WRHA Acute Care Surgery Program

Prevention and Management of Surgical Site Infections and Open Surgical Wounds

Clinical Practice Guidelines

Winnipeg Regional Health Authority
Caring for Health

Office régional de la santé de Winnipeg
À l'écoute de notre santé

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1 Executive Summary

Intent

- To enhance the quality of care provided to patients and their families related to the prevention and management of surgical site infections (SSIs) and open surgical wounds across the continuum of care within the WRHA.
- To provide healthcare provider teams with guidance, information and a consistent approach to consider regarding the prevention and management of SSIsand open surgical wounds.

Practice Outcome

- The implementation of best practice recommendations will enhance the prevention and management of SSIs and open surgical wounds through facilitating consistency and supporting clinical decision makingbased on current evidence, expert opinion and clinical judgment.
- The Interdisciplinary Team must ensure that patients receive appropriate screening and care planning in the pre-operative, intra-operative and post-operative phases of care and continued monitoring in the community. The prevention and management of SSIs and open surgical wounds requires effective communication between healthcare providers across the continuum of care.

Background

SSIs are ranked as the third most common healthcare associated infections (HAI). SSIs account for up to 25% of all healthcare acquired infections.

The risk for developing an SSI is linked to the patient's general health status, nutrition, smoking, co-morbidities, length of the surgical procedure, type of surgery (i.e. Clean; Clean-Contaminated; Contaminated; Dirty or Infected), and length of hospital stay. SSIs can have a significant effect on quality of life for the patient. They increase morbidity, mortality, hospital stay, and cost to the healthcare system overall.

Not all surgical wounds that do not heal are infected. If infection is not the cause of non-healing in a surgical wound, other risk factors need to be addressed.

The majority of SSIs are considered preventable and measures can be taken in the pre-operative, intra-operative, and post-operative phases of care to reduce risk of infection. Assessments at all phases of care are essential elements in the prevention and management of SSIs and open surgical wounds.

Target Population

Surgical adults receiving care services within the WRHA, in which the prevention and management of SSIs and open surgical wounds is required.

Evidence

This Clinical Practice Guideline was adapted from the Best Practice Recommendations for the Prevention and Management of Open Surgical Wounds, Canadian Association of Wound Care (CAWC), Volume 8, Number 1, 2010.

Best practice demands that healthcare providers be guided by best available evidence. Levels of evidence are graded on strength of the scientific evidence. The grading system used in these recommendations has been adapted from the National Institute for Health and Clinical Excellence (NICE) clinical guideline for Prevention and Treatment of Surgical Site Infection and several Registered Nurses´ Association of Ontario (RNAO) best practice guidelines. Each recommendation has been cited with a level of evidence.

The following chart outlines each of the 11 recommendations and levels of evidence.

	Recommendations	**Levels of Evidence NICE / RNAO**
1.	Holistic Assessment and development of a care Plan: Pre-, Intra- and Post-Operative Phases	NICE level 2+ RNAO level lV
2.	Include Patient and Caregiver in Care Plan	NICE level 4 RNAO level lV
3.	Educate Patient and Caregiver	RNAO level IV
4.	Assessment and Documentation	RNAO level IV
5.	Reassess Effectiveness of Interventions	RNAO level IV
6.	Surgical Wound Debridement	RNAO level Ib
7.	Rule Out or Treat Surgical Site Infection	NICE level 4 RNAO level IIa
8.	Provide Wound Moisture Balance	NICE level 1+ RNAO level IV
9.	Negative Pressure Wound Therapy and Biological Active Dressings	NPWT: RNAO level IV
10.	Team Approach	NICE level 4 RNAO level IV
11.	Surgical Site Surveillance Program	NICE level 4 RNAO level IV

2 Recommendations: Preventing and Managing Surgical Site Infections and Open Surgical Wounds

Recommendation 1:

Complete a **holistic assessment** to identify factors that may affect surgical wound healing in the pre-operative, intra-operative and post-operative phases. Review the patient's medical history, family history and social history**. Creating a care plan** based on strategies that promote timely healing of surgical wounds is essential in all phases of care.

An interdisciplinary team approach can identify and minimize risk factors that cause surgical wound complications. **Document** all risk factors and the care plan in the patient's health record and **communicate** them to the members of the team.

It would be optimal if prevention strategies are implemented as soon as possible in the pre-operative phase to address risk factors and are included in the care plan.

Pre-Operative Phase

Uncontrollable risk factors

Advanced Age: with increasing age, blood vessels become less elastic, collagen tissue is less pliable, and scar tissue is tighter.

Altered immune system:

- Radiation therapy: results in vascular scarring and fibrosis within 4 to 6 weeks and influences tissue healing.
- Chemotherapy: depresses bone marrow function and resistance to infection.
- Steroid use: long-term therapy may reduce inflammatory response and interfere with wound healing.
- HIV/AIDS

Previous experience with anesthetic, polypharmacy, co-morbidities, dental issues, and a prolonged preoperative stay are also uncontrollable risk factors.

Controllable risk factors

Anxiety, stress and fear: Preoperative anxiety is a normal adaptive response. It may be mild to severe and may be expressed as fear. The patient may fear pain, loss of control, death, anesthesia (afraid of what they may disclose, awakening during surgery or not awakening after), disfigurement or alerted body image, altered sexuality or sexual function, separation from loved ones, change in roles and support systems, financial stressors, and loss of income. Excessive anxieties may disrupt sleep, eating habits, concentration and can heighten additional risk factors. Provide education, support and

reassurance. Suggest relaxation techniques. Medication to reduce anxiety or improve sleep may be required. **See Recommendation #2 and #3 for additional interventions**.

Altered Nutritional status: Malnutrition presents a risk for prolonged healing. All patients should be screened for malnutrition either prior to or within 24 -72 hours of admission. Consideration to provide pre-operative nutritional support should be given for patients with severe malnutrition (SGA = C) undergoing elective surgery. Wound healing is compromised and post-operative complications are significantly increased in patients with moderate and severe malnutrition.

- Nutrition screening should be done for patients with weight loss or gain within previous 6 months.
- Obesity (BMI >30) increases the risk for wound infection, dehiscence and evisceration; fatty tissue has less vascularization, which decreases transport of nutrients and cellular elements required for healing.
- Underweight (BMI <18.5) increases the risk for wound infection and contributes to poor wound healing.
- Consult a Dietitian if the patient has been NPO or on clear fluids >5 days, poor oral intake <50% for >3 days, persistent nausea and vomiting, cachectic/wasted appearance, or any other issues that are affecting intake and/or wound healing.

Suboptimal glucose control: alters tissue perfusion and interferes with release of oxygen to tissues; uncontrolled hyperglycemia interferes with phagocytosis of leukocytes.

- Patient should be educated on the importance of optimizing blood glucose levels pre-operatively.
- Blood glucose levels and hemoglobin A1C should be drawn in pre-op clinic and dietician may need to be consulted depending on results.

