolonged inflammatory phase
- Exudate no longer beneficial (may block cell proliferation and degrade matrix in wound)

### Chronic Surgical Site Infection (7)

- Requires team approach
- Treatment based on:
  1. Duration of wound (usually over 1 month)
  2. Location of wound
  3. Type of infection
- Surgical intervention may be required to:

1. Remove devitalized tissue or infected foreign material
2. Close a fistula
3. Drain or remove sinus tract

- Multi-resistant microorganisms (MRSA, gram negative bacteria or fungi) may be involved
- Long-term antibiotics may be required
- Patients frequently require rehabilitation

**Increased localized pain is a significant predictor of deep compartment infection**

	Symptoms	Signs
<b>Acute Surgical Site Infection (&lt;30 days)</b>	<ul style="list-style-type: none"> <li>• Localized heat</li> <li>• Pain/tenderness</li> <li>• Redness</li> <li>• Swelling</li> </ul>	<ul style="list-style-type: none"> <li>• Purulent drainage</li> <li>• Fever (&gt;38.5)</li> <li>• Spontaneous dehiscence (category 2 or 3)</li> <li>• Wound opened by surgeon</li> <li>• Surgeon confirms SSI present</li> <li>• Abscess may be present</li> </ul>
<b>Chronic Surgical Site Infection (&gt;30 days)</b>	<ul style="list-style-type: none"> <li>• Pain</li> <li>• Decline in function</li> <li>• Fever may be absent</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of healing</li> <li>• Unresolved dehiscence</li> <li>• New sinus or fistula formation</li> <li>• Persistent wound drainage</li> <li>• Presence of foreign body</li> <li>• Presence of devitalized tissue</li> <li>• Poor local vascularity</li> <li>• Persistent odour</li> <li>• Absence of healing</li> <li>• Infected prosthetic implant</li> </ul>

Table 3: Acute versus Chronic SSIs adapted (7)

**4.2 Factors that affect healing**

**a. Risk Factors that may cause surgical wounds to open, develop infection or stall healing (7)**

- Diabetes
- Obesity
- Tobacco and nicotine use
- Vascular status
- Infection

- Multiple co-morbidities
- Medications
- Renal failure
- History of radiation treatments
- Use of internal grafts/implants
- Emergent surgery
- Re-exploration of wound
- Prolonged surgical time
- Prolonged ventilation during surgery
- Psychosocial factors (anxiety, depression, social isolation, low economic status and pain)
- Use of blood products
- Type of Surgery (i.e. clean, clean- contaminated, contaminated or dirty and infected)
- Inappropriate use of cleansers or wound dressings
- Coincident remote site infections
- Systemic use of steroids
- Extremes of age
- Nutritional deficits

**b. Odds Ratio of Surgical Wounds NOT Healing in 24 weeks (7)**

A good prediction of healing is 20- 40 % reduction in size within first 2-4 weeks.

If acute surgical wounds fail to heal within 30 days, they are considered chronic wounds.

**Factors that may affect healing potential**

**Local**

- Presence of necrosis, foreign body and/or infection
- Disruption of microvascular supply
- Cytotoxic (toxic to cells) agents

**Host**

- Co-morbidities (i.e. inflammatory conditions, nutritional insufficiencies, peripheral vascular or coronary artery disease)
- Adherence to plan of care by patient and caregivers
- Cultural and personal belief systems

**Environment**

- Access to care
- Family support
- Healthcare sector
- Geographic
- Socioeconomic status

### **Medications that can affect healing include:**

- chemotherapy
- anticoagulants
- antiplatelets
- corticosteroids
- vasoconstrictors
- antihypertensives
- diuretics
- immunosuppressive drugs
- Other medications used to treat acute episodic illnesses may affect healing (eg. antibiotics, colchicine, anti-rheumatoid arthritics)

### **Predictors of delayed healing (7)**

- Tobacco and nicotine use
- Poor nutritional status
- Increased BMI
- Wound bed too wet/desiccated causing a breakdown of extracellular matrix proteins and growth factors
- Prolonged inflammation
- Psychosocial factors (anxiety, depression, social isolation, low economic status and pain)
- Wound bed temperature decrease
- Infection
- Edema
- Seroma/hematoma/abscess
- Wound tension
- Wound trauma
- Presence of drainage devices

## **4.3 Complete a Holistic Assessment**

### **Level C: RNO's Interpretation of Evidence (1)**

- Information obtained should be documented in a structured format assessment form
- Should be undertaken by healthcare professional(s) trained and experienced in surgical wound management

#### **a. Obtain a comprehensive patient history including:**

- Medical history
- Family medical history
- History of deep vein thrombosis (DVT) and/or lower leg injury
- History of episodes of chest pain, hemoptysis or pulmonary embolus
- History of heart disease, stroke or transient ischemic attack (TIA)
- Comorbidities
- Pain

- Where patient sleeps at night
- History
- Surgical procedure and wound care history
- Current and past medications (Prescription, non-prescription, naturopathic, vitamin/mineral supplementation and illicit drug use including e-cigarettes, inhaled substances and nicotine replacement therapy)
- Nutritional status
- Allergies
- Psychosocial status including quality of life
- Functional, cognitive, emotional status and ability for self-care
- Lifestyle (activity level, interests, employment, dependents, support system)

### **Transfer of care communications received and reviewed**

- Wound history
- Wound measurements and percentage of healing (initial and current measurements)
- Dressing and treatment history
- Medication use
- Diagnostic/vascular/lab results
- Discharge summary
- Consultation notes
- Care plan
- Details of surgery and complications
- Nursing notes re: dressing changes etc.

