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Assessment and Management of Pressure Injuries for the Interprofessional Team

Third Edition



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Assessment and Management of Pressure Injuries for the Interprofessional Team

Third Edition

Greetings from Doris Grinspun,

Chief Executive Officer, Registered Nurses' Association of Ontario



The Registered Nurses' Association of Ontario (RNAO) is delighted to present the third edition of the clinical best practice guideline *Assessment and Management of Pressure Injuries for the Interprofessional Team*. Evidence-based practice supports the excellence in service that health professionals are committed to delivering every day. RNAO is delighted to provide this key resource.

We offer our heartfelt thanks to the many stakeholders who are making our vision for best practice guidelines a reality, starting with the Government of Ontario, for recognizing RNAO's ability to lead the program and for providing multi-year funding. For their invaluable expertise and leadership, I wish to thank Dr. Irmajean Bajnok, Director of the RNAO International Affairs and Best Practice Guidelines Centre, and Dr. Michelle Rey, Associate Director of Guideline Development. I also

want to thank the co-chairs of the expert panel, Dr. Karen Campbell (RN, Field Leader of MCIscWH and Wound Project Manager at Western University, ARGC Lawson Research Institute) and Dr. Gary Sibbald (MD, Professor of Public Health & Medicine, and Director/Course Coordinator of IIWCC and Masters of Science in Community Health, Prevention & Wound Care, Dalla Lana School of Public Health, Women's College Hospital, Trillium Health Care Partners, University of Toronto) for their exquisite expertise and stewardship of this Guideline. Thanks also to RNAO staff Grace Suva, Grace Wong, Diana An, and Tanvi Sharma for their intense work in the production of this Guideline. Special thanks to the members of the expert panel for generously providing their time and expertise, which has allowed us to deliver a rigorous and robust clinical resource. We couldn't have done it without you!

Successful uptake of best practice guidelines requires a concerted effort from educators, clinicians, employers, policy-makers, and researchers. The nursing and health-care community, with their unwavering commitment and passion for excellence in patient care, have provided the expertise and countless hours of volunteer work essential to the development and revision of each best practice guideline. Employers have responded enthusiastically by nominating best practice champions, implementing guidelines, and evaluating their impact on patients and organizations. Governments at home and abroad have joined in this journey. Together, we are building a culture of evidence-based practice.

We ask you to share this Guideline with your colleagues from other professions, because we have so much to learn from one another. Together, we must ensure that the public receives the best possible care every time they come in contact with us—making them the real winners in this important effort!

A handwritten signature in black ink that reads "Doris Grinspun". The signature is stylized and includes a long horizontal flourish at the end.

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How to Use this Document

This interprofessional Best Practice Guideline (BPG)^{G*} is a comprehensive document that provides resources for evidence^G-based interprofessional practice. It is not intended to be a manual or “how to” guide, but rather a tool to guide best practices and enhance decision making for interprofessional teams^G working with people with existing pressure injuries^G. The Guideline should be reviewed and applied in accordance with both the needs of the individual organizations or practice settings, and the needs and preferences of the person with a pressure injury. In addition, the Guideline provides an overview of appropriate structures and supports for providing the best possible evidence-based care.

Nurses, other health-care professionals, and administrators who lead and facilitate practice changes will find this document invaluable for developing policies, procedures, protocols, educational programs and assessments, interventions,^G and documentation tools. Interprofessional team members in direct care will benefit from reviewing the recommendations and the evidence that supports them. We particularly recommend that practice settings adapt these guidelines in formats that are user-friendly for daily use.

If your organization is adopting this Guideline, we recommend that you follow these steps:

1. Assess your health-care practices using the recommendations in this Guideline,
2. Identify which recommendations will address needs or gaps in services, and
3. Develop a plan for implementing the recommendations.

Implementation resources, including the RNAO *Toolkit: Implementation of Best Practice Guidelines* (2nd ed.; 2012) are available at www.RNAO.ca.

We are interested in hearing how you have implemented this Guideline. Please contact us to share your story.

* Throughout this document, terms marked with a superscript G (^G) can be found in the Glossary of Terms ([Appendix A](#)).

Purpose and Scope

Best practice guidelines are systematically developed statements designed to assist interprofessional team members to make decisions about health care and services (Field & Lohr, 1990). This Best Practice Guideline (BPG) is intended to replace the RNAO BPG *Assessment and Management of Stage I to IV Pressure Ulcers* (2007). It provides evidence-based practice recommendations^G for interprofessional teams across all care settings who are assessing and providing care to people with existing pressure injuries. A pressure injury is defined as “localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear^G. The tolerance of soft tissue for pressure and shear may also be affected by microclimate^G, nutrition, perfusion, co-morbidities and condition of the soft tissue.”(National Pressure Ulcer Advisory Panel [NPUAP], 2016, para 3).

Within the context of this Guideline, the interprofessional team refers to a team consisting of regulated health-care providers who provide wound care (i.e., pressure injury assessment, risk assessment for *additional* pressure injuries, and/or management of existing pressure injuries) for people who are living with existing pressure injuries. Although the principles for the prevention of pressure injuries may also apply, the focus of this Guideline is on the assessment and management of existing pressure injuries. For comprehensive information on pressure injury prevention, please refer to RNAO’s (2011), *Risk Assessment and Prevention of Pressure Ulcers* (<http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers>) clinical BPG. Members of the interprofessional team include but are not limited to nurses, physical therapists, occupational therapists, physicians, and dietitians. The interprofessional team should work in collaboration with the person^G with the pressure injury/injuries and the person’s circle of care—that is, paid and unpaid caregivers (e.g., personal support worker [PSW], developmental support worker [DSW], primary caregiver, substitute decision maker, family, friends etc.) to develop a plan of care.

In 2014, RNAO convened an expert panel to establish the purpose and scope of this Guideline. The panel was interprofessional in composition, comprising enterostomal therapy nurses, registered nurses, a registered practical nurse, nurse practitioners, a physical therapist, a dietitian, an occupational therapist, a physician, educators, and researchers.

Purpose

The purpose of this Guideline is to present evidence-based recommendations that apply to the decisions and best practices of interprofessional teams working to assess and manage existing pressure injuries in people 18 years of age and above. Where literature was limited, the expert panel used AGREE II quality-appraised pressure ulcer/injury guidelines, selected wound-bed preparation papers, and deliberative consensus to inform the recommendations. Although some of the evidence related to pressure injury prevention may apply to the management of people with existing pressure injuries, the expert panel agreed that such literature would not be included as supporting evidence for this Guideline.

Scope

This Guideline provides best practice recommendations in three main areas:

- Practice recommendations are directed primarily to the front-line interprofessional teams who provide care for people with existing pressure injuries across all practice settings.
- Education recommendations^G are directed to those responsible for interprofessional team and staff education, including educators, quality improvement teams, managers, administrators, and academic institutions.

- System, organization, and policy recommendations^G apply to a variety of audiences, depending on the recommendation. Audiences include managers, administrators, policy-makers, health-care professional regulatory bodies, and government bodies.

For optimal effectiveness, recommendations in these three areas should be implemented together.

While the expert panel recognizes that the treatment of mucosal membrane pressure injuries^G, cartilage pressure injuries^G, and medical device-related pressure injuries^G is an important clinical issue, coverage of these topics is outside the scope of this Guideline. Research on these types of pressure injuries continues to emerge, but at the time of the systematic review^G there was insufficient evidence to recommend evidence-based best practices for their treatment and management. The expert panel, however, recommends that interprofessional teams be aware that these types of pressure injuries are frequently misidentified and, for this reason, are often not reported or treated appropriately. For additional information on these types of pressure injuries, please refer to the list of resources included in [Appendix D](#).

Although most of the pressure injury assessment and management principles in this Guideline overlap with wound care best practices in specialized populations (e.g., pediatric, spinal cord injury, bariatric, critically ill, older adults, individuals in the operating room, and individuals in palliative care settings), they do not fully encompass the comprehensive care required by these sub-groups. Thus, these specialized populations are considered to be outside the scope of this Guideline. For additional information on pressure injury management in these populations, please refer to the resources listed in [Appendix D](#).

This Guideline is designed to help interprofessional teams become more comfortable, confident, and competent when caring for people with existing pressure injuries. It is intended for use in all domains of health care (including clinical, administration, and education) across health-care settings (including acute care, rehabilitation, long-term care, out-patient clinics, community care, and home care). It focuses on the core competencies and the evidence-based strategies that members of interprofessional teams require to assess and treat people with existing pressure injuries. Delivering effective care to such people requires coordination between health-care professionals, as well as open communication between health-care professionals and people with pressure injuries. In addition, people's individual needs and preferences should be acknowledged, and the personal and environmental resources available considered.

Various factors will affect the successful implementation of the recommendations in this Guideline across settings. Individual health-care professional skills and knowledge, and their professional judgment, are shaped over time by education and experience, and thus individual competencies vary. In all cases where the care needs of people with pressure injuries lie outside of the scope of a health-care professional's knowledge, this health-care professional should consult with other members of the interprofessional team (College of Nurses of Ontario [CNO], 2011). Governmental legislation, organizational policies and procedures, and the clinical population will also affect implementation of this Guideline.

Use of the Term "Person" in This Guideline

In this Guideline, the terms "person," "persons," or "people" are used to refer to individuals with existing pressure injuries. The expert panel has determined these terms to be equivalent to the terms "patient," "client," or "resident" used across various health-care settings. Exceptions to the use of this terminology occur in discussions of literature (e.g., studies, reports, etc.) that use alternative terms.

Use of the Term “Existing Pressure Injury” in This Guideline

The expert panel would like to inform the reader that as of April 8-9, 2016, the National Pressure Ulcer Advisory Panel (NPUAP) replaced the term “pressure ulcer” with “pressure injury.” In this Guideline, the term “existing pressure injury” is used to refer to stage 1, 2, 3, and 4 pressure injuries, unstageable pressure injuries, and deep tissue pressure injuries, as outlined by the NPUAP. Please refer to [Appendix E](#) for illustrations and full descriptions of each of these stages.

Use of the Term “Wound” or “Chronic Wound” in This Guideline

In this Guideline, the terms “wound” and “chronic wound” are used as synonyms for the term “pressure injury” unless otherwise indicated.