Low Hemoglobin and oxygenation: tissue repair is negatively influenced by a hematocrit value below 33%, and a hemoglobin value below 100g/l; oxygen delivery is decreased with both. In patients with hematocrits below 33% or hemoglobin values less than 100g/L, who have developed a SSI, or who are at very high risk of developing a SSI, the risks and benefits of red blood cell transfusion to promote tissue oxygenation should be considered When adequate oxygen is available for wound fibroblasts, collagen formation and wound tensile strength can be achieved.

Smoking: oxygen release is reduced; it inhibits wound healing and decreases circulation to the skin due to micro vascular obstruction from platelet aggregation and increased nonfunctioning hemoglobin. Encourage the patient to cease tobacco use at least one month prior to surgery.

Obstructive Sleep Apnea (known or suspect): patient asked to bring CPAP machine.

Decreased Physical Activity Level/condition: Consult physiotherapy for assessment and recommendations as needed.

Alcoholism: Institute supplements of Folic Acid, Thiamine, and Multivitamins and refer to the site's alcohol withdrawal protocol. The care plan should reflect monitoring for symptoms of withdrawal.

Hygiene:Ask patients to have a shower, bath or bed bath the day before or the day of surgery. Showering is generally preferable to bathing as it is less likely to result in the transfer of organisms from highly colonized sites (such as the perineum) to less colonized sites. Educate patients to not shave in the vicinity of the incision for one week pre-operatively. No hair removal is optimal. If hair removal is necessary, clippers should be used outside of the operating room theatre within 2 hours of surgery.

Infections: Identify and treat remote infections before elective surgery.

Colonization with antibiotic resistant organisms (ARO) (i.e.MRSA, VRE):**Refer to the Operative Directive: Admission Screening of patients for Antibiotic Resistant Organisms (MRSA & VRE), as well as the Specific Disease Protocol for the ARO in the WRHA Hospital Infection Prevention and Control Manual** available at http://home.wrha.mb.ca/prog/ipc/manual_hospital.php

Proper hand hygiene: **refer to WRHA Routine Practices for Reducing the Risk of Infection Transmission Policy,** available athttp://home.wrha.mb.ca/corp/policy/files/90.00.060.pdf

Intra-Operative Phase

Uncontrollable risk factors

Site, duration and complexity of surgery:

- Wound classification (i.e. clean; clean-contaminated; contaminated; dirty or infected) **refer to table 1 Surgical Wound Classification**
- Multiple surgeries
- Emergent (vs. elective surgery)
- Implants (vs. no implants)
- Use of blood products
- Duration of surgery/prolonged ventilation (≥ 2 hours)

Table 1: Surgical Wound Classification

Class I/Clean
An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.
Class II/Clean-Contaminated
An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.
Class III/Contaminated
Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.
Class IV/Dirty-Infected
Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

Centers for Disease Control (CDC). (1999). Recommendations for Prevention of Surgical Site Infection. Infection Prevention Guidelines, Appendix J, 1-6.

Controllable Risk Factors

Prophylactic antibiotics: The table below lists prophylactic antibiotics and the appropriate complete infusion times prior to surgery to maximize antibiotic efficiency. It is important to note that antibiotics should be repeated for surgeries lasting longer than the half-life of the antibiotic. Reference should be made to **The Compendium of Pharmaceuticals and Specialties (CPS): The Canadian Drug Reference for Health Professionals** for half-life, administration rates, as well as all other drug information.

Pre-operative prophylactic Antibiotic	**Drug Class**	**Infusion to be complete within specified timeframe before first incision and application of tourniquet (if applicable) – this will maximize antibiotic efficiency.**
Cefazolin	cephalosporin	Within 60 minutes of incision
Clindamycin	lincosamide	Within 60 minutes of incision
Vancomycin	glycopeptide	Within 60 minutes of incision

Antibiotics administered for thoracic, orthopedic and vascular patients should be discontinued within 24 hours from the time the surgery ended (48 hours for cardiac), whereas non-complex and uncomplicated surgeries require no further administration of antibiotics following surgery.

Performing/completing safe surgery checklist: **refer to WRHA Surgical Safety Checklist – Operating Room Policy,** available at http://home.wrha.mb.ca/corp/policy/files/110.220.025.pdf

Pre-operative skin preparation: Surgical skin prep shall be performed using an approved antiseptic; the antiseptic of choice should be alcohol-based chlorhexidine antiseptic solutions. Following application of the chlorhexidine–alcohol skin prep solution, the surgical team should allow the prepped skin to air dry for at least 3 minutes prior to application of surgical drapes. To maximize its efficacy, chlorhexidine-alcohol skin prep should not be washed off for at least 6 hours following surgery; **refer to WRHA Best Practice Guidelines, Surgical Skin Preparation,** available at http://www.wrha.mb.ca/professionals/ebpt/files/skinprep.pdf

Normothermia: Involves keeping the patient's core temperature between 36°C-38°C. Anesthesia, anxiety, wet skin preps and skin exposure in cold operating rooms can all contribute to hypothermia. Methods to maintain normothermia may include forced-air blankets for surgeries greater than 30 minutes, warmed intravenous fluids for surgeries greater than one hour, warmed lavage liquids for colorectal surgery, an ambient operating room temperature of 20°C to 23°C, hats and booties on patients during surgery and pre-warming 30 minutes to 2 hours prior to major surgery.

Tissue perfusion/hypovolemia: Maintain adequate oxygenation and circulation. Tissue oxygen saturation should be consistent with as high a pO2 as possible without risking O2toxicity. Reduced tissue oxygenation and circulation impairs immunity by reducing the following:

- oxidative killing by neutrophils
- deposition of collagen
- chemotaxis and phagocytosis of granulocytes
- motility of macrophages,
- production of antibodies
- production of super oxide radicals

Additional factors: Includes glucose control, pain management, the presence of suture or foreign body, surgical technique, instrument processing and operating room ventilation.

Staff Policies: All surgical team members who enter the semi-restricted and restricted areas of the surgical suite shall wear appropriate surgical attire (specific non-sterile theatre clothing) and adhere to the health care facility's dress code policy.

Staff Policies for SSI prevention and wound healing promotion includes the following:

- All surgical team members shall don freshly laundered scrub attire upon entry to the Operating Room
- Footwear should meet provincial labour codes.

- All hair shall be completely confined by a clean hood or hat. Reusable hats shall be laundered after each use.
- Finger nails shall be clean, short, natural and appear healthy
- Artificial nails, extenders or artificial enhancers shall not be worn
- All jewelry should be removed
- All surgical team members must wear personal protective equipment
- Surgical hand antisepsis/scrub procedure (water or waterless) which follows an approved standardized protocol and includes the site's and manufacturer's written instructions for use
- Powder-free gloves eliminate the potential for foreign body granuloma formation and reduce the spread of latex proteins
- Patient positioning; **refer to WRHA Best Practice Guidelines, Patient Positioning for Surgical Procedures,** available at http://www.wrha.mb.ca/professionals/ebpt/files/patientpositioning.pdf
- Proper use of surgical drains
- Proper use of urinary catheters
- Providing supplemental oxygen to maintain saturation rate of 95%
- Limiting Operating Room traffic and idle conversations in the operating room are essential to reducing airborne bacteria
- Room cleaning as per facility's policy
- Surgical wounds should be covered with an appropriate dressing at the end of surgery and monitored on an on-going basis

Post-Operative Phase

Address risk factors previously identified.