### **Diabetes**

#### **Home glycemic control and monitoring if patient is diabetic**

- Blood Sugar (BS) and A1C are within recommended range per responsible physician or NP
- Use of glucose log book (Diabetes Passport/Diabetic Log Book)
- Adequate insulin supplies
- Glucometer and required supplies
- Assess for barriers in monitoring glycemic control
- Community/health resources
- Diabetic Education Program

[Link to Waterloo Wellington Diabetes Directory](#)

[Link to Waterloo Wellington Diabetes Patient Self-Referral](#)

[Link to Waterloo Wellington Diabetes Medical Professional Referral](#)

#### **b. Complete a comprehensive physical examination including:**

- Blood Pressure, height, weight, all pulses including foot and ankle
- Review bloodwork that should include the following:



<b>Protein-Calorie Malnutrition</b>	<ul style="list-style-type: none"> <li>▮ Pre-albumin if available (low scores indicate <u>risk</u> for malnutrition)</li> <li>▮ Serum albumin level (&lt;30g/l will delay healing; &lt;20g/l will be non-healable)</li> <li>▮ C-reactive Protein (CRP)</li> </ul>	
<b>Check for anemia</b>	<ul style="list-style-type: none"> <li>▮ CBC (including RBC, Hct, Hgb, MCV, Platelets etc.)</li> </ul> <p>If anemic, proceed to checking →</p>	<ul style="list-style-type: none"> <li>▮ Serum Iron</li> <li>▮ Total Iron Binding</li> <li>▮ Ferritin</li> <li>▮ Transferrin</li> <li>▮ B<sub>12</sub></li> <li>▮ Red blood cell folate level</li> </ul>
<b>Kidney function (To check hydration)</b>	<ul style="list-style-type: none"> <li>▮ BUN</li> <li>▮ Creatinine</li> <li>▮ Potassium</li> </ul>	

**c. If surgical wound is on lower leg:  
Complete a lower leg assessment  
Level A: RNAO's Interpretation of Evidence (1)**

Perform a **BILATERAL** lower leg assessment including ABPI/TPBI

“All clinicians involved in the management of patients with lower limb ulcers should have direct access to an 8 MHz hand held Doppler device. This should not be considered a special investigation limited to vascular laboratory” (11)

Assess for the following:

- ABPI/TBPI or arterial vascular studies have been completed within last 3 mths and results documented
- If unable to obtain ABPI/TBPI, referral to vascular surgeon is recommended
- Assess pulses (popliteal – behind knee , dorsalis pedis – top of foot , posterior tibial – medial ankle)
- Assess capillary refill (normal less than 3 seconds)
- Leg measurements (foot, ankle, calf, thigh) to assess edema
- Ankle range of motion (ROM)
- Foot deformities
- Ankle flare
- Skin temperature (compare both legs)
- Skin colour (dependent and on elevation)
- Interdigital spaces
- Drainage on socks
- Presence of pain
- Nail changes (thicker, dry, crumbly, presence of fungal infection)
- Presence of hair on lower leg, feet and toes
- Presence of varicosities (varicose veins)

- Dermatological changes due to impaired blood flow
- History of compression
- Sudden onset of pain
- Repeat ABPI/TBPI assessment every 3 months if healing is not progressing

[Link to Video for Performing ABPI & Waveform Identification](#)

Perform ABPI/TBPI to assess healability and to rule out arterial disease. If patient is a diabetic, toe pressures should be obtained.

An Ankle Brachial Pressure Index (ABPI) measurement should be performed by a trained practitioner to rule out the presence of peripheral arterial disease, particularly prior to the application of compression therapy. ABPI measurement offers valuable information as a screening tool for lower extremity peripheral arterial disease. (11)

## Ankle Brachial Pressure Index (ABPI) / Toe Brachial Pressure Index (TBPI) Interpretations

### ABPI

**> 0.9-1.2 ....Normal (1.2 or > could indicate calcification, seen in diabetes, patients that smoke, hypertension, rheumatoid arthritis, systemic vasculitis or advanced age )**

**0.80-0.9 .....Mild ischemia (inflow disease may be present)**

**0.50-0.79 ....Moderate ischemia (Would benefit from vascular surgeon consult to expedite wound healing)**

**0.35-0.49 ....Moderately severe ischemia (Urgent vascular surgery consult recommended)**

**0.20-0.34 ....Severe ischemia (Urgent vascular surgery consult recommended)**

**<0.20 .....Likely critical ischemia, but absolute pressure and clinical picture must be considered (Urgent vascular surgery consult recommended)**

### TBPI:

**> 0.7 .....Normal > 0.7**

**0.64 - 0.7.....Borderline**

**< 0.64..... Abnormal indicating arterial disease (Urgent vascular surgery consult recommended)**

Lower Leg Vascular Assessment	Right		Left	
<p>RNAO recommends a 3 month complete reassessment if no evidence of healing and a 6 month reassessment for resolving and healing (but not yet healed) wounds</p> <p>If ulceration does not heal or show improvement after 3 months and patient has an Ankle Brachial Pressure Index (ABPI) of &gt; 0.8 to 1.3, a referral to a vascular surgeon to review potential surgical interventions is recommended</p>	ABPI:	TBPI:	ABPI:	TBPI:

### Further Investigation Required

#### Level C: RNAO's Interpretation of Evidence (1)

An Ankle Brachial Pressure Index (ABPI) >1.2 and <0.8 warrants referral for further medical assessment. People with abnormally low or abnormally high ABPI should be further investigated for peripheral arterial disease. For example, an ABPI >1.3 is considered indicative of non-compressible vessels that are found in individuals with diabetes, chronic renal failure and who are older than 70 years of age. In these cases, compression therapy may not be recommended. (1)

ABPI 0.5 to 0.8      TBPI 0.64 to 0.7  
**Suggest Transcutaneous Oxygen Pressure(TcPo<sub>2</sub>), Laser Doppler Flowmetry, Doppler Arterial Waveforms or Segmental Doppler Pressure studies**