A reference list and appendices (including a glossary of terms, a description of how this Guideline was developed, and details of our literature search) follow the main Guideline. See [Appendix A](#) for a glossary of terms. See [Appendices B and C](#) for the guideline development process and the process for the systematic review and search strategy. The remaining appendices include resources related to the assessment and management of existing pressure injuries in people 18 years of age and above.



Summary of Recommendations

This Guideline replaces the RNAO BPG *Assessment and Management of Stage I to IV Pressure Ulcers* (2007).


We have used these symbols for the recommendations:

- ✓ No change was made to the recommendation as a result of the systematic review evidence.
 - +
- The recommendation and supporting evidence were updated with systematic review evidence.
- NEW** A new recommendation was developed based on evidence from the systematic review.

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
1.0 Assessment	<p>Recommendation 1.1:</p> <p>Conduct a health history, a psychosocial history, and a physical exam on initial examination and whenever there is a significant change in the person’s medical status.</p>	V	+
	<p>Recommendation 1.2:</p> <p>Assess the risk for developing <i>additional</i> pressure injuries on initial examination and if there is a significant change in the person’s medical status using a valid and reliable pressure injury risk assessment tool.</p>	V	+
	<p>Recommendation 1.3:</p> <p>Assess the person’s pressure injury using the same valid and reliable wound assessment tool on initial examination and whenever there is a significant change in the pressure injury.</p>	V	+
	<p>Recommendation 1.4:</p> <p>Assess the person’s pressure injury for signs and symptoms of infection (superficial critical colonization/localized infection and/or deep and surrounding infection/systemic infection) using a standardized approach on initial examination and at every dressing change.</p>	V	NEW

	<p>Recommendation 1.5:</p> <p>a) Screen all persons with pressure injuries for risk of malnutrition using a valid and reliable screening tool on first examination and if there is a delay in pressure injury healing.</p> <p>b) Determine the nutritional status of all persons at risk for malnutrition using a valid and reliable assessment tool within 72 hours of initial examination, and whenever there is a change in health status and/or the pressure injury.</p> <p>c) Perform a comprehensive nutrition assessment of all persons with poor nutritional status within 72 hours of initial examination, and if there is a change in health status or delayed healing.</p>	V	NEW
	<p>Recommendation 1.6:</p> <p>Assess for pressure injury pain on initial examination and continue to monitor pain at subsequent visits, including prior to and after every wound care intervention, using the same valid and reliable tool consistent with the person's cognitive ability.</p>	V	+
	<p>Recommendation 1.7:</p> <p>Perform a vascular assessment (i.e., medical history, physical exam) of all persons with pressure injuries in the lower extremities on initial examination.</p>	V	+
	<p>Recommendation 1.8:</p> <p>Conduct a mobility and support surface assessment on initial examination and whenever there is a significant change in the person's medical condition, weight, equipment, mobility, and/or pressure injury healing.</p>	V	+
2.0 Planning	<p>Recommendation 2.1:</p> <p>Obtain the referral or consultations required to plan and coordinate a pressure injury plan of care.</p>	V	+
	<p>Recommendation 2.2:</p> <p>Develop a pressure injury plan of care that incorporates goals mutually agreed upon by the person, the person's circle of care, and the interprofessional team.</p>	1a	+

PRACTICE RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
3.0 Implementation	<p>Recommendation 3.1:</p> <p>Reposition the person at regular intervals (i.e., every two to four hours) based on person-centred concerns. While sitting, weight-shift the person every 15 minutes.</p>	V	+
	<p>Recommendation 3.2:</p> <p>Position all persons with a pressure injury on a pressure redistribution support surface at all times.</p>	V	+
	<p>Recommendation 3.3:</p> <p>Implement an individualized nutritional plan of care in collaboration with the person and his/her circle of care that addresses nutritional requirements and provides adequate protein, calories, fluid, and appropriate vitamin and mineral supplementation to promote pressure injury healing.</p>	V	+
	<p>Recommendation 3.4:</p> <p>Provide local pressure injury care consisting of the following, as appropriate:</p> <ul style="list-style-type: none"> ■ cleansing (level of evidence = V); ■ moisture balance (healable) or moisture reduction (non-healable, maintenance) (level of evidence = Ia–b, V); ■ infection control (i.e., superficial critical colonization/ localized infection and/or deep and surrounding infection/systemic infection) (level of evidence Ia–b, V); and ■ debridement (level of evidence = V). 	Ia, Ib, V	+
	<p>Recommendation 3.5:</p> <p>Provide electrical stimulation (when available) as an adjunct to best practice wound care in order to speed healing and promote wound closure in stalled but healable stage 2, 3, and 4 pressure injuries.</p>	Ia	+

	<p>Recommendation 3.6:</p> <p>Implement, as an alternative, the following treatments in order to speed closure of stalled but healable pressure injuries, as appropriate and if available:</p> <ul style="list-style-type: none"> ■ electromagnetic therapy (level of evidence = Ib), ■ ultrasound (level of evidence = Ib), and ■ ultraviolet light (level of evidence = Ib). <p>Do not consider the following treatment in order to speed closure of stalled but healable pressure injuries:</p> <ul style="list-style-type: none"> ■ laser therapy (not recommended) 	Ib	+
	<p>Recommendation 3.7:</p> <p>Provide negative pressure wound therapy to people with stage 3 and 4 pressure injuries in exceptional circumstances, including enhancement of quality of life and in accordance with other person-/family-centred preferences.</p>	V	+
	<p>Recommendation 3.8:</p> <p>Collaborate with the person and his/her circle of care to implement a pressure injury self-management plan.</p>	Ia	+
	<p>Recommendation 3.9:</p> <p>Implement a person-centred pain management plan using pharmacological and non-pharmacological interventions.</p>	V	+
4.0 Evaluation	<p>Recommendation 4.1:</p> <p>Use the initial risk assessment tool to reassess the person's risk for developing additional pressure injuries on a regular basis and whenever a change in the person's health status occurs.</p>	V	NEW
	<p>Recommendation 4.2:</p> <p>Use the initial wound assessment tool to monitor the person's pressure injuries for progress toward person-centred goals on a regular basis and at dressing changes.</p>	V	+

EDUCATION RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
5.0 Education	<p>Recommendation 5.1:</p> <p>Develop and implement comprehensive and sustainable interprofessional pressure injury education programs for clinicians and students entering health-care professions.</p>	V	+
	<p>Recommendation 5.2:</p> <p>Assess health-care professionals' knowledge, attitudes, and skills related to the assessment and management of existing pressure injuries before and following educational interventions using an appropriate, reliable, and validated assessment tool.</p>	IV, V	+

SYSTEM, ORGANIZATION, AND POLICY RECOMMENDATIONS		LEVEL OF EVIDENCE	STATUS
6.0 System, Organization, and Policy	<p>Recommendation 6.1:</p> <p>Organizations must lead and provide the resources to integrate pressure injury management best practices into standard and interprofessional clinical practice, with continuous evaluation of outcomes.</p>	IV	+
	<p>Recommendation 6.2:</p> <p>Lobby and advocate for investment in pressure injury management as a strategic quality and safety priority in jurisdictions in order to improve health outcomes for people with pressure injuries.</p>	V	NEW

Interpretation of Evidence

Levels of evidence are assigned to study designs to rank how well particular designs are able to eliminate alternate explanations of the phenomena under study. The higher the level of evidence, the greater the likelihood that the relationships presented between the variables are true. Levels of evidence do not reflect the merit or quality of individual studies.

For guideline recommendations, where available, the highest level evidence is assigned that most aligns with the recommendation statement. In cases where there are multiple studies of various design with similar findings, the studies with the highest level of evidence are assigned (and cited) in support of the recommendation.

Guideline recommendations are, on occasion, assigned more than one level of evidence. This is a reflection of the varied study designs that support the multiple components of a recommendation. For transparency, the individual levels of evidence for each component of the recommendation statement are identified in the Discussion of Evidence.

LEVEL	SOURCE OF EVIDENCE
Ia	Evidence obtained from meta-analysis ^G or systematic reviews of randomized controlled trials ^G , and/or synthesis of multiple studies primarily of quantitative research.
Ib	Evidence obtained from at least one randomized controlled trial.
IIa	Evidence obtained from at least one well-designed controlled study ^G without randomization.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study ^G , without randomization.
III	Synthesis of multiple studies primarily of qualitative research ^G .
IV	Evidence obtained from well-designed non-experimental observational studies, such as analytical studies ^G or descriptive studies ^G , and/or qualitative studies.
V	Evidence obtained from expert opinion or committee reports, and/or clinical experiences of respected authorities.

Adapted from the Scottish Intercollegiate Guidelines Network (Scottish Intercollegiate Guidelines Network [SIGN], 2011) and Pati (2011).

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Declarations of interest that might be construed as constituting an actual, potential, or apparent conflict were made by all members of the Registered Nurses' Association of Ontario expert panel, and members were asked to update their disclosures regularly throughout the Guideline development process. Information was requested about financial, intellectual, personal, and other interests, and was documented for future reference. No limiting conflicts were identified.

Further details are available from the Registered Nurses' Association of Ontario.



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Stakeholder Acknowledgement

As a component of the development process for Best Practice Guidelines, RNAO is committed to obtaining feedback from nurses and other health-care professionals from a wide range of practice settings and roles, from knowledgeable administrators and funders of health-care services, and from stakeholder^G associations. Stakeholders representing diverse perspectives were solicited* for their feedback, and RNAO wishes to acknowledge the following individuals for their contribution in reviewing this Best Practice Guideline:

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*Stakeholder reviewers are individuals who have expertise in the subject matter of the Guideline, or are representatives of organizations involved in implementing the Guideline, or are affected by the implementation of the Guideline. Reviewers may be nurses and other point-of-care health-care providers, nurse executives, administrators, research experts, members of interprofessional teams, educators, nursing students, or individuals who have personal experience with pressure injuries. RNAO aims to solicit stakeholder expertise and perspectives representing diverse health-care sectors, and interprofessional participants at all levels of the health-care continuum (e.g., clinical practice, research, education, and policy) and across geographic locations.