Perfusion: pain, fear, smoking, medication and cold are sympathetic nervous system activators and may induce profound vasoconstriction in subcutaneous and skin blood vessels supplying peripheral tissue; the ideal wound interface temperature is 37°C, and reduced temperatures may inhibit the activity of phagocytic cells and affect cell mitosis.

Pain: Assess and manage pain; **refer to WRHA Clinical Practice Guideline, Pain Assessment and Management; and WRHA Best Practice Guideline, Normal Wound Healing,** both available athttp://www.wrha.mb.ca/professionals/ebpt/files/PAM_CPG.pdf

Ensure Normothermia.

Hand hygiene: Maintain proper hand hygiene and routine practices. Implement additional precautions as required; **refer to WRHA Hospital Infection Prevention and Control Manual,** available at http://home.wrha.mb.ca/prog/ipc/manual_hospital.php

Pre-operative skin preparation: To maximize pre-operative skin preparation efficacy, chlorhexidine-alcohol skin prep should not be washed off for at least 6 hours following surgery; **refer to WRHA Best Practice Guidelines, Surgical Skin Preparation**, available at http://www.wrha.mb.ca/professionals/ebpt/files/skinprep.pdf

Post-operative Incision Care:

- Ensure that aseptic technique is used for dressing changes
- Maintain surgical dressings post-operatively; keeping the wound clean and dry to prevent infection
- Cleanse the wound with sterile saline with initial dressing change
- Appropriate dressing and wound care regime

Maintain glucose control:Maintain range within 4 – 10 mmol/L.

Antibiotics:Antibiotics administered for thoracic, orthopedic and vascular patients should be discontinued within 24 hours from the time the surgery ended (48 hours for cardiac), whereas non-complex and uncomplicated surgeries require no further administration of antibiotics following surgery.

Nutrition: Provide timely nutritional support including adequate protein, calories, and fluid either by oral, enteral, or parenteral means. Vitamin and mineral supplements such as multivitamins, vitamin C, and zinc may be necessary to promote optimal healing.

Communicate: any potential postoperative risks to the post-anesthetic care unit (PACU) and all postoperative care providers

Edema: Prevent venousstasis and control edema by ensuring early mobility and range of motion of extremities, elevation of affected limbs and use of compression stockings and/or sequential compression devices (SCD) providing the patient has adequate vascular supply.

Support the wound: Support garments or devices should be applied immediately post-op in cases where there is potential for tension on the wounds from internal or external forces. For example, a female patient who is undergoing elective cardiac surgery with a sternal incision should purchase a front-closure support bra that can be applied in the OR so that the breasts do not pull against the incision. Support garments and preferences are surgeon specific. Support garments and binders need to be used with caution to prevent additional complications. For example, an abdominal binder that is applied to prevent or support a dehisced abdominal wound should be applied no higher than 4cm below the xiphoid process so that respirations are not restricted. The binder should allow for 2.5cm of space between the binder and the skin. Binders should be worn when the patient ambulates.

Education: Surgical teams that provide wound care and dressing changes should receive basic wound care education that reflects best practices. The knowledge, skills,

and attitudes of health care providers can have a major impact on their ability to assess the complexity of a wound, control a patient's symptoms and manage associated problems. Knowledge of wound care products and their appropriate use, as well as the phases of wound healing and use of products on wounds healing by secondary intention, is crucial. It is essential that health care professionals understand the phases of normal wound healing and wound healing in the presence of complications.

Consult Advanced Wound Care Specialist: Surgical wounds that are not healing in a normal, timely manner should be referred to a clinician with advanced wound care knowledge for specialized decision-making regarding the best wound care product choice. The goals of wound dressing products are to provide a moist wound bed, protect the open wound bed from trauma or potentially harmful agents, manage drainage/exudate, and prevent and manage infection. **Refer to Table 3: Recognizing Surgical Wound Healing.** Education should incorporate infection prevention practices.

Level of Evidence = NICE level 2+ and RNAO level lV

Recommendation 2:

Include the patient, **family and/or caregiver** as members of the team when developing care plans.

- Build relationships with the patient, family and/or caregiver
- Establish a collaborative approach to planning care to meet the physical, emotional, social and spiritual needs **of the patient**
- Enable and empower the patient, family and/or caregiver to be active participants in care
- Encourage engagement to facilitate the best possible surgical outcomes
- Maintain a partnership with patient/family/caregiver for care planning and service delivery

Level of Evidence = NICE level 4 and RNAO level lV

Recommendation 3:

Educate the patient, family and/or caregiver to optimize surgical wound healing.

To ensure optimal wound healing, patients, families and/or caregivers require information.

- Give clear, consistent information and advice throughout all phases of care
- Offer information to prevent SSIs and optimize wound healing
- Offer instruction on when and how to perform hand hygiene
- Offer information about how to care for the wound after discharge
- Offer information about how to recognize signs and symptoms of infection of the surgical wound, including erythema, and warmth of the area around the incision, abnormal discharge, malaise, increased pain to the surgical area, fever, chills, and who to contact if there are concerns
- Inform patients after their surgery if they have been given antibiotics
- Information should be written in plain language and, in areas with large non-English speaking populations, instructions should be made available in other languages
- Instructions should be reviewed with the patient/family/caregiver, and they should be given an opportunity to ask questions and provide feedback to ensure that the instructions have been understood
- At discharge the patient/family/caregiver should receive clear instructions about who to call, including the contact number should wound complications arise

Recommendation 4:

Assess the surgical wound and document findings using a standard approach.
A comprehensive wound assessment approach provides baseline data and identifies subtle changes that may indicate early signs of infection and, in turn, support timely, appropriate interventions.

- Assessment of the surgical area should begin immediately following surgery
- The initial post-operative dressing should remain over the wound for the first 48 hours, and should be reinforced if breakthrough drainage occurs
- Following removal of the initial dressing, the surgical site and surrounding area should be assessed regularly
- Early indicators of infection or abscess formation can include serous or purulent exudate, erythema, induration, swelling, increase in skin temperature surrounding the wound, night sweats, chills, fever, increased pain or tenderness, feeling of general malaise, and an increase in white blood cell count
- The level of suspicion for infection increases if more than one indicator of infection is present (as stated above)
- If there is any redness/inflammation around the wound, mark the edge of inflammation with a marker. This marking supports communication between team members as to whether the "redness" has increased or decreased

- Any offensive smelling discharge from the wound after surgery requires further investigation as this is an indicator of infection. The physician should be notified immediately as antimicrobial therapy may be warranted. Often, opening the wound and allowing it to drain is sufficient to treat the infection. Opening a wound should only be done under the guidance of a physician or Advanced Wound Care Clinician who has authority to do so.
- A deep tissue abscess should be drained if possible
- Ensure patient/family/caregiver teaching occurs prior to discharge
- Since many post-operative infections occur after discharge, careful and thorough assessment and follow-up in the community is essential
- From the removal of the initial dressing through to peri-wound tissue closure/healing, the wound bed should be assessed using a standardized wound assessment tool

A systematic approach to surgical wound assessment and treatment includes three steps:

Step 1: What are you seeing?
The parameters identified in the "Measure" mnemonic should be included in the wound assessment to help clinicians connect in a common language when monitoring a wound and documenting findings. **Table 2** shows the MEASURE assessment framework.