ABPI <0.5      TBPI <0.64  
**Urgent vascular surgical consult needed**

**Referrals to vascular lab may be required for the following investigations:**

**Transcutaneous oxygen (TCPO<sub>2</sub>)**

- Measures partial pressure in adjacent areas of the wound
- Considered reliable method to measure the viability of tissue except where acute edema or inflammation is present
- Tissue hypoxia results TCPO<sub>2</sub> <40 mmHg
- Critical ischemia TCPO<sub>2</sub> <30 mmHg

**Laser Doppler Flowmetry**

- Useful in cases where false readings obtained in TCPO<sub>2</sub> (where acute edema or inflammation is present)

**Doppler Arterial Waveforms**

- Non-invasive
- Demonstrates the normal tri-phasic signal of the pulse

**Segmental Doppler Pressures**

- Determines location of vascular lesion
- Pressures measured at thigh, above knee, calf and ankles
- Results compared with each other and with other leg

**Imaging Studies (Angiography)**

- Determines location and extent of disease
- Used by surgeon to provide roadmap in deciding and planning revascularization of the limb

**d. Assess the Wound and Peri-wound**

Wound and Peri-wound Assessment is best performed using a validated and reliable wound assessment tool. (See Toolkit item #8a for Bates-Jensen Wound Assessment Tool)

A comprehensive wound assessment should include observation and documentation of the following: (1)

1. Location
2. Odour

3. Sinus Tracts (including undermining and tunneling): Measurement can be obtained by gently inserting small probe into sinus tract, marking probe with end of finger and measuring length from end of probe to finger end
4. Exudate: Comment on amount and colour of exudate present
5. Pain:
6. Wound bed appearance: colour and type of tissue present (fibrin, granulation or epithelial tissue) and presence of eschar or slough.
7. Condition of peri-wound (surrounding skin) and wound edges
8. Document percentage of healing since last visit
9. Obtain photos following best practice

[Link to Bates-Jensen Wound Assessment](#)

[Link to Suggested Reading for Obtaining Photos](#)

#### e. Wound Measurement

##### Level B: RNAO's Interpretation of Evidence (1)

1. Measure and document the surface area of surgical wound at regular intervals to monitor progress
2. Measure depth of wound
3. Measure size of wound: Area of wound measured by multiplying length (longest measurement) and width (shortest measurement) of wound

Expected Reduction in Wound Size (7)
<b>Primary intention:</b> <ul style="list-style-type: none"> <li>• Wounds with minimum tissue loss</li> <li>• Surgical closure joins the wound edges</li> <li>• Will re-epithelialize within 2-3 days</li> </ul>
<b>Secondary intention:</b> <ul style="list-style-type: none"> <li>• Left open to heal using moist wound healing</li> <li>• 20-30% reduction in size in the first 3-4 weeks</li> </ul>
<b>Tertiary intention (Delayed Primary Closure):</b> <ul style="list-style-type: none"> <li>• Used when wound heavily contaminated</li> <li>• Reduces risk of infection and controls debris/necrotic tissue</li> <li>• When the wound appears to be clean and healing, it is closed surgically</li> </ul>

#### f. Determine if the wound is “Healable, Maintenance or Non-Healable”

**Healable:** Have sufficient vascular supply, underlying cause can be corrected, & health can be optimized

**Maintenance:** have healing *potential*, but various patient factors are compromising wound healing at this time

**Non-healable/Palliative wound:** has no ability to heal due to untreatable causes such as terminal disease or end-of-life

**g. Nutritional Assessment**

**Level B: RNAO’s Interpretation of Evidence (1)**

The following assessments and blood work should be considered when investigating nutritional status of a person with a wound:

<u>Protein-Calorie Malnutrition</u>	<ul style="list-style-type: none"> <li>▮ Pre-albumin if available (low scores indicate <u>risk</u> for malnutrition)</li> <li>▮ Serum albumin level (&lt;30g/l will delay healing; &lt;20g/l will be non-healable)</li> <li>▮ C-reactive Protein (CRP)</li> </ul>	
<b>Check for anemia</b>	<ul style="list-style-type: none"> <li>▮ CBC (including RBC, Hct, Hgb, MCV, Platelets etc.)</li> </ul> <p>If anemic, proceed to checking →</p>	<ul style="list-style-type: none"> <li>▮ Serum Iron</li> <li>▮ Total Iron Binding</li> <li>▮ Ferritin</li> <li>▮ Transferrin</li> <li>▮ B<sub>12</sub></li> <li>▮ Red blood cell folate level</li> </ul>
<b>Kidney function (To check hydration)</b>	<ul style="list-style-type: none"> <li>▮ BUN</li> <li>▮ Creatinine</li> <li>▮ Potassium</li> </ul>	

- Calculate Body Mass Index (BMI)
- Determine recent weight loss/gain
- Complete Mini Nutritional Assessment (MNA)  
[http://www.mna-elderly.org/forms/mini/mna\\_mini\\_english.pdf](http://www.mna-elderly.org/forms/mini/mna_mini_english.pdf)  
 If screening section results < 11 = complete assessment section  
 If assessment section results < 24 = Registered Dietician referral required
- Review recent dietary consult
- Identify barriers or risk factors to healthy eating
- Link to EatRight Ontario to talk to dietician [www.eatrightontario.ca](http://www.eatrightontario.ca) 1-877-510-5102

[Link to EatRight Ontario](#)

In addition to inquiring about recent weight loss, signs of dehydration, and assessing the Braden Scale Nutritional sub-scale, which helps to capture protein intake, there are several signs of micronutrient deficiencies that are easy to detect when you know what to look for.