Stakeholder reviewers for RNAO BPGs are identified in two ways. First, stakeholders are recruited through a public call issued on the RNAO website (<http://RNAO.ca/bpg/get-involved/stakeholder>). Second, key individuals and organizations with expertise in the Guideline topic area are identified by the RNAO guideline development team and expert panel, and are invited to participate in the review.

Reviewers are asked to read a full draft of the Guideline and participate in the review prior to its publication. Stakeholder feedback is submitted by completing an online survey questionnaire.

Stakeholders are asked to answer the following questions with regard to each recommendation:

- Is this recommendation clear?
- Do you agree with this recommendation?
- Does the evidence support this recommendation?
- Does this recommendation apply to all roles, regions, and practice settings?

The survey also includes an opportunity for stakeholders to include comments and feedback related to each section of the Guideline.

The RNAO Guideline development team compiles the survey submissions and prepares a summary of the feedback received. The RNAO expert panel reviews and considers all feedback and, if necessary, modifies the Guideline content and recommendations prior to publication, in order to address the feedback received.

Stakeholder reviewers have consented to the publication of their names and contact details in this Guideline.

Background

Pressure injuries serve as a key indicator of the overall quality and safety of health-care organizations and facilities (Harrison, Logan, Joseph, & Graham, 1998). For example, in 2013, the Canadian Institute for Health Information (CIHI, 2013) published a two-year study on the prevalence^G of wounds using administrative data gathered from hospitals, home-care agencies, hospital-based continuing-care units, and long-term-care facilities. According to CIHI (2013), pressure injury prevalence rates range from 0.4 percent to 14.1 percent (0.4 percent in acute care, 2.4 percent in home care, 6.7 percent in long-term care, and 14.1 percent in complex continuing care). However, CIHI (2013) has suggested that the prevalence of pressure injuries in reality is higher than researchers can ascertain from current administrative databases, proposing that there is a high probability that the prevalence of pressure injuries in acute in-patient settings is underestimated for the following reasons:

1. As a result of inadequate documentation in nurses' and physicians' notes, several studies from other countries that identified hospital patient records as a source of data do not capture adequate information about pressure injuries; and
2. Stage 1 pressure injuries are not included in the analysis of several studies (stage 1 ulcers, if not cared for, tend to develop into higher-staged pressure injuries).

From the patient perspective, the burden of pressure injuries is substantial because of the significant impact of pressure injuries on individuals' health-related quality of life. In a systematic review of the effect of pressure injuries on quality of life, Gorecki et al. (2009) identified several areas associated with an individual's well-being that are affected by pressure injuries: physical (e.g., symptoms, general health, perceived etiology); social (e.g., the impact of pressure injuries on the relationship between health-care professionals and their clients, and on others); psychological (e.g., negative emotions such as anger, frustration, anxiety, and depression); and financial.

In addition to their considerable effect on individuals' quality of life, the economic burden of pressure injuries is high. In Canada for example, Chan et al. (2013) estimated a monthly cost of \$4,750 (Canadian) for every individual with a spinal cord injury who was receiving pressure injury care in Ontario in his or her community. Clarke et al. (2005) have estimated that treatment costs for a single pressure injury can range from US\$10,000 to \$86,000 (with a median cost of \$27,000), and that treating pressure injuries can increase nursing time by up to 50 percent.

The high prevalence of pressure injuries, the reduced quality of life for affected individuals, and the significant cost of treating pressure injuries to the health-care system all underscore the need for the jurisdictions, governments, and the decision-makers within the health-care system, to take action in order to prevent, treat, and heal pressure injuries more effectively and efficiently. To advance pressure injury management, there is a clear need to provide a standardized approach across the continuum of care that reflects evidence-based, interprofessional, person-centred care. This requires implementation of the most recent research, and consensus from experts and consumers of pressure injury care.

Governments, agencies, and health-care professionals need to be proactive in addressing the overwhelming costs associated with pressure injuries. In Ontario and Canada for example, several pressure injury prevention initiatives are underway to promote the reporting of pressure injury incidence^G to a centralized body. The Excellent Care for All Act, 2010 focuses on quality indicators (e.g., pressure injury prevalence) in multiple care sectors. Mandatory public reporting of pressure injuries is also a requirement in the long-term care sector across Ontario (Accreditation Canada, 2013), and organizations are required to report their data to the Canadian Institute for Health Information (CIHI) through the Continuing Care Reporting System (CCRS), Home Care Reporting System (HCRS), and long-term care systems (i.e., RAI-MDS [Resident Assessment Instrument]), which provide consistency across the country.

At a national level, Accreditation Canada has added pressure injury prevention as a required organizational practice for acute care, rehabilitation, complex care, and long-term care (Accreditation Canada, 2013). System initiatives such as this can encourage the health-care sector to implement, monitor, and report on pressure injury prevention and treatment programs. Moreover, such programs may begin to illuminate some of the system gaps as well as the opportunities that exist to improve access to and delivery of evidenced-based, interprofessional, person-centred pressure injury prevention and treatment.

Avoidable and Unavoidable Pressure Injuries

The expert panel would like to emphasize that most—though not all—pressure injuries are avoidable. Pressure injuries are determined to be unavoidable if they develop despite the implementation of a preventive wound-care plan (Black et al., 2011). According to a National Pressure Ulcer Advisory Panel (NPUAP) consensus conference that took place in 2010, there are individuals who may develop unavoidable pressure injuries. Unavoidable pressure injuries may develop in people in the following circumstances:

- Movement is restricted as a result of hemodynamic instability (Black et al., 2011),
- Appropriate nutrition and fluids cannot be provided and/or maintained (e.g., person refuses to eat or to be fed or hydrated artificially) (Black et al., 2011),
- A person is at end-of-life (Sibbald, Krasner, & Lutz, 2009), or
- Other circumstances impede or limit the optimization of preventative pressure injury care (Black et al., 2011).

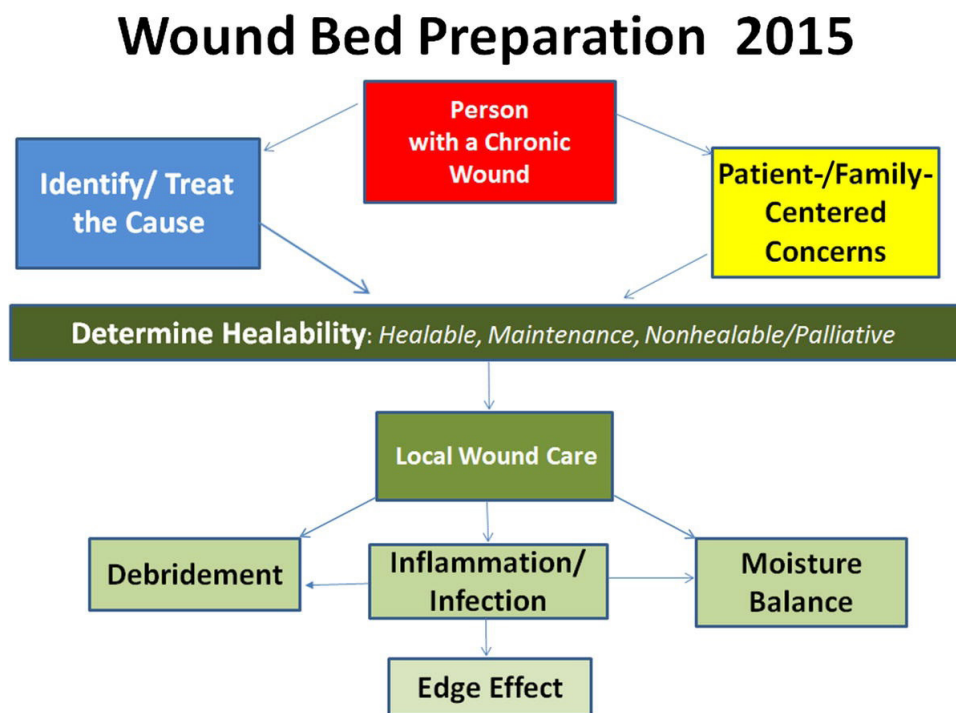
Regardless of a person's level of risk (e.g., high risk for pressure injuries), all patients should receive preventative pressure injury care (e.g., turning and repositioning^G, nutrition). Moreover, high-risk conditions do not make the development of pressure injuries inevitable. For example, not all high-risk individuals (e.g., individuals in intensive care units) will develop pressure injuries. It is also important to highlight that pressure injuries develop as a result of a combination of individual and environmental influences. Pressure injury avoidability is “usually determined when the outcome is known and preventive interventions are evaluated” (Black et al., 2011, p. 36).

Guiding Framework

The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure injury as “localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue” (NPUAP, 2016, para 3). The NPUAP classifies pressure injuries using stages that denote different degrees of tissue loss. For additional information on the NPUAP’s Pressure Injury Staging System, please refer to [Appendix E](#).

The wound-bed preparation paradigm uses an interprofessional approach to systematically outline the key principles of chronic wound (i.e., pressure injury) management for the interprofessional team. Within the context of current evidence in pressure injury assessment and management, the expert panel has developed and organized this Guideline according to the wound-bed preparation paradigm and with an interprofessional and person-centred lens on pressure injury care. (For definitions of the various components of the paradigm—including patient (person)-/ family-centred concerns^G, healability^G, local wound care^G, debridement^G, inflammation^G, infection^G, moisture balance^G, and edge effect^G—please refer to [Appendix A](#).)

Figure 1: Wound-Bed Preparation Paradigm, 2015



Source: Reprinted from “Optimizing the Moisture Management Tightrope with Wound Bed Preparation 2015,” by R. Sibbald, J. A. Elliott, E. A. Ayello, and R. Somayaji, 2015, *Advances in Skin and Wound Care*, 28(10), p. 468. Copyright 2015 by Wolters Kluwer Health, Inc. Reprinted with permission.

Practice Recommendations

There are very few research studies on the assessment of existing pressure injuries. Therefore, expert panel consensus supported by evidence from reputable pressure ulcer/injury guidelines has been used to support the discussions of evidence for key assessment recommendations.