Step 2: When are you seeing it?
It is equally important to note when to look for changes in the surgical wound. **Table 3** identifies the healing signs for surgical wound healing.

Step 3: What should you consider if you see it?
Early recognition of alterations in healing will support early intervention to return the patient to a healing trajectory.

Table 2: MEASURE for wound assessment

Measurement of the wound
♦Provides baseline data even if the incision is well approximated ♦ Measure the length of the incision and width of the approximated edge
Exudate quality and amount
♦Color, amount, consistency and odor (if present) ♦ Drainage should diminish within three to four days ♦ Signs of increasing bio-burden may include increased serous exudates; purulent drainage; color change from clear serous to opaque yellow; odor
Appearance of wound bed
♦Tissue in the wound bed: quality, type, and amount; epithelial tissue; granulation tissue; and presence of slough or necrotic tissue
Suffering
♦ Complete a pain assessment; note type, quality and degree of pain ♦ Use a pain assessment tool to support consistent communication between patient and caregiver
Undermining
♦Identify whether there is tunneling or undermining and measure the amount
Re-evaluation *
♦wounds should generally be re-evaluated every 1-4 weeks or when a significant change in wound status occurs(based on clinical judgment)
Edge of the wound
♦Assess disruption of the approximated edge (gaps in the suture line). If dehiscence occurs, depth is added to the length x width measurement ♦ Description of the peri-wound tissues should include color, temperature and presence / location of edema or induration ♦ Induration along both sides of the suture line may be expected, and may be a healing ridge

Keast DH, Bowering K, Evans W, et al. Measure: A proposed assessment framework for developing best practice recommendations for wound assessment. Wound Repair Regen. 2004; 12(3 suppl):S1-S17.

* Wounds healing by secondary intention should have a rate of contraction of about 0.5 cm per week. A wound edge that is dry or rolled indicates the wound is not responding to the care plan. Re-evaluation of the wound is then required to ensure the treatment is optimal. All local wound, host factors, health care professional and resource/treatment related factors need to be addressed. If wound healing is not evident, then referral should be made to an Advanced Wound Clinician.

Table 3: Recognizing Surgical Wound Healing

Healing signs for surgical wound healing

Outcome Measure	Days 1-4: New Wound	Days 5–9: Healing	Days 10-14: Proliferative Healing	Day 15-years 1-2: New Skin Forming
Incision color	Red, edges approximated	Red, progressing to bright pink (all skin tones)	Bright pink (all skin tones)	Pale pink, progressing to white or silver in light-skinned patients; pale pink, progressing to darker than normal skin color or may blanch to white in dark-skinned patients
Surrounding tissue Inflammation	Swelling, redness, or skin discoloration, warmth, pain	None present	None present	None present
Drainage type	Bloody, progressing to yellow/clear	None present	None present	None present
Drainage amount	Moderate to minimal	None present	None present	None present
Closure materials	Present, may be sutures or staples	Beginning to remove external sutures/staples	Sutures/staples removed, steristrips or tape strips may be present	None present
New skin	Present by day 14 along entire incision	Present along entire incision	Present	Present
Healing ridge	None present	Present by day 9 along entire incision	Present along entire incision	Present

Table 3 Continued: Recognizing Surgical Wound Healing

Unwanted results for surgical wound healing

Incision	Red, edges approximated but tension evident on incision line	Red edges may not be well approximated; tension on incision line evident	May remain red, progressing to bright pink	Prolonged new skin formation, keloid or hypertrophic scar formation
Surrounding tissue inflammation	No signs of inflammation present: no swelling, no redness or skin discoloration, no warmth and minimal pain at incision site; hematoma (bruise) formation	Swelling, redness, or skin discoloration; warmth, pain at incision site; hematoma (bruise formation)	Prolonged inflammatory response with swelling, redness, or skin discoloration; warmth and pain; hematoma (bruising) formation	If healing, may be stalled at a plateau with no evidence of healing and continued signs of redness, pus, heat, or coolness, pain or numbness
Drainage type		Red tinged/yellow and pus	Any type of drainage (pus) present	Any type of drainage (pus) present
Drainage amount		Moderate to minimal	Any amount present	Any amount present
Closure materials		No removal of any external sutures/staples	Sutures/staples still present	For secondary intention healing, failure of wound contraction or edges not approximated
New skin	Not present along entire incision	Not present along entire incision	Not present along entire incision, opening of incision line	Not present or abnormal skin appearance, such as keloid or hypertrophic scarring
Healing ridge	None present	None present along entire incision	Not present along entire incision, opening of incision line	Abscess formation with wound left open to heal slowly

Brown P, Maloy JP, Oddo D, Quick Reference to Wound Care. Gaithersburg, MD: Aspen Publishers, Inc; 2001.p.202-3.

Level of Evidence = RNAO level IV

Recommendation 5:

Determine the effectiveness of the interventions and reassess if healing is not occurring at the expected rate. Assess the wound edge and rate of healing to determine if the treatment approach is optimal.

Regular assessment and documentation of wound healing is essential to determine whether the wound is progressing through an orderly sequence of healing. Tools are available that allow for systematic wound assessment (see Recommendation 5). Standardization of assessment is crucial, particularly when multiple caregivers are involved.

Assessment of the advancement of the wound edge or contraction of the wound is an excellent way to determine if the wound is responding to the care plan. In wounds healing by primary intention collagen synthesis usually peaks at about the ninth day and at about this time the "healing ridge" should be palpable just under the intact suture line. Absence of this healing ridge indicates impaired healing and an increased risk for dehiscence.

In situations where wound healing may not be a feasible goal, evaluation should be targeted at ensuring the treatment is maintaining the wound and preventing infection, decreasing dressing frequency, decreasing pain and improving patient quality of life.

Level of Evidence = RNAO level IV

Recommendation 6:

Debride the surgical wound of necrotic tissue.

Removal of necrotic tissue will help to reduce bacterial burden in the management of open surgical wounds. General debridement techniques and principles can be applied to non-healing surgical wounds; **refer to the WRHA Best Practice Guidelines: Preparation of the Wound Bed: Debride the Wound, p. 20-22** available athttp://www.wrha.mb.ca/professionals/ebpt/files/wc-04prepofthewoundbed.pdf**andThe Canadian Association of Enterostomal Therapy (CAET)'s *Evidence-Based Recommendations For Conservative Sharp Wound Debridement.*** Available at**:** http://www.caet.ca/caet-english/documents/caet-conservative-sharp-wound-debridement-bpr.pdf

- Conservative sharp debridement of surface necrotic material is a fast and effective method, provided it is within the clinician's skill level and scope of practice. The patient must be provided an appropriate analgesia before, during and after the procedure; the setting must allow for the achievement of hemostasis.
- Acute surgical wound debridement falls only within the scope of the physician or trained Advanced Wound Care Practitioner

- Irrigation at safe pressures with appropriate irrigating fluids will help to mechanically debride, flush loose necrotic material and dilute toxins; it is important to ensure that the majority of the irrigating fluid is recovered
- Dressing selection should promote autolytic debridement where possible
- Team members must wear Personal Protective Equipment (PPE)

Level of Evidence = RNAO level Ib

Recommendation 7:
Rule out or treat a Surgical Site Infection.