**Signs of micronutrient deficiencies:**

- ▮ Reddish tongue with a smooth surface (Vitamin B deficiency)

- ▮ Magenta flank-steak appearing tongue with cracks at corners of the mouth (called angular stomatitis) (Vitamin B<sub>2</sub> deficiency)
- ▮ Dementia, diarrhea, dermatitis (pellagra)—crepe paper skin with wrinkles in the skin and flat surfaces between the wrinkles —also associated with bullous pemphigoid and granuloma annulare (Vitamin B<sub>3</sub> deficiency)
- ▮ Prominent “snowflake” exfoliation of the epidermis of the lower legs (Essential Fatty Acid deficiency)
- ▮ Skin and capillary fragility with purpura, skin tears, increase risk of pressure ulcers, severe collagen deficiency so that the skin is like plastic wrap, and extensor tendons and venous plexus is easily seen through the transparent epidermis (Chronic Scurvy/Vitamin C deficiency)
- ▮ Reddish, scaly, itchy skin lesions (Vitamin A, E, and K deficiency)
- ▮ Seborrheic-like rash that is red, flaky seen along the lateral eyebrows, nasal labial folds and chin (Zinc deficiency)
- ▮ Prolonged tenting of the skin in the presence of adequate fluid intake

**If the presence of any of these signs of micronutrient deficiencies is noted, a referral should be made to a Registered Dietitian who can work with the primary care provider for screening of dietary deficiencies and treatment.**

The **Nestle Mini-Nutritional Assessment (MNA)** ( Toolkit item #9) is a screening and assessment tool that identifies individuals age 65 and above who are malnourished or at risk of malnutrition, allowing for earlier intervention to provide adequate nutritional support. It has not been validated for use with younger individuals. The screening tool consists of 6 questions.

- Complete the screen by filling in the boxes with the appropriate numbers.
- Total the numbers for the screening score.

The screening score (max 14 points):

12- 14 points = normal nutritional status  
 8-11 points = at risk of malnutrition  
 0 -7 points = malnourished

[Link to Mini-Nutritional Assessment Form](#)

**Nutrition is an essential component of wound healing.  
 Consider dietician referral  
 for supplementation recommendations.**

### **Nutritional Supplementation**

Nutritional supplementation should be provided to a patient only after a thorough nutritional assessment has been completed and the reason for malnutrition has been identified. (12)

## Macronutrients

Macronutrients such as carbohydrates, proteins and lipids (fats) are required in adequate amounts to provide the body with total energy needs. Caloric intake of 30-35 kcal/kg of body weight is recommended for patients with chronic wounds. Patients that are underweight may require a caloric intake of 35-40% kcal/kg of body weight. (12)

These macronutrients should be consumed daily in the following amounts:

- Carbohydrates 45-60%
- Fat 25-30%
- Protein 15-20% (1.25-1.5 g/kg of body weight) (12)

**Protein** needs are increased in order for healing to occur. Diets that include inadequate amounts of protein can be blamed for “increased skin fragility, decreased immune function, poorer healing and longer recuperation after illness”. (12) Caution should be taken when administering protein to patients with liver or kidney failure. Consultation with a Registered Dietician is recommended with this patient population.

**Arginine and Glutamine** are amino acids that are needed in the production of collagen. Collagen is required for healing to occur. Although supplementation of Glutamine is controversial, it is believed to be helpful in those patients where malnutrition and chronic wound healing are being addressed. Arginine is required by the body when under metabolic stress. Supplementation of Arginine has been shown to improve healing. It is important to note that both Arginine and Glutamine require adequate protein intake to be of any value. (12)

**Fats** are an integral part of a healthy diet required for healing to occur. Omega 3 fatty acids are antithrombotic, vasodilators and anti-inflammatory. Omega 6 fatty acids are responsible for platelet aggregation, inflammation and vasoconstrictors. Further research is required before supplementation of Omega 3 or Omega 6 should be recommended. (12)

## Micronutrients (12)

### Zinc

- Should only be supplemented if deficiency is determined
- Recommended dose: 40mg of elemental zinc/day (176 mg zinc sulfate) for up to 10 days to enhance wound healing

### Asorbic Acid (Vitamin C)

- Recommended dose: 500 to 1000 mg daily in divided doses

### Vitamin A

- Recommended in patients taking corticosteroids
- Recommended dose: 10,000-25,000 IU daily for 10-14 days
- Use with caution in patients with protein deficiencies or liver failure



#### 4.4 Optimize Medical Therapy (4) (3) (2) (7) (9)

The strategies of caring for patients with surgical wounds are to improve circulation, prevent infection and encourage self-management

- **Tobacco and nicotine cessation**
  - Barriers to cessation should be addressed at each patient visit
  - Educational, pharmacological and behavioral techniques should be utilized
- **Control hypertension**
- **Control blood sugar if diabetic**
- **Prevent moisture-associated skin damage (MASD)**
  - Assess for wound exudate, continence of urine and stool.
  - If incontinence is a concern, a continence assessment should be completed by a qualified practitioner (e.g. an Enterostomal Therapist (ET) or Nurse Continence Advisor)
- **Encourage exercise**
  - Assess mobility and dexterity aids currently being used (bedrail, superpole, trapezebar, therapeutic surfaces, raised toilet seat and seating devices)
  - Recommendations for exercise as per qualified professional
  - Referral to Physiotherapy/Occupational Therapy as necessary
- **Address dehydration**
  - Can impair blood flow and oxygen delivery to wound
- **Control Pain**

**Increased localized pain is a significant predictor of deep compartment infection**

- Pain interferes with deep breathing and coughing (possible pneumonia) and limits movement
- Encourage use of analgesics (pain medication) at regular intervals (eg. Every 3-6 hours) instead of taking only as needed
- Coordinate medication administration with wound care treatment and physical therapy times.