1.0 ASSESSMENT

According to the expert panel, it is imperative that the interprofessional team conduct an initial comprehensive assessment in collaboration with the person and his/her circle of care in order to determine the healability^G of the pressure injuries and to identify the intrinsic risk factors^G and extrinsic risk factors^G that may facilitate and/or impede wound healing.

An initial comprehensive assessment identifies the person's health status and medical condition by assessing and carrying out the following:

- Health and psychosocial history (see Recommendation 1.1),
- Physical exam (see Recommendation 1.1),
- Risk for additional pressure injuries (see Recommendation 1.2),
- Pressure injury stage (see Recommendation 1.3),
- Presence of infection (i.e., superficial critical colonization/localized infection and/or deep and surrounding infection/systemic infection) (see Recommendation 1.4),
- Nutritional risk and nutritional status (see Recommendation 1.5),
- Presence of pain (see Recommendation 1.6),
- Presence of vascular compromise (see Recommendation 1.7), and
- Sources of pressure and shear (see Recommendation 1.8).

RECOMMENDATION 1.1:

Conduct a health history, a psychosocial history, and a physical exam on initial examination and whenever there is a significant change in the person's medical status.

Level of Evidence = V

Discussion of Evidence:

In order for the interprofessional team to be able to tailor pressure injury management to the person's current overall health, the expert panel recommends that the team conduct a health and psychosocial history and a physical exam in collaboration with the person and his/her circle of care (i.e., entourage^G). This should be done on initial examination and whenever there is a significant change in the person's medical status. A significant change may include but is not limited to the following: deterioration or improvement in pressure injury status, the development of additional pressure injuries, worsening or improvement in the status of the person's co-morbid condition(s), and deterioration

or improvement in the person's functional or psychosocial status (Houghton, Campbell, & CPG Panel, 2013). The health-care setting and the person's socio-economic circumstances may influence the frequency of assessments (e.g., available resources, organizational policy, etc.).

Health History

Review of Presenting Illness

The interprofessional team should assess the history of the person's previously healed pressure injuries (if any) and existing pressure injuries. This includes gathering information regarding the cause of the person's pressure injuries, and previous interventions/treatments (including their effectiveness or ineffectiveness) that the person has received from other health-care professionals. This information will help the interprofessional team identify interventions that should be continued and treatments that have not yet been considered or implemented to promote pressure injury healing. Please see [Appendix F](#) for an example of a structured medical history.

Review of Psychosocial Status

Pressure injuries have a significant physical and psychosocial impact on a person's well-being and quality of life; both are affected by the physical limitations imposed by the pressure injury, as well as by the environmental and lifestyle modifications required by pressure injury management (Gorecki et al., 2009). Socially, the treatments and symptoms of pressure injuries (e.g., pain, copious exudates^G) can create social isolation, impede the person's social interactions, and interfere with his or her personal relationships (Gorecki et al., 2009). Psychologically, the presence and management of pressure injuries can negatively impact individuals' sense of control and independence, their sense of self/self-concept, and their body image (Gorecki et al., 2009). It is therefore important that the interprofessional team customize the person's plan of care by assessing the physical and psychosocial impact of the existing pressure injuries on the person.

Competent and skilled holistic care—that is, care that encompasses the person's body, mind, and spirit—can have a significant impact on a person's recovery (Perry et al., 2014), sense of hope, and willingness to adhere to pressure injury interventions (Gorecki et al., 2009). Members of the interprofessional team should perform a psychosocial assessment on initial examination, when there are significant changes in the person's medical condition, and regularly over the course of treatment. A social worker or clinical psychologist may be consulted to assist with the psychosocial aspects of wound management. In accordance with other pressure ulcer/injury guideline groups, the expert panel recommends that a psychosocial assessment assess the following:

- The person's psychological health, behaviour, and cognition (e.g., anxiety, depression, stress, ability to cope with one's illness) (Australian Wound Management Association [AWMA], 2012; National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, & Pan Pacific Pressure Injury Alliance [NPUAP, EPUAP, & PPIA], 2014). (Please see [Appendix G](#) for a list of suggested tools for assessing a person for anxiety, depression, and stress.)
- The person's expectations, knowledge, and beliefs with respect to the interventions and outcomes of treatment (e.g., a person's perception of a treatment on his/her quality of life).
- The values and goals of care of the person and/or the person's significant other(s), which can be influenced by his/her culture and ethnicity (AWMA, 2012; NPUAP, EPUAP, & PPIA, 2014).
- The physical, financial, social, and emotional resources available to the person to support adherence to a management or treatment plan (e.g., availability and access to pressure redistribution^G support surfaces^G, lifestyle requirements and/or limitations, support with activities of daily living, emotional support) (AWMA, 2012; NPUAP, EPUAP, & PPIA, 2014; Registered Nurses Association of Ontario [RNAO], 2007).

Review of Co-morbid Health Conditions

An assessment of co-morbid conditions will identify factors that may interfere with pressure injury healing. Wound healing is complicated by co-morbid conditions including but not limited to cancer, diabetes, stroke, heart failure, renal failure, and pneumonia (Wound Ostomy and Continence Nurses Society [WOCN], 2010). People with cardiovascular disease, for example, may have reduced perfusion to tissues and an increased risk for cell death (Perry et al., 2014). Diabetes may cause vascular disease, impaired sensation, and decreased immune response in the lower limbs (Perry et al., 2014). Moreover, people with diabetes, a suppressed immune system, an autoimmune disease, malnutrition, poor tissue perfusion, and hypoxia are at higher risk for localized infection (NPUAP, EPUAP, & PPIIA, 2014). In general, a range of conditions may increase a person's risk for pressure injuries, wound infection, and compromised healing.

Review of Allergies and Use of Medications and Other Substances

It is important to review the medications that a person with a pressure injury uses to treat co-morbid conditions, including anti-rejection drugs, chemotherapy, and steroids, because these may impede pressure injury healing (WOCN, 2010). The expert panel also recommends a review of the person's allergies; food and wound care product sensitivities; use of alcohol, tobacco, and other substances (e.g., recreational drugs); and use of natural health products, vitamins, and mineral supplements, as these may also affect pressure injury healing or the treatment plan.

Review of Diagnostic Test Results

Diagnostic tests offer additional information regarding a person's co-morbid conditions and current health. Moreover, diagnostic tests assist the interprofessional team and the person with the pressure injuries to evaluate how co-morbid conditions have been and are being managed, and whether management might be further optimized (i.e., modified or additional clinical intervention) in order to support pressure injury healing. According to the *Canadian Best Practice Guidelines for the Prevention and Management of Pressure Ulcers in People with Spinal Cord Injury: A Resource Handbook for Clinicians*, people should be screened and treated for common conditions such as diabetes, hypothyroidism, inflammation, and anemia, because of the potential of these conditions to delay wound healing (Houghton, et al., 2013). The expert panel agrees with this recommendation insofar as it applies to the general population (i.e., people 18 years of age and above, without spinal cord injury) with pressure injuries.

As part of a comprehensive assessment, the following tests should be considered (Houghton et al., 2013):

- **Complete blood count** (e.g., haemoglobin, hematocrit, white blood cell count, absolute lymphocyte count, red blood cell morphology);
- **Iron profile** (e.g., ferritin, serum iron, percentage saturation, total iron binding capacity);
- **Inflammatory markers** (e.g., C-reactive protein, erythrocyte sedimentation rate);
- **Endocrine factors** (e.g., fasting or random glucose, haemoglobin A1C, thyroid function tests); and
- **Albumin.**

Albumin is a poor indicator of nutritional status; it should be used as a prognostic factor for inflammation, which can increase the risk of malnutrition by increasing a person's metabolism (NPUAP, EPUAP, & PPIIA, 2014).

Physical Exam

All people with pressure injuries should have a physical exam that includes measurements of their height, weight, and vital signs; presence of pain; a head-to-toe skin assessment; and an assessment for edema, impaired sensory perception, contractures, scoliosis, and increased or decreased muscle tone, which can affect the person's ability to position and sit. Additional components of a physical exam should be guided by the person's existing co-morbidities. Please refer to Recommendations 1.4, 1.6, and 1.7 of this Guideline for further details on the assessment of infection, pain, and vascular compromise in people with pressure injuries.

Overall, a thorough head-to-toe physical assessment and a medical history consisting of a review of the person's presenting illness, psychosocial status, co-morbid conditions, allergies, medications, substance use, diagnostic test results, and risk for developing additional pressure injuries is required to provide the person and his/her circle of care with a customized pressure injury plan of care that targets actual and potential barriers and facilitators to wound healing.

RECOMMENDATION 1.2

Assess the risk for developing *additional* pressure injuries on initial examination and if there is a significant change in the person's medical status using a valid and reliable pressure injury risk assessment tool.

Level of Evidence = V

Discussion of Evidence:

Because people with one pressure injury are at risk for developing additional pressure injuries, the expert panel recommends that the interprofessional team assess individuals for their risk for developing additional pressure injuries.

People can be predisposed to pressure injuries through both intrinsic and extrinsic factors. Intrinsic risk factors are the result of a person's physical, psychosocial, or medical conditions, whereas extrinsic risk factors are derived from the environment (RNAO, 2007). The most important intrinsic risk factor for pressure injuries is immobility, while the most important extrinsic risk factor is shear injury (NPUAP, EPUAP, & PPIIA, 2014). Friction^G is considered to be a component of shear (i.e., increased friction increases shear). Various other risk factors for pressure injury predisposition in specific populations and care settings continue to emerge in the literature.

Interprofessional teams can use pressure injury risk assessment tools to assess risk factors (e.g., sensory perception, moisture, activity, mobility, nutrition, and shear) for the development of additional pressure injuries. Although some tools do not capture all of the main areas of risk, they should be used as part of a comprehensive assessment of pressure injury development and reoccurrence (NPUAP, EPUAP, & PPIIA, 2014). Other risk factors that should be assessed include skin status, perfusion, and oxygenation.

The expert panel recommends that interprofessional teams use a pressure injury risk assessment tool in combination with their clinical judgment and other specialized assessment tools as necessary (e.g., nutritional risk screening tool) to identify the risk factors to be addressed in the person's plan of care (O'Tuathail & Taqi, 2011).

For more information and a list of suggested validated pressure injury risk assessment tools, please refer to [Appendix H](#).