For all surgical procedures, infection at the operative area has always been recognized as a potential complication. Infection at the operative site remains a potentially devastating, even fatal, event. A SSI is typically multi-factorial in origin. The occurrence of a post-operative infection is dependent upon the interaction of patient-related factors, procedure-related factors and appropriate and timely antimicrobial prophylaxis.

SSI is the third most common healthcare-acquired infection; it is the most common nosocomial infection among surgical patients; it prolongs hospital stay and incurs additional cost. Surgical wounds account for 20% of all hospital skin infections.

SSI management requires an interdisciplinary team approach that often includes infectious disease practitioners. SSIs resulting from inpatient procedures may be recognized while the patient is still in hospital or, more commonly, after discharge. Most SSIs will be recognized in the community as up to three-quarters of all surgical procedures are performed in the hospital outpatient setting.

Criteria for Defining a SSI

SSIs are classified as either being incisional or organ/space. Incisional SSIs are further divided into those involving only skin and subcutaneous tissue (superficial incisional SSI) and those involving deeper soft tissues of the incision (deep incisional SSI) Organ/space SSIs involve any part of the anatomy, (i.e. organ or space) other than incised body wall layers, that was opened or manipulated during an operation. SSIs are well defined by the CDC's NHSN. **Table 4** identifies the classifications of SSIs.

Wounds following surgical procedure are classified as superficial incisional, deep incisional, or organ/space, depending upon the tissue or body part involved.

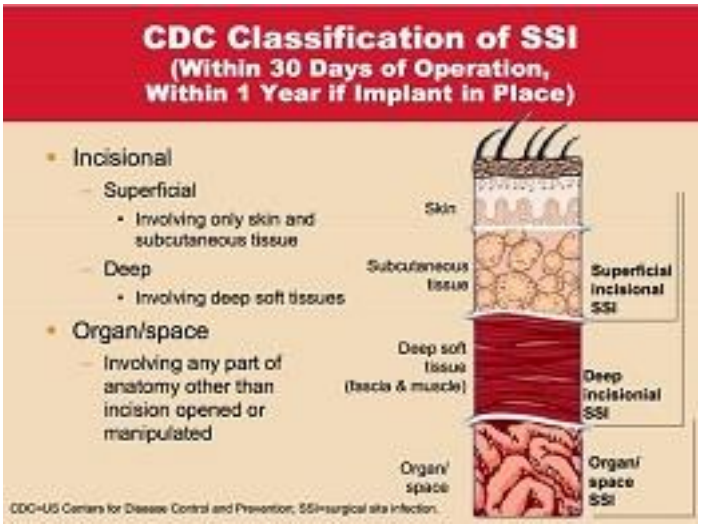

Figure 1: Cross-section of abdominal wall depicting CDC classifications of SSI

Table 4: Classifications of SSIs

Superficial Incisional SSIs	♦ Infection occurs within 30 days after the operation ♦ Involves only skin or subcutaneous tissue of the incision and at least one of the following: 1) Purulent drainage from the superficial incision. 2) Organisms isolated from an aseptically obtained culture. 3) At least one of the signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative. 4) Diagnosis of superficial incisional SSI by the surgeon or attending physician.
Deep Incisional SSIs	♦ Infection occurs within30 days after the operation if no implant is left in place or within 1 year if implant is in place ♦ Involves deep soft tissues (i.e. fascial and muscle layers) and at least one of the following: 1) Purulent drainage from the deep incision but not from the organ/space component of the surgical site. 2) A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (38°C), or localized pain or tenderness, unless incision is culture-negative. 3) An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination. 4) Diagnosis of a deep incisional SSI by a surgeon or attending physician.
Organ/Space SSIs	♦Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place ♦ Involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operation and at least one of the following: 1) Purulent drainage from a drain that is placed through a stab wound into the organ/space. 2) Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space. 3) An abscess or other evidence of infection involving the organ/ space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination. 4) Diagnosis of an organ/space SSI by a surgeon or attending physician.

Mangram AJ, Horan TC, Pearson ML, et al. Guideline for Prevention of Surgical Site Infection, 1999. Hospital Infection Control Practices Advisory Committee. Infection Control and Hospital Epidemiology, 1999; 20:250-78.

SSIs can be acute (occurring within and lasting < 30 days) or chronic (occurring after 30 days). The respective clinical presentations are different, with differing long-term outcomes. **Table 5** shows Acute vs. Chronic SSIs.

Table 5: Acute vs. Chronic SSIs

Acute SSI (<30 days)	♦ Symptoms: localized heat, pain or tenderness, redness, swelling ♦ Signs: purulent drainage, fever (>38°C), spontaneous dehiscence (category 2 or 3), wound is deliberately opened by the surgeon or the surgeon confirms that a SSI is present • An abscess or other evidence of infection may be seen on direct examination or on histologic or radiographic assessment. Microorganisms are isolated from an aseptically obtained culture of fluid or tissue from the incision site • After 48 hours SSIs are more common sources of fever, and careful inspection of the surgical incision is indicated. For patients with a temperature < 38.5° and without tachycardia, observation, dressing changes or opening the incision site suffices. For patient with a temperature > 38.5°C or a heart rate ≥ 110 bpm, antibiotics are generally required, as well as opening of the suture line • Infections that develop after surgical procedures involving non-sterile tissue - such as colonic, vaginal, biliary or respiratory mucosa – may be caused by a combination of aerobic and anaerobic bacteria. These infections can progress rapidly and involve deeper structures than the skin (i.e. fascia, fat or muscle) • If the SSI is successfully managed, healing will resume and the long-term outcome is excellent
Chronic SSI (>30 days)	♦ Symptoms: pain, decline in function; fever may be absent, with normal vital signs ♦ Signs: lack of healing of an acute SSI, unresolved dehiscence, new sinus or fistula formation, persistent wound drainage, presence of a foreign body or devitalized tissue, poor local vascularity, persistent odor, absence of healing or infected prosthetic implant • The features and extent of a chronic SSI depend upon the nature of the Surgical procedure and which systems were involved (i.e. gastrointestinal, gynecological, orthopedic, neurological surgery or sternotomy). A chronic infection is more likely to be associated with a persistently open surgical wound

Treatment of Surgical Site Infection

Acute SSI

SSIs rarely occur during the first 48 hours after surgery, and fever during this early period usually arises from noninfectious or unknown causes. Most SSIs occur within 30 days of surgery or within one year if an implant has been inserted.