### **Recommendations for nociceptive pain (described as sharp, aching or throbbing)**

- Non-Opioids – eg. ASA or Acetaminophen
- Mild Opioids – eg. Codeine
- Strong Opioids – eg. Morphine or Oxycodone

### **Recommendations for neuropathic pain (described as burning, stinging, shooting, stabbing or hyperesthesia – sensitivity to touch)**

- Second generation tricyclic agents – eg. Nortriptyline or Desipramine
- If pain is not relieved try using Gabapentin or Pregabalin

### **Non-pharmacological Pain Control Options:**

- Support surfaces
- Repositioning
- Cognitive behaviour therapy
- Music
- Distraction
- Relaxation techniques
- Massage
- Exercise
- Heat and/or cold

### **Pain Red Flags**

#### **Possible Infection**

- Increase in pain level
- New pain in patients with altered sensation

Any **sudden, severe, acute pain** could be an **emergency** situation and should be investigated **immediately**

Pain can be a trigger for autonomic dysreflexia that may occur in patients with spinal cord injury T6 or above

## **4.5 Surgical and Medical Intervention Strategies (7)**

1. Debridement (remove devitalized tissue or infected foreign material)
2. Close a fistula
3. Drain or remove sinus tract
4. Vascular surgery
5. Skin grafts
6. Bioengineered tissue surgery

## 4.6 Presence of Superficial bacteria

### a. Surgical Wound Infection

#### Level A, B and C: RNAO's Interpretation of Evidence (1)

Surgical wounds, like most wounds, can become infected with superficial or spreading bacteria. The validated mnemonics 'NERDS' and 'STONEES' classify the signs and symptoms of localized infection (NERDS) and spreading infection (STONEES).

#### The Presence of at least 3 of the following:

##### Superficial Bacteria

- ▮ **N**- Non-healing wound
- ▮ **E**- Exudate increased
- ▮ **R**- Red friable (fragile tissue that bleeds easily)
- ▮ **D**- Debris (presence of necrotic tissue (eschar/slough) in wound)
- ▮ **S**- Smell

#### The Presence of at least 3 of the following:

##### Spreading Bacteria (< 3 low bacteria count, >3 high bacteria count)

- ▮ **S**- Size increasing
- ▮ **T**- Temperature increased (> 3 degrees F difference)
- ▮ **O**- Os (probes to bone or bone is increased)
- ▮ **N**- New areas of breakdown
- ▮ **E**- Exudate present
- ▮ **E**- Erythema and/or Edema
- ▮ **S**- Smell

In addition to recognizing the signs and symptoms of infection in surgical wounds, it may be helpful to obtain a culture and sensitivity (C&S) using a validated method of sampling to quantify bacteria in wounds. Tissue biopsies are considered the gold standard but unfortunately are not practical in many settings. Fortunately, a linear relationship between quantitative tissue biopsy and swab for C&S taken using the Levine method of sampling (see below) has been validated and is recommended for assessing any open wound. Swabs for C&S are important in determining the type of bacteria and the appropriate antibiotics, but are not necessary to confirm the presence or absence of infection. The C&S results may not reflect the presence or absence of biofilm.

**Obtain a swab for C&S when: (4)**

- Clinically serious infection
- Patients are hypersensitive to 1<sup>st</sup> line of antibiotics
- Antibiotic-resistant pathogens suspected (recent hospitalization or out of country travel)

**Levine Method for obtaining C&S laboratory swab (14)**

1. Cleanse wound thoroughly
2. Place swab on granulation tissue (**must be granulation tissue only** –if none present, tissue aspiration or biopsy may be required)
3. Apply enough pressure to extract fluid
4. Turn swab 360 degrees on fluid (avoid slough or debris)
5. Place swab in transport medium

## 5. Provide Local Wound Care

Post-surgical Wound Care	
Dressings	<ul style="list-style-type: none"><li>• Initial dressing applied during surgery should remain on for 48 hours (reinforce as necessary for breakthrough drainage).</li><li>• Use an aseptic non-touch technique for changing or removing surgical wound dressings</li><li>• Dressing should be chosen on the basis of cost-effectiveness, properties of dressing and patient/caregiver preference</li><li>• Provide moist wound healing to promote growth of granulation tissue, prevent prolonged inflammation and protect from trauma, exudate and infection</li><li>• Provides thermal regulation</li></ul> <p><b>Primary intention</b></p> <ul style="list-style-type: none"><li>• Usually only require dry, sterile cover dressing for 24-48 hours for protection</li><li>• Should re-epithelize within 2-3 days</li><li>• Palpate healing ridge approximately 5 days</li></ul> <p><b>Secondary intention</b></p> <ul style="list-style-type: none"><li>• Interactive products should be used.</li><li>• Require moist healing environment while preventing peri-wound maceration or desiccation.</li><li>• Dressing should prevent bacteria from entering wound</li></ul> <p><b>Exudating wounds</b></p> <ul style="list-style-type: none"><li>• Dressing choice should maintain moisture while wicking moisture away from peri-wound skin to prevent maceration</li><li>• Decreased pain when removed</li><li>• Calcium alginate (best for bleeding wounds)</li><li>• Hydro-fiber</li><li>• Foam dressing</li><li>• Exudate absorbers</li><li>• Secondary dressing may be used</li><li>• Periwound may benefit from barrier film/hydrocolloid</li><li>• Negative pressure wound therapy (NPWT) may be indicated</li></ul> <p><b>Pouching</b></p> <ul style="list-style-type: none"><li>• Consider if wound exudates &gt;25 ml/day or dressing requires changing more than 3-4 times/day</li><li>• Suggest referral to Enterostomal Therapist (ET) or Wound Care Specialist</li></ul> <p><b>Dry wounds</b></p> <ul style="list-style-type: none"><li>• Prevents growth of granulation tissue and re-epithelization</li><li>• May benefit from hydrogel, hydrocolloid, non-adherent mesh or transparent film/dressings</li></ul>