RECOMMENDATION 1.3

Assess the person's pressure injury using the same valid and reliable wound assessment tool on initial examination and whenever there is a significant change in the pressure injury.

Level of Evidence = V

Discussion of Evidence:

The expert panel recommends that a reliable^G and valid^G wound assessment tool be used to assess a person's pressure injury on initial examination and whenever the person's pressure injury undergoes a significant change. This will enable the interprofessional team, in collaboration with the person and his/her circle of care, to establish baseline wound status measures for use in recognizing pressure injury healing or deterioration. Moreover, the use of a validated descriptive wound assessment tool provides the interprofessional team with clinical language and a reliable method by which to conduct a systematic physical assessment, and allows for consistent documentation and communication among the members of the interprofessional team (RNAO, 2007). The frequency of reassessment will vary depending on the health-care setting (i.e., available resources, organizational policy).

Concurring with other current, reputable wound care guidelines, the expert panel recommends that the measurement and physical assessment of stage 2 and higher pressure injuries should include determinations of the following:

- Wound location (Beekman et al., 2013; NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury measurement section).
- Size of the wound (length, width, depth, undermining^G, tunnelling^G, and wound edges) (NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury measurement section).
- Surface area of the wound (length x width; mm², cm²) (RNAO, 2007—refer to pressure injury measurement section).
- Quality and amount of tissue in the wound bed (Beekman et al., 2013; NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury description section).
- Peri-wound^G integrity (Beekman et al., 2013; NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury description section).
- Exudate (type, amount, and odour). This criterion also applies to stage 1 and deep tissue injury pressure injuries. (Beekman et al., 2013; NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury description section).
- Staging of the pressure injuries (i.e., stage 1, 2, 3, and 4; unstageable; and deep tissue injury pressure injuries) (Beekman et al., 2013; NPUAP, EPUAP, & PPPIA, 2014—refer to pressure injury staging section).

Pressure Injury Measurement

There is no “gold standard” for measuring stage 2 and higher pressure injuries (i.e., surface area and size of the wound). What is most important is that the same method be applied consistently, so that the interprofessional team can ascertain accurate changes in pressure injury measurements. Consistency in obtaining wound measurements is achieved through positioning the person in a correct anatomical placement in order to observe the pressure injury, thereby minimizing the distortion of the surrounding soft tissue (NPUAP, EPUAP, & PPPIA, 2014). If the latter is not possible, it is most important that the person be placed in the same position when pressure injuries are measured, and that the same method of measurement be consistently applied at each assessment.

If doing so is feasible (e.g., the person does not have contractures), using a head-to-toe orientation to establish wound length and width can increase the accuracy, consistency, and reliability of wound measurements (NPUAP, EPUAP, & PPPIA, 2014). However, the expert panel does not recommend measuring the volume (length x width x depth = volume) of

the wound. The evidence on measuring wound volume remains inconclusive, both in terms of the availability of best methods and in terms of its value as a wound measurement (St-Supery et al., 2011). The expert panel also recommends acetate tracing^G to measure pressure injuries, as this has been demonstrated to have a high measure of inter-rater reliability, is efficient to use, and requires little additional skill to perform (Keast et al., 2004).

Pressure Injury Description

The expert panel recommends that the interprofessional team use a valid and reliable pressure injury assessment tool as part of a comprehensive clinical assessment to gauge wound status and stage 2 and higher pressure injury healing. According to the expert panel, certain wound assessment tools are best used for describing a wound (i.e., discriminative assessment tools), while others are best suited to monitoring wound healing (i.e., evaluative assessment tools). Thus, wound assessment tools should be selected based upon the intended purpose of the evaluation. If a full description of the wound is desired, then a comprehensive tool with multiple domains may be indicated. To determine whether a wound is changing over time, a tool specifically designed to evaluate wound healing is recommended. Moreover, members of the interprofessional team must be trained on the appropriate use of wound assessment tools. Harris and colleagues (2010) recognize that “substantial visual and physical assessment skills, combined with clinical judgment and experience” are required to conduct a physical assessment (p. 254). For a detailed listing and descriptions of suggested discriminative and evaluative pressure injury assessment tools, please refer to [Appendix I](#).

Conducting pressure injury assessments in people with darkly pigmented skin can be challenging. The physical assessment of pressure injuries in such cases should include an assessment of the following:

- Skin temperature (heat or coolness) (AWMA, 2012; Perry et al., 2014; NPUAP, EPUAP, & PPPIA, 2014);
- Edema or induration^G (AWMA, 2012; NPUAP, EPUAP, & PPPIA, 2014);
- Skin tenderness (NPUAP, EPUAP, & PPPIA, 2014);
- Change in tissue consistency (NPUAP, EPUAP, & PPPIA, 2014); and
- Presence of pain (NPUAP, EPUAP, & PPPIA, 2014).

In people with darkly pigmented skin, inflammation will cause the skin to darken to an eggplant/purplish colour, particularly over bony prominences. To help distinguish inflamed skin from microvascular hemorrhage (i.e., hemosiderin staining^G) in individuals with darkly pigmented skin, Sussman and Bates-Jensen (2007) offer the following clinical suggestions:

- Conduct the assessment in natural or halogen lighting, as fluorescent light will impart blue tones to the skin.
- Use other clinical indicators, such as sensation (pain) and tissue tension (edema or induration and hardness).
- Note colour changes by observing differences between the person’s affected and unaffected skin.
- Assess whether the skin has undergone vasoconstriction due to cold (pallor) or hyperemia (redness or deepening skin tones) as a result of lying on a bony prominence. Expose skin to ambient room temperature for 5–10 minutes before examining.
- Observe the wound margins for staining. Hemosiderin staining that occurs at the wound edges is a sign of wound chronicity. Staining beyond the wound margins is related to injury.

Pressure Injury Staging

Although there are many staging systems to describe wound stages, the expert panel and other pressure injury management guideline groups recommend that the interprofessional team use the National Pressure Ulcer Advisory Panel (NPUAP) staging system, because it is currently the most widely accepted system for identifying and staging tissue injury (AWMA, 2012; National Institute for Health and Care Excellence [NICE], 2014; NPUAP, EPUAP, & PPIA, 2014). The purpose of this tool is to allow for descriptions of the severity of pressure injuries according to stages, based on the extent of tissue loss and maximum depth of tissue damage in the pressure injury. In April 2016, the NPUAP consensus panel defined and characterized six stages: stage 1, 2, 3, and 4; unstageable; and deep tissue pressure injuries. It is important to note that staging pressure injuries should only occur after necrotic tissue has been removed, and should only describe the maximum depth of a wound at a single point in time.

In general, stage 2 pressure injuries do not have necrotic tissue, whereas stage 3 and 4, and unstageable pressure injuries do have necrotic tissue. In unstageable pressure injuries, the slough^G and eschar (i.e., necrotic tissue) must be removed in order to expose the base of the wound and allow for a determination of its stage. In addition, stage 2 pressure injuries heal with epithelial tissue, whereas stage 3 and 4, and unstageable pressure injuries heal with granulation tissue and contraction (NPUAP, EPUAP, & PPIA, 2014). Finally, a deep tissue pressure injury that may initially present as “intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister...may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (unstageable, stage 3 or stage 4)” (NPUAP, 2016, para 9). If a pressure injury cannot be accurately staged using the NPUAP staging system, the expert panel recommends describing the pressure injury as either a partial thickness^G or a full thickness^G pressure injury, as appropriate.

Health-care professionals should be aware that the NPUAP staging system will continue to evolve. To review the NPUAP’s Pressure Injury Staging System (i.e., definitions and illustrations) in use at the time of publication, please refer to [Appendix E](#). Current information can be found on the NPUAP website.

The NPUAP staging system is not intended to be used to characterize other types of wounds, or to describe the progression of a wound through the healing process.

It is highly recommended that reverse staging of pressure injuries^G *not* be used to describe the healing process of a wound, because this does not accurately reflect the physiological process that occurs in pressure injuries (NPUAP, 2000). For example, once a pressure injury has been staged as 3, it should never be relabelled as a stage 2 or 1 wound as healing progresses; however, if the pressure injury progresses to become deeper, it may be relabelled as such (i.e., as a stage 4 pressure injury). In other words, the NPUAP staging system should not be used to monitor wound *healing*, but only for initial assessments and to describe the worsening of a wound.

RECOMMENDATION 1.4

Assess the person’s pressure injury for signs and symptoms of infection (superficial critical colonization/localized infection and/or deep and surrounding infection/systemic infection) using a standardized approach on initial examination and at every dressing change.

Level of Evidence = V

Discussion of Evidence:

It is important to determine whether a pressure injury is infected. All pressure injuries contain bacteria (Sibbald, Woo, & Ayello, 2007). Bacterial balance is defined as “contamination with organisms on the surface or colonization with organisms in the tissue arranged in micro-colonies without causing damage” (Sibbald et al., 2007, p. 25). However, when the wound is not in bacterial balance (i.e., when bacterial imbalance occurs), the result is infection. The progression from bacterial balance to bacterial damage occurs along a continuum characterized by the following stages: contamination^G, colonization^G, critical colonization^G, and infection^G. In contrast to contamination and colonization, critical colonization refers to an infection wherein the bacterial burden causes excessive inflammation and wound healing is delayed (Perry et al., 2014; Sibbald et al., 2007). Critical colonization is typically seen in superficial infections. In addition to the inflammatory response and pain common to superficial critical colonization, deep and surrounding wound infections can cause tissue damage (i.e., wound size increases and peri-skin breakdown occurs) (Sibbald et al., 2007). For an illustration of the progression from bacterial balance to bacterial damage, please refer to [Appendix J](#).

The World Union of Wound Healing Societies [WUWHS] (2008) describes the continuum along which bacterial balance occurs as follows: contamination, colonization, localized infection, spreading infection, and systemic infection. Intervention is required when localized infection, spreading infection, or systemic infection occurs (WUWHS, 2008). For additional information on the WUWHS’s best practices on wound infection, please refer to the *Wound infection in clinical practice: An international consensus* (http://www.woundsinternational.com/media/issues/71/files/content_31.pdf) document (WUWHS, 2008). The expert panel suggests that interprofessional teams may use the terms “superficial critical colonization” and “localized infection” interchangeably, and “deep and surrounding infection” and “systemic infection” interchangeably.