Table 6: Treatment of Acute SSIs

Time	
< 48 hours after operative procedure	♦ SSI is unlikely at this time. ♦ Assess for signs and symptoms of infection ♦ True soft-tissue emergencies are necrotizing clostridial or mixed anaerobic cellulitis, or streptococcal necrotizing fasciitis. In this situation, the most important ♦ Management steps include the following: • Urgent surgical consultation • Administration of a first dose of empiric antimicrobial therapy, based on likely causative microorganisms • Consultation with a pharmacist and consider using: 1) Penicillin G + clindamycin 2) Cefazolin + metronidazole 3) Vancomycin + metronidazole
> 48 hours after operative procedure	♦ Assess for signs and symptoms of infection ♦ Open the wound and culture for microorganisms ♦ Consider ultrasound to rule out underlying abscess ♦ For surgical procedures conducted above the waist (i.e. head, neck, trunk or upper extremities), consider the following antimicrobial therapy: • Cefazolin • Clindamycin • Vancomycin ♦ For surgical procedures involving the abdomen, perineum, genitourinary tract or lower extremities, consider the increased likelihood of surgical site contamination with microbial flora originating from the gut, consider the following antimicrobial regimens: 1) Cefazolin + metronidazole (or clindamycin) 2) Clindamycin + ciprofloxacin 3) Vancomycin +metronidazole + ciprofloxacin

Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. Clin Infect Dis. 2005; 41:1375-407

Chronic SSI

Management of a chronic SSI in an open surgical wound requires a team approach. The type of treatment is based upon the duration (generally greater than 30 days) and location of the wound and the type of infection involved. Clear guidelines for the management of infection in a chronic open surgical wound are less well-defined, and usually rely upon expert opinion. Generally, the clinician must identify and correct the underlying surgical and non-surgical factors that have led to the infection. Further surgical intervention is frequently required, depending upon the surgical problem, usually to remove devitalized tissue or infected foreign material, close a fistula or ulcer space, or drain/remove a sinus tract. Multi-resistant microorganisms such as MRSA, other Gram-negative bacteria or even fungi may be involved. Healing the wound is

encouraged rather than treating colonization. Rehabilitation is frequently needed as part of the recuperation phase.

Level of Evidence = NICE level 4 and RNAO level IIa

Recommendation 8:

Provide optimal local wound moisture balance to promote healing by choosing an appropriate dressing for the acute and chronic phases of surgical wound healing.

Moist wound healing is one of the cornerstones of evidence-based wound care in both the acute and chronic settings. The advantages of moist wound healing include less intense and less prolonged inflammation; rapid keratinocytosis and increased fibroblast proliferation; an increased rate of collagen synthesis and epithelial cell migration, resulting in earlier angiogenesis; and faster contraction of full-thickness wounds.

Acute Surgical Wounds

Acute wounds (including surgical wounds) are caused by external trauma to the human body and follow a systematic process of repair, progressing through vascular, inflammatory, proliferation and maturation stages of healing.

Wounds with minimal tissue loss that are closed surgically heal by primary intention when the closure joins the wound edges, eliminating dead space and minimizing the need for new tissue formation. These wounds generally heal with minimal scar formation.

Surgical wounds can be further classified into clean, clean-contaminated, contaminated or dirty-infected, providing an indication of how the wound will heal. Delayed primary closure may be used to prevent infection in contaminated surgical wounds. The wound is allowed to remain open for several days before final closure to ensure all sources of contamination have been removed. Surgical wounds described as dirty-infected, dehisced or ruptured heal best by secondary intention, where the wound is left open and heals when granulation tissue fills the wound from base up.

Surgical wounds tend to have a lot more exudate than most other wounds due to edema from the surgical procedure and third spacing from fluid resuscitation throughout the pre-operative to post-operative periods. Exudate from acute surgical wounds is rich in white blood cells, protein, essential nutrients and growth factors that support the stimulation of fibroblasts and production of endothelial cells.

If an acute surgical wound fails to heal within 30 days, it becomes a chronic wound.

Chronic Surgical Wounds

A chronic wound is defined as one that deviates from the expected sequence of tissue repair; this may include infected or dehisced surgical wounds.

Chronic wounds do not always heal in a predictable fashion, due to a wide variety of host and local wound factors. They are often described as being "stuck" in a prolonged inflammatory phase, in which the wound exudate is no longer beneficial and may in fact become harmful. Chronic wound fluid shows higher levels of matrix metalloptroteases, which may slow or block cell proliferation, degrade the wound matrix and contribute to the prolonged inflammatory stage.

Dressing Selection

Prior to the development of advanced wound products, gauze dressings were the primary wound dressings available and were changed frequently throughout the day. Although effective, gauze dressings can be very time-consuming to apply and painful for the patient; they have also been shown to lead to higher infection rates and can cause dispersal of significant amounts of bacteria into the air when the dressing is moved. Frequent dressing changes required with gauze dressings decreases the wound bed temperature, which can result in delayed healing. Interactive advanced wound products have an advantage over wet gauze dressings, as they prevent bacterial penetration of the wound.

Gauze may be appropriate for the delivery of antimicrobial solutions for acutely infected surgical wounds, provided they are used for a short course of 2 to 10 days, and should be followed by an Advanced Wound Care Clinician. Gauze may also be appropriate for surgical wounds with copious exudate, (for example abdominal wounds) until the exudate subsides; in such cases advanced wound dressings may not be cost-effective as they will still require frequent dressing changes. Dressing choices need to be reassessed and revised as the wound condition changes.

Choosing a dressing that provides a moist wound healing environment has been shown to promote the growth of granulation tissue, prevent prolonged inflammation and provide protection and thermal regulation in both acute and chronic wounds. Evidence supports the use of advanced wound products; studies have shown improved patient outcomes; decreased pain with dressing procedures and decreased overall costs. Refer to **WRHA Wound Care Appendix B: Dressing Selection** available at http://www.wrha.mb.ca/professionals/ebpt/files/wc-11appendixb.pdf

Wound Packing

The dressing material selected for packing depends on the amount of drainage and extent of depth, tunneling or undermining. Strip gauze packing is used to fill narrow areas (such as tunneling) or mildly exudative wounds. When using any type of strip or rope packing, **one continuous length of packing** must be used with one end of the packing left out of the wound to ensure complete removal of the packing takes place.

When packing a wound, it needs to be lightly and completely packed. Packing the wound too tightly can lead to tissue ischemia and can cause discomfort for the patient. Packing a wound incompletely can cause premature closure of the skin. If the wound is completely packed, this allows the wound to close from the inner or deepest aspect to the superficial tissues (from the inside out).

For large deep exudative wounds, an absorbent dressing may be more suitable such as a calcium alginate or hydrofiber rope but only if the entire wound base is visible. If the entire wound base is not visible, a calcium alginate or non-reinforced hydrofiber must not be used as there is an increased risk of the dressing being left in the wound. Dressing selection for surgical wounds is determined by the type of closure (primary, delayed primary intention or secondary intention), as well as the amount of wound exudate. Consideration should also be given to patient concerns, caregiver knowledge and time, setting, and available financial resources.