<b>Cleansing</b>	<ul style="list-style-type: none"> <li>• Use sterile saline up to 48 hours post-op</li> <li>• Patients can usually shower after 48 hours</li> <li>• Use tap water after 48 hours if incision has dehisced or been surgically opened</li> </ul>
<b>Topical Antimicrobial Agents</b>	<ul style="list-style-type: none"> <li>• If healing in timely manner, topical agents not required</li> <li>• Use appropriate interactive dressing</li> <li>• Refer to Wound Care Specialist as required</li> </ul> <p><b>Healing by primary intention</b> - Do <b>NOT</b> use ANY</p> <p><b>Healing by secondary intention</b> - Do <b>NOT</b> use Eusol and gauze, moist gauze or mercuric antiseptic solutions</p>
<b>Debridement</b>  DO <b>NOT</b> USE – EUSOL/DEXTRANOMER OR ENZYMATIC TREATMENTS FOR DEBRIDEMENT ON SURGICAL WOUNDS	<p><b>Autolytic debridement</b> - promote where appropriate</p> <p><b>Mechanical debridement</b> - Irrigation – safe pressures (8-15 psi’s) will help remove loose necrotic tissue. Ensure that majority of irrigation solution is recovered</p> <p><b>Conservative sharp debridement</b> – must be within scope of practice. Provide analgesia prior to procedure as necessary</p> <p><b>Maggot therapy</b> – not commonly used in Canada</p>

Table 2: Post-surgical Care adapted (4) (5)  
(7) (13)

Antibiotics are generally given preoperatively or inter-operatively for patients having clean surgery involving placement of implant or prosthetic, clean-contaminated surgery or contaminated surgery. (4)

### Clinical Outcomes of Surgical Site Infections (7)

- Poor scars (cosmetically unacceptable, spreading, hypertrophic or keloid)
- Persistent pain
- Itching
- Restriction of movement especially over joints
- Impact on social well-being affected

### Additional costs of surgical site infections

- Re-operation
- Extra nursing care
- Extra interventions
- Drug treatments

- Loss of productivity
- Patient dissatisfaction
- Litigation
- Decreased quality of life

#### **Microorganisms that cause infection (4)**

- Staphylococcus aureus (most commonly found)
- Colorectal surgery – enterobacteriaceae and anaerobes
- Prosthetic surgery/presence of foreign body – staphylococcus epidermidis  
Number of microorganisms required to cause infection is lower

#### **How do microorganisms come in contact with wound (4)**

- Endogenous infection (from patient)
- Microorganisms from instruments or operating room environment
- Contamination from environment (in trauma wound)
- Microorganisms gain access to wound after surgery

#### **Practices to prevent surgical site infection (4)**

- Handwashing
- Remove microorganisms that normally colonize the skin
- Prevent the multiplication of microorganisms at the operative site (use of prophylactic antibiotics)
- Enhance patient's defences against infection by minimizing tissue damage and maintaining normothermia
- Preventing access of microorganisms into the incision postoperatively by use of wound dressings

#### **b. Signs and symptoms of Cellulitis (14) (15)**

- Cellulitis is a spreading bacterial infection of the dermis and subcutaneous tissues, where the edge of the erythema may be well-defined or more diffuse and typically spreads rapidly
- Systemic upset with fever and malaise occurs in most cases, and may be present before the localising signs such as the local symptoms seen with STONEES
- Lower leg cellulitis can be extremely serious with long-term morbidity, including lower leg edema. It requires prompt recognition by health care providers and appropriate interventions
- Note that lower leg cellulitis usually affects only one leg, not both. If both legs are affected, it is likely venous dermatitis or allergic contact dermatitis, but this does not mean that it could never be cellulitis in both legs

#### **c. Determining Goals for Local Treatment for Surgical Wounds (1)**

Level A, B and C: RNAO's Interpretation of Evidence

**Healable Wounds:** Have sufficient vascular supply, underlying cause can be corrected, & health can be optimized

**Goal:** Principles of wound bed preparation and moist wound healing: debridement, bacterial balance, exudate control, protect peri-wound skin

**Maintenance Wounds:** have healing *potential*, but various patient factors are compromising wound healing at this time

**Goal:** Principles of wound bed preparation and moist wound healing: debridement, bacterial balance, exudate control and protect peri-wound skin. Avoid higher cost advanced wound treatments until factors compromising wound healing are resolved. Focus on quality of life issues, exudate and odour management

**Non-healable/Palliative wounds:** has no ability to heal due to untreatable causes such as insufficient vascular supply, terminal disease or end-of-life

**Goal:** Avoid higher cost advanced wound treatment and focus on exudate and odour management, quality of life issues.

### Calculating Current Percentage of Healing Since Admission

$$\frac{V(\text{Initial}) - V(\text{Current})}{V(\text{Initial})} \times 100 = \text{_____ \% reduction in volume}$$

(V = Volume of wound calculated as Longest Length x Perpendicular Widest Width x Depth straight in)  
(Adapted from Sussman and Bates-Jensen 2007)

### 'Closed' vs 'Healed'

- Closed : Skin intact, underlying tissue or structures are not visible
- Healed : Wound has been closed for a 2 year time period allowing for collagen re-modelling from type 3 to type 1

These terms are often mistakenly used interchangeably.