An accurate diagnosis of an infected pressure injury is based on an assessment of the person’s clinical signs and symptoms in and around the local wound bed, the deeper structures, and the surrounding skin (Sibbald et al., 2007). The expert panel recommends that the interprofessional team, in collaboration with the person and his/her circle of care, assess pressure injuries for signs and symptoms of infection (i.e., superficial critical colonization/localized infection or deep and surrounding infection/systemic infection) on initial examination and at every visit, including at every dressing change. Regular pressure injury assessments allow interprofessional teams to identify and treat wound infections while they are still in the early stages of development. An assessment of the presence and degree of the person’s pain must be included as a component of any assessment for infection.

In general, people with pressure injuries are at increased risk for infection (i.e., superficial critical colonization/localized infection or deep and surrounding infection/systemic infection) because of decreased blood flow to the affected area, which reduces the delivery of important nutrients, white blood cells, oxygen, and medications to the tissues for healing (NPUAP, EPUAP, & PPPIA, 2014). In conducting assessments, health-care professionals should be aware that immunocompromised persons (e.g., persons with diabetes) may not exhibit some of the common signs and symptoms of infection (e.g., increased temperature).

Determining whether a pressure injury exhibits superficial critical colonization/localized infection or a deeper and surrounding infection/systemic infection will allow the interprofessional team to select the most appropriate treatment (i.e., topical agents for superficial critical colonization/localized infection, or systemic microbial agents for deeper and surrounding/systemic infections) (Sibbald et al., 2007).

Overall, the assessment of infection (i.e., superficial critical colonization/localized infection and/or deeper and surrounding infection/systemic infection) is an important component of a comprehensive wound care assessment. For examples on how to assess pressure injuries for infection, please refer to [Appendix K](#).

Bacterial biofilm^G is present in approximately 60 percent of chronic wounds (NPUAP, EPUAP, & PPIA, 2014). Biofilm causes chronic inflammation and can prevent pressure injuries from healing (NPUAP, EPUAP, & PPIA, 2014). Moreover, biofilm is microscopic and cannot be seen by the naked eye; a wound swab is also unable to determine its presence (see below). According to the NPUAP, EPUAP, & PPIA (2014) guideline group, the interprofessional team should suspect bacterial biofilm in a pressure injury that:

- has been present for more than four weeks,
- has not shown any signs of healing in the previous two weeks,
- displays clinical signs and symptoms of inflammation, and/or
- does not respond to antimicrobial^G therapy.

To guide the use of appropriate anti-infective agents, it is important to obtain a semi-quantitative wound culture^G swab (or tissue culture, in appropriate settings) (NPUAP, EPUAP, & PPIA, 2014; WOCN, 2010). However, prior to obtaining a sample, the wound bed should be cleaned of debris (see Recommendation 3.4). Tissue cultures and swabs should only be done once a clinician has reviewed the person's wound history, conducted a physical exam of the pressure injury, and assessed the wound for signs of symptoms of infection. Since a wound swab cannot diagnose a pressure injury infection, it should not be done routinely. For an example of a swabbing technique, please refer to [Appendix L](#).

RECOMMENDATION 1.5

- a) Screen all persons with pressure injuries for risk of malnutrition using a valid and reliable screening tool on first examination and if there is a delay in pressure injury healing.
- b) Determine the nutritional status of all persons at risk for malnutrition using a valid and reliable assessment tool within 72 hours of initial examination, and whenever there is a change in health status and/or the pressure injury.
- c) Perform a comprehensive nutrition assessment of all persons with poor nutritional status within 72 hours of initial examination, and if there is a change in health status or delayed healing.

Level of Evidence = V

Discussion of Evidence:

Poor dietary intake and increased metabolic requirements can lead to malnutrition, which is a risk factor both for the development of pressure injuries and for delayed wound healing (RNAO, 2007). Malnutrition refers to “a condition in which a nutritional deficiency or an excess or imbalance in energy, protein, and other nutrients causes measurable adverse effects on tissue, body structure, body function, and clinical outcomes” (NPUAP, EPUAP, & PPIA, 2014, p. 79). Malnutrition also predisposes people with pressure injuries to an increased risk of morbidity and mortality (NPUAP, EPUAP, & PPIA, 2014). Thus, it is important to screen people with pressure injuries for risk for malnutrition and provide adequate nutritional support to vulnerable persons and their circle of care in order to facilitate wound healing, maintain immune competence, and decrease the risk of infection (Allard et al., 2015).

Screening for Risk for Malnutrition

The expert panel and the NPUAP, EPUAP, & PIPPA (2014) guideline group recommend that an initial screen for a person's risk for malnutrition be conducted on first examination of a person with a pressure injury (e.g., upon admission to a hospital, at pre-admission visits for planned/elective surgeries, or upon intake to home care), whenever there is a significant decline in the person's clinical condition, and when progress is not observed with respect to the healing of the wound(s). In assessing for risk for malnutrition, a validated and reliable tool should be used. To review an example of a nutrition risk assessment tool, please refer to [Appendix M](#).

Determining Nutritional Status

In order to determine whether a person who is identified to be at risk for malnutrition is in fact malnourished, the panel recommends that a health-care professional (most likely a registered dietitian) confirm the person's nutritional status using a reliable and validated tool. This assessment should occur as soon as possible after first examination (i.e., within 72 hours), whenever there is a change in the person's health status, or when a person's pressure injuries are not progressing toward healing. To review an example of an assessment tool to determine nutritional status, please refer to [Appendix M](#).

Assessment using a nutrition risk assessment tool, followed by use of an assessment tool to determine nutritional status, can expedite the early identification of people at risk of malnutrition and the initiation of appropriate nutritional supplementation in people with pressure injuries and those at risk for developing additional pressure injuries. When deemed necessary, assessment and referral to other interprofessional team members (e.g., a physician, dentist, denturist, speech language pathologist, physical therapist, occupational therapist, social worker) may be required to further assess, plan and alleviate, and/or modify factors contributing to a person's malnutrition (Perry et al., 2014; NPUAP, EPUAP, & PPIPA, 2014). To review factors contributing to malnutrition, please refer to [Table 1](#).

Comprehensive Nutrition Assessment

A comprehensive nutritional assessment refers to “a systematic approach to collect, record, and interpret relevant data from patients, clients, family members, caregivers, and other individuals and groups” (Writing Group of the Nutrition Care Process/Standardized Language Committee, 2008, p. 1114). A comprehensive nutritional assessment is typically conducted by a registered dietitian; thus, the interprofessional team should refer a person with pressure injuries and poor nutritional status to a registered dietitian for further assessment and the development of a nutritional plan of care.

Generally, a comprehensive nutritional assessment should include an assessment of the following (Charney, 2008):

- information gained from the determination of the person's nutritional status using a valid and reliable nutrition assessment tool,
- anthropometric measures^G,
- detailed dietary assessment (i.e., food and fluids),
- biochemical evaluation,
- medical history,
- lifestyle,
- living arrangements,
- reliance on others for meal preparation and purchase of food,
- literacy, and
- mobility.

Table 1: Factors Contributing to Malnutrition

CONTRIBUTING FACTORS	
Functional:	<ul style="list-style-type: none"> ■ Problems chewing ■ Problems swallowing ■ Level of independence with feeding ■ Cognitive dysfunction (i.e., inability to eat independently) ■ Changes in activity level (Perry et al., 2014) ■ Dental problems (e.g., loose fitting dentures) (WOCN, 2010)
Medical:	<ul style="list-style-type: none"> ■ Diabetes control ■ Renal disease management (Perry et al., 2014) ■ Gastrointestinal symptoms (e.g., nausea, vomiting, constipation) ■ Medical/surgical interventions that influence the intake or absorption of nutrients (e.g., gastrointestinal surgery) ■ Side effects of medications ■ Advanced age (WOCN, 2010) ■ Depression (AWMA, 2012) ■ Pain
Psychosocial:	<ul style="list-style-type: none"> ■ Access to food (e.g., ability to afford food and supplements, access cooking facilities, and prepare meals, ability to afford groceries or to obtain groceries) ■ Reliance on others to buy food ■ Ability to cook or prepare food ■ Cultural food preferences (WOCN, 2010) ■ Availability of social support ■ Living alone
Organizational:	<ul style="list-style-type: none"> ■ Interruptions during meals (e.g., by staff, tests that require fasting) ■ Disturbed by activities, noise, unpleasant smells ■ Unable to open food packages (Keller et al., 2015)

RECOMMENDATION 1.6

Assess for pressure injury pain on initial examination and continue to monitor pain at subsequent visits, including prior to and after every wound care intervention, using the same valid and reliable tool consistent with the person’s cognitive ability.

Level of Evidence = V

Discussion of Evidence:

The experience of varying degrees of pain, ranging from mild to severe, is common in people with pressure injuries. Pressure injury pain can be most severe and persistent during exposure to pressure and shear; when nerve endings are damaged and inflamed, infected, or excoriated; and when procedures and treatments are performed on the wound (NPUAP, EPUAP, & PPIA, 2014).

According to several pressure ulcer/injury guidelines and the expert panel, the assessment of pain is a vital component to incorporate into an overall clinical assessment (Beeckman et al., 2013; Perry et al., 2014; NPUAP, EPUAP, & PPIA 2014; RNAO, 2007). A pain assessment should be performed at every visit (e.g., at first examination and during reassessments), including prior to and after every wound care intervention (e.g., dressing changes, debridement), in order to ensure proper management of the person's pain (Perry et al., 2014; NPUAP, EPUAP, & PPIA, 2014). Appropriate assessment tools should be used for people with pressure injuries who are cognitively impaired in order to appropriately evaluate and treat their pain.