In situations where the wound requires a secondary closure, counted radiopaque sterile surgical sponges may be intentionally left in the patient's wound as packing at the end of surgery. The location, number and type of counted surgical sponges used for packing should be documented on the perioperative record during surgery. Information should be made clear to all care providers, during the hand-off phase, on the intentional retention of these surgical sponges. Surgical sponges are to remain in the open incision and are to be removed only in the aseptic environment of an operating room theatre. These same surgical sponges must also be counted when the surgeon removes them during the secondary wound closure procedure. Upon removal, the surgical sponges that were used as packing are counted, documented and bagged. The type and number of sponges removed must be identical to the number of sponges documented as having been packed into the incision during the prior procedure. If there is a discrepancy, an intraoperative x-ray must be taken to ensure that no surgical sponges are retained in the patient's wound.

Exudating Wounds

Excess exudate impacts nutritional status. Achievement of a positive nitrogen balance is widely considered to be the primary goal of nutritional support. Abdominal fluid nitrogen loss needs to be included in nitrogen balance calculations to ensure adequate protein administration. Although measurement of individual abdominal fluid nitrogen loss is optimal, an estimate of 2g of nitrogen per liter can be used (12.5g of protein per liter).

In addition to open abdomens, other sources of protein losses, such as surgical drains should be taken into account. Although currently there is no recommendation to adjust feeding recommendations to replenish surgical drain protein losses, it may be useful to track the volume of fluid output and duration of time that the individual is draining such fluids to determine protein needs over time.

In addition to delaying wound healing by prolonging inflammation and breaking extracellular matrix proteins and growth factors, too much exudate will also cause the peri-wound tissue to become macerated (white, overly moist and non-viable). In heavily exudating wounds, the clinician may select a calcium alginate, Hydrofiber or foam dressing that will not only maintain moisture in the wound bed, but will also protect or wick moisture away from the peri-wound skin, decrease pain on removal and provide thermal regulation. Calcium alginates also have the property of hemostasis and therefore are the best choice for bleeding wounds.

Foam dressings are also optimal for heavy exudating wounds. Foams are available in a wide variety of sizes and absorbencies, with both lateral and vertical wicking abilities and varying degrees of moisture vapor permeability (allowing the exudate to evaporate through the dressing into the air).

Pouching is another option for the management of heavy exudating wounds. Expert opinion supports the use of pouching when exudate, significant odor or the need for skin protection from exudate are of concern. Generally, wounds with > 25 mL discharge /24 hours or those requiring dressing changes more than three to four times per day may be considered for this option. Other important considerations for pouching include the location of the wound, patient comfort and mobility and team members' time. Troughing a wound using ostomy products and film dressings to channel the exudate into a pouch-may be an option for larger wounds or fistulas. The involvement of an Enterostomal Therapy nurse is encouraged when exploring pouching or troughing.

When the wound is highly exudative, the peri-wound skin benefits from protection with a skin barrier. If an infection is present, treat the infection.

Dry Wounds

A dry wound bed prevents growth of granulation tissue and re-epithelialization. Dry surgical wounds may benefit from the addition of a hydrogel, non-adherent mesh or acrylic dressing to retain moisture and protect the wound bed.

Summary

Assess the patient and the wound for healing; **refer to WRHA Best Practice Guidelines, Wound Care, Preparation of the Wound Bed,** available athttp://www.wrha.mb.ca/professionals/ebpt/files/wc-04prepofthewoundbed.pdf.All surgical wounds require reassessment at regular intervals to evaluate the rate of healing and effectiveness of the care plan, and to identify and address any factors that may contribute to the delay in healing.

Level of Evidence = NICE level 1+ and RNAO level IV

Recommendation 9:

Consider the use of **negative pressure wound therapy (NPWT) and biologically active dressings.**

Negative Pressure Therapy (sub atmospheric pressure) is delivered to the wound to promote wound healing; it helps to remove excess fluid, increase vascularity, contract wound edges and decrease colonization; please **refer to thermal Use of Silver Dressings and Negative Pressure Wound Therapy Clinical Practice Guidelines** available at http://www.wrha.mb.ca/professionals/ebpt/files/NPT-Guidelines.pdf **Table 7** shows factors increasing the success of NPWT.

Before considering NPWT to support wound healing, an overall assessment of the wound-specific factors and patient's general health must be addressed to determine healing ability. The wound care specialist must consult and collaborate with the surgeon/attending physician to determine the use of NPWT and biologically active dressings.

Negative Pressure Therapy is contraindicated where there is necrotic tissue. It should not be placed directly over exposed blood vessels and/or organs, untreated osteomyelitis, non-enteric or unexposed fistulas, or malignancy in the wound. It should not be initiated unless the infection has been treated. Precautions should be taken in patients with active bleeding, hemostasis difficulties, or patientson anticoagulants. Apply the device in accordance with the product's protocols

Table 7: Factors Increasing the Success of NPWT

Wound has/is…	**Patient is/has…**
• Good blood supply • Healthy, granular wound bed • Freshly debrided • High levels of exudates • >2.0 cm wide	• Medically stabilized (i.e. nutrition, blood Pressure, blood glucose, fluid balance, infection) • Few or well-controlled co-morbidities • Comfortable (i.e. not in pain) • Adherent with therapy

World Union of Wound Healing Societies' Initiative. Vacuum assisted closure: recommendations for use: A consensus document. http://www.wuwhs.org/datas/2_1/11/VAC_Engl_WEB.pdf.

Biologically Active Dressings

Biologically active dressings will be used in the reconstructive phase or for scar revisions. Various biologic dressings, such as living human fibroblasts, extracellular matrix, collagen-containing preparations, hyaluronic acid and platelet-derived growth factor, have been developed in an effort to find adjunctive exogenous factors to induce and stimulate healing or to produce skin substitute for use in acute and chronic wounds.

Used alone these dressings will not effectively produce results if proper wound bed preparation does not first occur. Wound bed preparation, together with an appropriately chosen wound dressing or tissue substitute, can lead to a more effective treatment of acute and chronic difficult-to-treat wounds.

Caution

Advanced skill is required for the use of biologically active dressings. They should not be used on wounds with infection, presence of malignancy, sinus tracts or excessive exudate, or on patients known to have hypersensitivity to any of the product components. Consider cultural issues related to the source of the biologically active dressing.

Level of Evidence = NPWT: RNAO level IV

Recommendation 10:

Recognize that surgical wound healing requires a **team approach**.

The team coordinates care and promotes communication and problem solving among team members and other teams. Effective communication and teamwork is required at all phases of wound healing, from initial consults through to the time the wound closes. An interdisciplinary team approach allows for the safe and efficient treatment of patients who are at high risk for surgical site complications. From the physician consult to the pre-operative, intra-operative and post-operative phases many healthcare providers are involved with the patient and family to support them through the physical and psych-social challenges that arise from having a surgical complication (i.e. SSI, open surgical wound). The attitude and approach of the team can affect surgical wound healing.

Patient-Centered Care

Providing patient-centered care that includes culturally appropriate services and acknowledging that there are challenges and barriers may improve interdisciplinary team communication and teamwork with patients and families who are dealing with surgical complications. Good communication between health care providers and the patient and family is essential.