**Understand and teach the difference!**



## Treatment Plan

- Documentation and communication between all healthcare team
- Wound treatment plan determined in accordance to treatment goal (healable, maintenance or non-healable)
- Arrange for physician/nurse practitioner orders as required to begin plan of care including agreement to professional referral recommendations
- Maintain original dressing x 48 hours after surgery (reinforce dressing prior to this if necessary)
- Provide pressure redistribution (support surfaces) for sleep, seating and use of medical devices
- Debridement/reduction by qualified professional
- Ensure appropriate skin care
- Identify any potential barriers to wound treatment plan
- Consider required referrals and further follow-up with previous professional referrals
- Consider compression if venous insufficiency/edema present and if ABPI/TBPI is within safe range
- Utilize toolkit to determine wound cleansing, debridement and dressing selection (South West Region Wound Care Program: Wound Cleansing Table and Dressing Selection and Cleansing enablers and CAWC Product Picker chart)
- Advanced therapies e.g. Negative Pressure Wound Therapy (NPWT), Electric Stimulation and Hyperbaric Oxygen Therapy might be considered

Waterloo Wellington Venous Leg Guidelines – Compression

## Healable/Maintenance Treatment Plan

- Correction of the underlying disease process if possible
- Collaborative agreement between the physician, nurses, team, and the client regarding setting goals about the “healability” of the wound
- Pain control
- Debridement can lead to wound enlargement, spread infection or lead to further necrosis
- If there is objective evidence that wound is healable, conservative sharp, surgical, mechanical, or autolytic debridement is recommended
- Avoid ‘tourniquet affect’ when securing dressings
- Avoid nicotine and caffeine use
- Optimize nutrition

## Palliative or Non-healable Plan

- NO DEBRIDEMENT to be performed
- Minimize risk of infection with use of providone-iodine or chlorhexidine
- Health teaching regarding signs and symptoms of an infection to client and caregiver
- Care should be used when removing tape to prevent trauma
- Avoid ‘tourniquet affect’ when securing dressings

- Pain Control

### **Compression Use**

- Only to be used if there is objective evidence that arterial supply is sufficient for healing
- Used only under close supervision of very experienced wound care specialists for mixed (venous and arterial) etiologies
- Mild compression may be used after by-pass surgery to prevent edema (only with surgeon's order)
- Should be removed immediately if pain develops

Initiation of compression therapy requires a lower leg assessment to be completed, ABPIs/TBPIs to be determined and results evaluated in addition to physician/NP order

#### **d. Utilize Product Picker from Canadian Association of Wound Care (CAWC)**

Product Picker for Classification of Dressing Products

Each organization may use the PDF Fillable CAWC Product Picker to list the products available within their organization (see Toolkit Item #12)

When trying a new product, allow 2 weeks to assess effectiveness unless adverse effect noted.

[Link to Product Picker](#)

#### **e. Patient Education on Skin Care (16)**

Skin care is a vital element to promote wound healing.

The following information is provided to patients as recommended practices:

- Avoid harsh soaps or highly perfumed soaps.
- Soothe any local skin irritation with a moisturizing cream.
- Avoid creams with perfumes and lanolin, as these products increase the risk of dermatitis.
- Monitor skin for potential reactions, and if present, contact your care provider.
- Discuss long-term use of steroids with your care provider.
- Avoid the use of adhesive products

## f. Adjunctive Therapies (7)

Consider Multi-disciplinary referrals for adjunctive therapy.

Adjunctive therapy refers to additional treatment used together with the primary treatment to achieve the outcome of the primary treatment. These should be limited to healable wounds.

### Negative Pressure Wound Therapy

- Removes exudate
- Reduces peri-wound edema
- Increases local microvascular blood flow
- Promotes formation of granulation tissue
- Reduces complexity of wound
- Supports moist wound bed environment
- Enhances circulation
- Increases oxygenation to compromised tissue

### Indications for NPWT

- Wound dehiscence or wound with potential to heal
- Stabilization of graft
- Incision at risk for dehiscence
- Appears to decrease surgical site infection rates after invasive treatment of lower limb trauma
- Less effective with multiple comorbidities

### Contraindications for NPWT

- Unexplored fistula
- Necrotic tissue
- Untreated osteomyelitis
- Malignancy within wound

### Precautions

- Must be free of active **UNTREATED** infection
- Wound bed must **NOT** involve fistulas to internal organs or body cavities
- Caution with anticoagulants
- Hypergranulation and wound odour may occur with patients over the age of 65
- Discontinue if patient complains of pain
- Use systemic antibiotics with NPWT to treat infections

### Electrical Stimulation

- Increases blood flow
- Increases tissue oxygenation
- Angiogenesis
- Increases tensile strength of wound
- Decreases pain
- Decreases diabetic peripheral neuropathic pain
- Increases cell proliferation and protein synthesis

### **Contraindications to Electrical Stimulation**

- Osteomyelitis
- Demand pacemakers
- Wounds with heavy metal residues
- Pregnancy
- Electrode placement over carotid sinus or tangential to heart or over laryngeal musculature
- Malignancy
- History of dysrhythmia

### **Hyperbaric Oxygen Therapy (HBOT)**

- Angiogenesis
- Collagen synthesis
- Osteoclastic activity
- Releases growth factor
- Increases oxygen diffusion in plasma and local tissues
- Leukocyte-killing ability
- Increases effectiveness of antibiotics
- Decreases edema

### **Indications for HBOT**

- Compromised skin grafts and flaps
- Hypoxic wounds

### **Precautions for HBOT**

- Claustrophobia
- Anxiety

## 6. Provide Organizational Support

### a. Multi-disciplinary Team Intervention Referral Criteria Checklist

#### iFUN Criteria guidelines for referral to an advanced wound specialist

- i Intervention**      **If an intervention is required (i.e. ABPI, toe pressures, debridement)**
- F Frequency**        **If the frequency of dressing changes is not less than 3 x a week within 4 weeks of treatment**
- U Unknown**         **If the cause of the wound or the cause of the failure to heal is unknown**
- N Number**            **If the size of the wound has not decreased by 20-30% in 3-4 weeks of treatment**