Pain Assessment

The expert panel, in accordance with the AWMA (2012) and NPUAP, EPUAP, & PIPPA (2014) guideline groups, recommends that a pain assessment include the following:

- Location of the pain (AWMA, 2012);
- Frequency, quantity, duration, and severity of the pain (AWMA, 2012; NPUAP, EPUAP, & PPIA, 2014);
- Characteristics of the pain (AWMA, 2012);
- Detailed pain history (e.g., previous pain experiences and interventions for pain management) (AWMA, 2012; NPUAP, EPUAP, & PPIA, 2014);
- Factors that trigger and relieve the pain (AWMA, 2012);
- Diagnosis of the type and cause of the pain (NPUAP, EPUAP, & PPIA, 2014);
- The person's anticipation of pain, based on his or her previous experience of pain in specific situations (e.g., during treatment or while at rest) (Solowiej, Mason, & Upton, 2010); and
- Functional limitation(s) resulting from the person's pain.

A validated pain assessment tool will provide the most accurate assessment of a person's pain in terms of presence and severity, and it is recommended that interprofessional teams, in collaboration with the person and his/her circle of care, use such tools to guide their assessments (AWMA, 2012). In order to increase the accuracy of pain assessment, the interprofessional team should also consider any preferences the person may express with regard to the type of validated tool used (e.g., numerical, textual, or graphics-based assessment tools) (AWMA, 2012). Please refer to [Appendix N](#) for a list of recommended pain assessment tools for use with cognitively intact adults.

Currently, there are a limited number of pain assessment tools for use in people who are cognitively impaired. According to the AWMA (2012) and NPUAP, EPUAP, & PIPPA (2014) guideline groups, it is also important to “incorporate the client's body language and nonverbal cues into the assessment of pain” (NPUAP, EPUAP, & PPIA, 2014, p. 143) (e.g., facial expressions, restlessness). Moreover, for persons who are not able to respond verbally or grasp the concept of pain scales, the person's circle of care (e.g., family and primary caregivers) may be able to assess and report changes in the person's behavior that may indicate a pain response. For a list of pain assessment tools for use with individuals who are cognitively impaired, please refer to [Appendix N](#).

For further information on the general principles of pain assessment and management, please refer to RNAO's (2013) *Assessment and Management of Pain* (<http://rnao.ca/bpg/guidelines/assessment-and-management-pain>) clinical BPG.

Table 2 lists various factors that have been shown to influence individuals' experience and perception of pain. They should be considered in conjunction with the results obtained by a pain assessment tool.

Table 2: Factors That Aggravate or Alleviate Pain

AGGRAVATING FACTORS	ALLEVIATING FACTORS
Increasing stage or severity is associated with greater pain levels (AWMA, 2012)	Wound dressings: silicone, hydrogels, alginates, polymeric membrane foams, and foam dressings require less frequent changes, and cause less pain and trauma on removal (NPUAP, EPUAP, & PPIIA, 2015)
Interventions (e.g., dressing changes, debridement, local treatments) are associated with greater pain than when wounds are at rest (AWMA, 2012; Woo, 2015)	Topical analgesics (e.g., ibuprofen impregnated dressings, topical morphine) and systemic analgesia (NPUAP, EPUAP, & PPIIA, 2015)
Wound dressings: hydrocolloid dressings with aggressive adhesive film dressings and wet-to-dry dressings are considered to be painful (Expert Panel, 2015)	Repositioning consistent with the person's wishes (NPUAP, EPUAP, & PPIIA, 2015).
Anxiety and the anticipation of pain (Expert Panel, 2015)	Appropriate support surfaces (<i>see Table 3</i>)
Presence of infection (NPUAP, EPUAP, & PPIIA, 2014)	

RECOMMENDATION 1.7

Perform a vascular assessment (i.e., medical history, physical exam) of all persons with pressure injuries in the lower extremities on initial examination.

Level of Evidence = V

Discussion of Evidence:

For people with pressure injuries in the lower extremities over bony prominences (e.g., heels) or from sustained environmental pressure (e.g., footwear), a vascular assessment of the lower extremities is essential to ensuring safety during treatment, identifying barriers to healing, and determining appropriate treatment options. The assessment should be performed prior to developing a plan of care, and prior to wound management (e.g., application of various

dressings, debridement, and compression). It is critical to assess the arterial vascular supply to the person's lower extremities thoroughly prior to performing any type of debridement of the lower extremities in order to determine whether the arterial blood supply is sufficient to support pressure injury healing and healing of the debrided wound (NPUAP, EPUAP, & PPIA, 2014). The expert panel recommends that an assessment (i.e., medical history and physical exam) be conducted by any member of the interprofessional team.

If the assessment reveals impairments in vascular status (i.e., arterial flow) in the person's lower extremities, the person should be referred to the most responsible health-care professional or to a health-care professional with vascular expertise for further assessment and diagnostic testing of his or her lower leg pressure injuries prior to any wound intervention, or if the wound is not healing as expected after wound care management (e.g., debridement). Please refer to Recommendation 4.2 of this Guideline for additional information on monitoring wound healing.

According to the expert panel and other pressure ulcer/injury guideline groups, a vascular assessment of the lower extremities should involve collecting specific information (medical history) from the person and his/her circle of care *in conjunction with* a physical exam. The person is considered to have poor circulation to the lower legs if there is a combination of the following signs and symptoms:

1. Medical history

- History of previous pressure injuries in the lower extremities, the interventions used, and the person's previous response to wound management.
- Risk factors that contribute to arterial insufficiency, such as elevated lipids, diabetes, family history of vascular compromise, smoking, and cardiovascular history (e.g., previous stroke, cardiac events or surgery, or previous vascular surgery) (Perry et al., 2014; NPUAP, EPUAP, & PPIA, 2014).
- Increased pain in the lower extremities at rest and with movement (e.g., intermittent claudication) (NPUAP, EPUAP, & PPIA, 2014).

2. Physical exam

- Diminished pedal pulses (check posterior tibial and dorsalis pedis). Calcification of the blood vessels in the lower extremities, combined with insufficient training in measuring pedal pulses among health-care professionals, may result in false negative results in the assessment of palpable pedal pulses. However, in cases where diagnostic tests are unavailable, this assessment is useful to support health-care planning (RNAO, 2007).
- Presence of dependent rubor and pallor on elevation of the lower limbs.
- The affected lower limb is cooler, cyanotic, lacks hair, and has dystrophic nails.
- Non-invasive arterial studies (e.g., ankle brachial pressure index^G [ABPI], toe pressure index^G [TPI]) (Perry et al., 2014; NPUAP, EPUAP, & PPIA, 2014). In the affected limb, an ABPI less than 0.6 or a TPI less than 0.65 is indicative of poor blood circulation in the lower extremities. A handheld audible Doppler is a valuable, simple, cost-effective, and reliable tool for determining mono, bi, and triphasic pulses. In general, triphasic and biphasic audible signs are associated with an adequate blood supply to promote wound healing. Caution is required in persons with diabetes and biphasic wave patterns (Alavi et al., 2015).

RECOMMENDATION 1.8

Conduct a mobility and support surface assessment on initial examination and whenever there is a significant change in the person's medical condition, weight, equipment, mobility, and/or pressure injury healing.

Level of Evidence = V

Discussion of Evidence:

The expert panel recommends that all people with pressure injuries be assessed for all sources of pressure and shear in all positions and during transfers, turning, and repositioning in order to optimize pressure redistribution and facilitate pressure injury healing. Potential sources of pressure and shear include activities, transfers, and turning. Turning may occur on stretchers (in emergency departments; on operating room tables; on tables during lengthy tests, such as cardiac catheterization; and on ambulance stretchers) and on seats used for transportation, such as in a car, and while using bedpans, commodes and slings. This assessment should occur on initial examination, whenever there are significant changes in the person's medical condition, and if the pressure injury exhibits delayed healing. Through regular assessment, pressure redistribution can be optimized to help alleviate pressure on bony prominences, and in areas where pressure injuries are most likely to develop (NPUAP, EPUAP, & PPIIA, 2014). Pressure redistribution also improves the perfusion of blood and nutrients to the open wound (NPUAP, EPUAP, & PPIIA, 2014).

If issues relating to a person's mobility and activities of daily living are identified, referral to an occupational therapist or a physical therapist is recommended. Occupational therapists and physical therapists can identify the sources of pressure and make recommendations regarding the selection of new equipment or the adaptation of existing equipment in order to optimize pressure redistribution. Pressure injury risk assessment tools often include a mobility assessment. (For more information on risk assessment tools, please refer to Recommendation 1.2.)

According to the expert panel and other pressure ulcer/injury guideline groups, a mobility and support surface assessment should include an evaluation of the following:

- the person's and his/her caregiver's level of activity (NPUAP, EPUAP, & PPIIA, 2014);
- the person's ability to shift and reposition (NPUAP, EPUAP, & PPIIA, 2014);
- the person's size, weight, and height (Perry et al., 2014; NPUAP, EPUAP, & PPIIA, 2014);
- factors contributing to the person's comfort and discomfort (e.g., pain resulting from movement) (Beeckman et al., 2013; NPUAP, EPUAP, & PPIIA, 2014);
- the number, severity, and location of existing pressure injuries (NPUAP, EPUAP, & PPIIA, 2014);
- continence and other sources of moisture (e.g., some support surfaces can wick moisture away from the skin) (Perry et al., 2014);
- the need for head elevation;
- the need for transfers; and
- the person's living situation.

With regard to head elevation, elevations greater than 30 degrees place more pressure on bony prominences (Perry et al., 2014). However, persons with ventilators, tube feeding, breathing issues (e.g., chronic obstructive pulmonary disease), dysphagia, and chronic heart failure may require the head of the bed to be elevated to 30 degrees. In such cases, the increased risk for complications (such as the risk of ventilator-acquired pneumonia when the head of the bed is less than 30 degrees) outweighs the risk of placing pressure on bony prominences.

Equipment

The person's equipment should be assessed in order to rule out improper: use, setup, ergonomics, and/or fit, and/or equipment malfunctioning as the cause(s) or contributing factor(s) of the person's pressure injury. Referral to an occupational therapist, physical therapist, or specialized seating clinic for a more thorough assessment should be considered. For additional information on how to perform a seating assessment, please refer to **Appendix O**. In general, the expert panel recommends that an equipment evaluation include an assessment of the person's

- bed or other support surface,
- wheelchair/seating,
- sporting equipment,
- bathroom equipment,
- transfer equipment and any other surface upon which the person sits or lies (e.g., vehicle seat, couch, etc.),
- foot rest/foot wear; and
- supports for maintaining equipment (e.g., hand check for proper air inflation of air cushions). (See **Appendix O** for instructions on how to conduct a hand check on an air cushion.)