Quality Improvement

Effective teamwork is a key component to the prevention of adverse events. It has been acknowledged that "communication failure" is at the core of nearly every medical error and adverse event. There is a close correlation between team communication and safe care. The importance of teamwork as a factor in infection prevention and control must be recognized. There is increasing evidence that teamwork and collaboration are essential to improved patient outcomes. The team creates partnerships with other teams across the continuum of care to communicate infection prevention and control information and coordinate strategies.

Collaborative practice requires the team to go from the bedside to the wider workplace that health care providers are part of every day. This shift may help the team to become more collaborative, examining the "Healthy Work Environments framework and reflect[ing] physical/structural, cognitive, psychological, social, cultural and professional and occupational components of teamwork that must be addressed by the team members and at the team level to ensure best practice" is delivered.

Surveillance

Surveillance is a systemic and ongoing method of data collection; dissemination of information to the team has been found to help reduce the number of SSIs. Surveillance data of Health Care Associated Infections (HAIs) can be used to improve patient outcomes. Teamwork supports surveillance of surgical wound infection rates.

Level of Evidence = NICE level 4 and RNAO level IV

Recommendation 11:

Implement a **surgical site surveillance program** that crosses clinical setting boundaries.

SSI surveillance is an essential component of the recognized guidelines and continuous quality improvement initiatives that inform best practice for the prevention of infection and improvement of patient outcomes. It has been shown to reduce SSI rates by 32 per cent.

Successful SSI surveillance programs focus on targeted high-risk and high-volume operative procedures. They include epidemiologically sound definitions, stratification of SSI rates according to risk factors, effective surveillance methods and data feedback. Studies have identified the importance of SSI surveillance for at least 30 days, up to a year, following surgery.

Significant infections (deep incisional and organ/space) require readmission to hospital and can be captured and reported by hospital surveillance programs within the Infection Prevention & Control Department.Superficial SSIs are managed in the community and may not be captured by the operating hospital's surveillance program. Early identification of SSIs in the community is primarily important for the prompt initiation of treatment strategies; it also offers the opportunity to provide SSI data to hospital/surgical facility surveillance programs.

Level of Evidence = NICE level 4 and RNAO level IV

3 Glossary

Advanced Wound Clinician -Clinicians with advanced wound care credentials as recognized by WRHA

Assessment -A systemic and interactive process of information gathering and analysis for the purpose of identifying actual and potential health problems and evaluating effectiveness of care

Bacterial Burden (Bioburden) – The metabolic load imposed by bacteria in tissue

Body Mass Index (BMI) – Is a method of classifying body weight according to health risk. Health risk levels are associated with BMI categories:
Overweight: BMI is 25.0 – 29.9 = increased health risk.
Obese Class I: BMI is 30.0 – 34.9 = high health risk.
Obese Class II: BMI is 35.0 – 39.9 = very high health risk.
Obese Class III: BMI is 40 or greater = extremely high health risk

Colonization - Presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or cellular injury.

Debridement - Removal of devitalized tissue

Exudate - Accumulation of fluids in a wound: may contain serum, cellular debris, bacteria and leukocytes

Glucose Control -Blood glucose targets before meals should be < 7.8 mmol/L (and > 3.9 mmol/L), and random blood glucose values should be < 10 mmol/L

Health Care- Associated infections (HAIs) – Infections that were neither present nor incubating at the time the patient entered the health care system

Hemostasis –The arrest of bleeding by the physiological properties of vasoconstriction and coagulation or by surgical means

Malnutrition – The condition that develops when the body does not get the right balance of nutrients needed to maintain healthy tissues and organ function

Normothermia–Normal core body temperature range of 36°C to 38°C (96.8°F to 100.4°F)

Peri-wound - The tissue immediately surrounding a wound

Personal Protective Equipment – Gloves, gowns, masks and protective eyewear used according to risk of exposure to prevent transmission of infection

Primary Intention - Incisions closed by primary intention generally require only the application of a dry, sterile cover dressing; a dressing is required only for protection, as the wound will re-epithelialize within two to three days.

Subjective Global Assessment (SGA) – is a nutrition directed history and physical examination which classifies patients into 3 nutritional categories.
SGA A: Well nourished
SGA B: Moderately malnourished
SGA C: Severely malnourished

Secondary Intention -Acute surgical wounds that are left open to heal by secondary intention require a moist wound healing environment. To achieve an optimal moisture balance in the wound, the goal is to keep the wound bed moist while simultaneously preventing it from becoming either too wet or desiccated, both of which can cause further deterioration or a delay in wound healing.

Surgical Site (wound) Infection (SSI) -An infection that occurs when pathogenic organisms multiply in a surgical wound giving rise to local signs and symptoms, for example, heat, redness, pain and swelling, and (in more serious cases) with systemic signs of fever or raised white blood cell count. Infection in the surgical wound may prevent healing taking place so that the wound edges separate or it may cause an abscess to form in the deeper tissue.

Team - A group of two or more individuals who must interact and adapt to achieve a common objective

Tunneling - A narrow channel or passageway under or beyond wound margin

Undermining – A closed passageway under the surface of the skin that is open only at the skin surface; generally it appears as an area of skin ulceration at the margins of the ulcer with skin overlying the area; undermining often develops from shearing forces

Vascular Insufficiency – Poor blood supply, which may prevent appropriate wound healing

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WRHA.Best Practice Guideline, Wound Care, Preparation of the Wound Bed. http://www.wrha.mb.ca/professionals/ebpt/files/wc-04prepofthewoundbed.pdf

WRHA.Best Practice Guideline, Normal Wound Healing. http://www.wrha.mb.ca/professionals/ebpt/files/wc-03normalwoundhealing.pdf

WRHA.Best Practice Guideline, Use of Silver Dressings and Negative Pressure Wound Therapy
http://www.wrha.mb.ca/professionals/ebpt/files/NPT-Guidelines.pdf

WRHA.Evidence Informed Practice Tools: Wound Care Appendix B: Dressing Selection http://www.wrha.mb.ca/professionals/ebpt/files/wc-11appendixB.pdf

WRHA, Evidence Informed Practice Tools: Wound Care Appendix A: Infection Prevention and Control (IP & C) Wound Management Principles
http://www.wrha.mb.ca/professionals/ebpt/files/wc-10appendixA.pdf

WRHA.Best Practice Guidelines, Patient Positioning for Surgical Procedures.
http://www.wrha.mb.ca/professionals/ebpt/files/patientpositioning.pdf

WRHA.Best Practice Guidelines, Surgical Skin Preparation.
http://www.wrha.mb.ca/professionals/ebpt/files/skinprep.pdf

WRHA.Policy 90.00.060 Routine Practices for Reducing the Risk of Infection Transmission. http://home.wrha.mb.ca/corp/policy/files/90.00.060.pdf

WRHA.Policy 110.220.025 Surgical Safety Checklist – Operating Room.http://home.wrha.mb.ca/corp/policy/files/110.220.025.pdf

WRHA.Policy 110.000.320 Wound Care.
http://home.wrha.mb.ca/corp/policy/files/110.000.320.pdf

WRHA.Hospital Infection Prevention and Control Manual.
http://home.wrha.mb.ca/prog/ipc/manual_hospital.php

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