CRITERIA	SUGGESTIONS FOR REFERRAL
Patient requiring assistance to quit using tobacco or nicotine products	Refer patient to smoking cessation program, pharmacist, social worker, physician, nurse practitioner and/or counsellor  (Level A: RNAO's Integrating Smoking Cessation into Daily Practice) (3)
Medical management may include appropriate systemic antibiotic therapy for patients with bacteremia, sepsis, advancing cellulitis or osteomyelitis.	Refer to most responsible physician, nurse practitioner or Infectious Diseases Specialist for antibiotic treatment.  (Level C: RNAO's Assessment and Management of Venous Leg Ulcers) (15)
Prevent or manage pain	Refer to most responsible physician, nurse practitioner, physiotherapy, pain and symptom management team or pharmacist as needed  (Level C: RNAO's Assessment and Management of Venous Leg Ulcers) (15)
Mini Nutritional Assessment (MNA) < 24 Unable to afford or have access to nutritional food	Refer to Registered Dietitian Refer to Social Work  (Level B: RNAO's Assessment and Management of Venous Leg Ulcers) (1)

Mobility Issues	Refer to physiotherapy or occupational therapist for mobility or gait aids  (Level B: RNAO's Assessment and Management of Venous Leg Ulcers) (1)
Unable to complete lower leg assessment and/or ABPI	Refer to wound care specialist, trained nurse or vascular lab  (Level B: RNAO's Assessment and Management of Venous Leg Ulcers) (1)
Home Safety Assessment	Refer to physiotherapy or occupational therapist  (Level B: RNAO's Assessment and Management of Venous Leg Ulcers) (1)

**b. Patient, Caregiver and Healthcare Provider Teaching and Learning Resources**

'Teach-back' method is a way of ascertaining patients understanding about what they need to know or do regarding their health. Patients are asked to state in their own words what they understand to be important. It is a way to confirm that things have been explained in a manner that the patient understands.

**Lifestyle**

- Tobacco and nicotine cessation with goal to be nicotine-free
- Pain management

**Rest/Activity/Mobility**

- Turning and sitting schedule for repositioning
- Pillow between knees
- Activity level according to post-operative instructions

**Safety**

- Prevention of injury – friction, shearing

## **Wound**

- Self-care of wound/tube(s) if appropriate
- Handwashing/hygiene
- Aseptic technique
- Reprocessing of instruments
- Appropriate storage of equipment and supplies
- When to call primary caregiver (e.g. signs and symptoms of infection, dehiscence, deep vein thrombosis, cellulitis, impaired blood flow, difficulties with compression)

## **Dietary**

- Dietary requirements as per dietician

## **Diagnostic Tests**

- Results understood by patient

## **Skin Care**

- Comprehensive self care of skin
- Incontinence and prevention/treatment of Moisture Associated Skin Damage (MASD)

## **Family and caregiver support**

- Family/caregiver actively willing and able to participate in treatment plan
- Assess family fears and concerns
- Repositioning, nutrition, continence if needed
- Access need for caregiver respite/relief
- Conflict with caregivers

## **Community/Social Supports**

- Community support groups (eg. Diabetic education and self- management sessions, walking groups, Southern Ontario Aboriginal Diabetes Initiative - SOADI)
- Check for availability for financial compensation (e.g. private insurance, veterans medical benefits, Ontario Disability Support Program –ODSP/Ontario Works, Non-Insured Health Benefits -NIHB and Southern Ontario Aboriginal Diabetes Initiative – SOADI for First Nations people and Inuit)
- Long or short term placement (e.g. convalescent, respite, rehabilitation)
- Confirm that ongoing medication coverage is arranged

Community Support Services

Trillium Drug Benefits

### c. **Discharge or Transfer Planning and Communications**

Regardless of the method of providing the information (e.g. Care Connect, photocopy or Discharge Summary), it is agreed that the following information is critical in providing seamless care when individuals who have surgical wounds are being discharged or transferred to a different care setting:

- Diagnostic results
- Relevant consultation notes
- Post and current treatment and education plan
- List of appropriate contact information for ongoing needs
- If wound is on lower leg or foot:
  - Identify need to reassess ABPI/TBPI in 6 months
  - Lower leg assessment results

If wound closed or eschar is stable (in arterial disease) send discharge summary outlining outstanding issues and teaching completed to:

- Referral source
- Most responsible physician (MRP)/nurse practitioner

Appropriate documents shared between the following:

- Acute care
- Complex Continuing Care/Rehab
- Long-term care
- Community care
- Primary care physician/Nurse Practitioner
- Professionals referred to
- Other \_\_\_\_\_

### d. **Waterloo Wellington Integrated Wound Care Program Evidence-Based Wound Care Surgical Wound Clinical Pathway**

Placeholder for Pathway



### Content Item #

1. CAWC Best Practice Enabler
2. CAWC Quick Reference Guide
3. Brief Pain Inventory Short Form
4. Canadian Nurses Association Social Determinants of Health and Nursing: A Summary of Issues
5. Assessing Patient-Centered Concerns Worksheet
6. Smoking Cessation
  - a. Smoking Cessation Smoking, Chronic Wound Healing and Implications for Evidence-Based Practice (Article by: McDaniel and Browning 2014)
  - b. Readiness to Quit Smoking Checklist
  - c. Applying 5A's to Smoking Cessation
  - d. WHY test
  - e. Smoking Cessation Medication Comparison chart
  - f. Strategies to Avoid Relapse
7. Wound Assessment Forms
  - a. Bates-Jensen Wound Assessment
8. Mini Nutritional Assessment Form (MNA)
9. Quality of Life Assessments
  - a. Cardiff Wound Impact Questionnaire
  - b. World Health Organization QOL
10. Depression Screening Tools
  - a. Geriatric Depression Screen
11. Dressing 'Product Picker'

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