Pressure mapping^G technology is an adjunctive tool often used in assessments of support surfaces and wheelchair seating. The interprofessional team should be aware of the limitations of pressure mapping technology and should interpret this information carefully. However, with visual output, pressure mapping technology can be used to educate people with pressure injuries regarding weight shifting strategies in wheelchairs and seat cushions (Houghton et al., 2013).

In general, a thorough evaluation of a person's lifestyle, environment, activity level, and use of equipment throughout the day is warranted. An assessment by an occupational therapist or physical therapist can occur in the in-patient setting as well as in the person's home. For additional information on selecting the most appropriate support surface for a person with a pressure injury, please refer to Recommendation 3.2 of this Guideline. For further information on the assessment of mobility and support surfaces, please refer to RNAO's (2011) *Risk Assessment and Prevention of Pressure Ulcers* (<http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers>) clinical BPG. Although this clinical best practice guideline refers to the assessment of mobility support surfaces for people at high risk for pressure injuries (i.e., pressure injury prevention), the principles also apply to persons with existing pressure injuries.

2.0 PLANNING

RECOMMENDATION 2.1

Obtain the referral or consultations required to plan and coordinate a pressure injury plan of care.

Level of Evidence = V

Discussion of Evidence:

The interprofessional team, in collaboration with the person and his/her circle of care, must plan care appropriately. Interprofessional care refers to the “provision of comprehensive health service to patients by multiple health caregivers who work *collaboratively* to deliver quality care within and across settings” (RNAO, 2013b, p. 64). Thus, it is important that the interprofessional team collaborate with the person with a pressure injury and his or her circle of care to coordinate a pressure injury care plan. Access to specialists may differ within and among regions and health-care settings. Wherever possible, the appropriate interprofessional team members should be consulted in developing the pressure injury plan of care. In the absence of access, care should be taken to ensure that the plan of care reflects current evidence-informed best practices.

To provide comprehensive, coordinated, and quality clinical care for people with pressure injuries, consultation and collaboration with the following health-care professionals may be necessary:

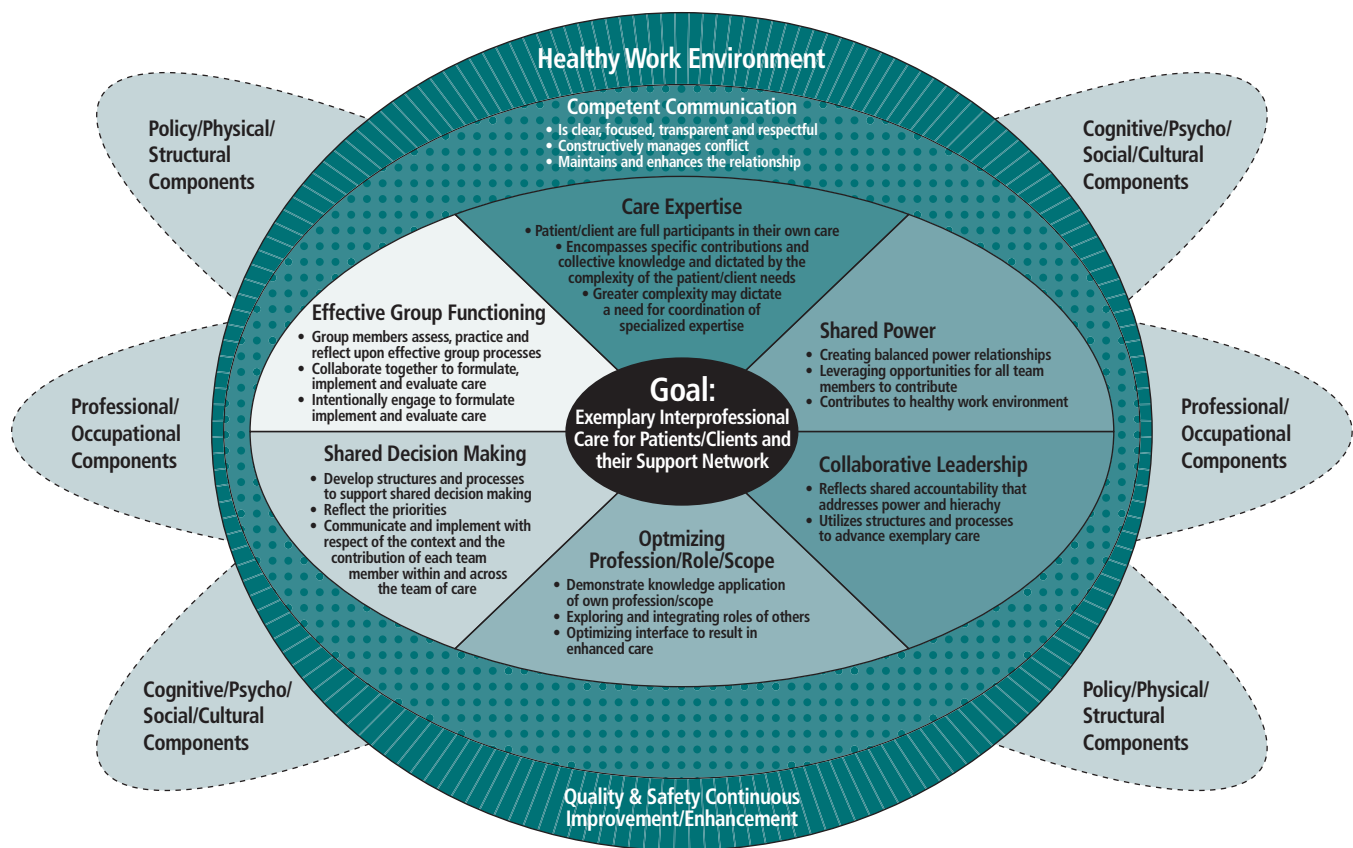
- chiropodist (for specialized care of pressure injuries in the lower extremities);
- enterostomal therapy nurse (for specialized care in wound, ostomy, and continence health concerns);
- health-care professionals and clinics who have obtained advanced training in wound care;
- infection control specialist/microbiologist (for unresponsive, recalcitrant, or recurrent infection) (AWMA, 2012);
- nurse practitioner (for the assessment and management of pressure injuries, depending on individual practitioner knowledge, training, skill set, and role on the interprofessional team);
- occupational therapist (for pressure redistribution, mobility, activities-of-daily-living assessments, expertise in wheelchair seating prescription, shear prevention, and management);
- person with a pressure injury and his/her circle of care (e.g., primary caregiver, friends, family, substitute decision maker, PSW—for recognizing and integrating their knowledge of pressure injuries into the plan of care);
- physiatrists (for care of persons with spinal cord injuries and work with rehabilitation personnel);
- physical therapist (for pressure redistribution, mobility, adjunctive therapies, expertise in wheelchair seating prescription, and shear prevention and management);
- physician (e.g. family doctor, medical specialists—for the assessment and management of pressure injuries, depending on individual practitioner knowledge, training, skill set, and role on the interprofessional team);
- registered dietitian (for the assessment and management of nutritional status);
- registered nurse, registered practical nurse (for the assessment and management of pressure injuries, depending on individual practitioner knowledge, training, skill set, and role on the interprofessional team);
- social worker (for psychosocial, spiritual care, psychosocial assessment/social supports, and disposition planning);
- speech language pathologist (for swallowing and communication); and
- surgeon (for surgical intervention, surgical debridement, flap closures, and vascular assessment).

To provide effective interprofessional care and collaborate with the person and his/her circle of care, interprofessional teams should demonstrate expertise in six key domains (RNAO, 2013b, p. 23):

1. care expertise (ensure that those offering suggestions have the appropriate training);
2. shared power (i.e., shared control, responsibility);
3. collaborative leadership;
4. optimize each person's profession, role, and scope of practice;
5. shared decision making; and
6. effective group functioning.

Figure 2 provides further details regarding the six key domains. For additional information on interprofessional care concepts and best practices, please refer to RNAO's (2013b) *Developing and Sustaining Interprofessional Health Care: Optimizing patients/clients, organizational, and system outcomes* (<http://rnao.ca/bpg/guidelines/interprofessional-team-work-healthcare>) nursing BPG.

Figure 2: Conceptual Model for Developing and Sustaining Interprofessional Health Care



*Adapted from the National Competency Framework and the RNAO Model for Healthy Work Environments for Nurses

Source: Reprinted from *Developing and Sustaining Interprofessional Health Care: Optimizing patients/clients, organizational, and system outcomes*, by Registered Nurses' Association of Ontario, 2013, p. 23. Copyright 2013 by RNAO.

RECOMMENDATION 2.2

Develop a pressure injury plan of care that incorporates goals mutually agreed upon by the person, the person's circle of care and the interprofessional team.

Level of Evidence = 1a

Discussion of Evidence:

Participation by the person and his/her circle of care (e.g., primary caregivers, substitute decision makers) in setting clinical goals and developing a pressure injury plan of care is paramount. Part of this process will be for the interprofessional team to determine if the wound is healable, maintenance, or non-healable^G (see **Figure 1** for the Wound-Bed Preparation Paradigm 2015; see **Appendix A** for definitions). A plan of care must be established for each type of wound. The plan of care should be developed collaboratively once the initial assessment has been completed, and should be updated whenever a change in the person's medical condition occurs or when progress toward healing does not occur. Pressure injury management strategies should be customized to take into account the person's attitudes, beliefs, culture, lifestyle needs, and personal preferences. Moreover, it is essential that a shift of control from the interprofessional team to the person occur, in order to empower the person and to support him or her in carrying out the plan of care.

The setting of mutually agreed-upon goals shifts control and independence from the interprofessional team to the person and his or her circle of care (Gorecki et al., 2009). The expert panel recommends that mutual goal setting and care planning is best achieved through the establishment of a therapeutic relationship with the person and his or her circle of care, by the implementation of person- and family-centred^G care principles. A therapeutic relationship is defined as “a purposeful, goal-directed relationship between the health-care provider and the person accessing the health system for care and treatment that is grounded in an interprofessional process directed at advancing the best interest and outcome of the person” (CNO, 2013; RNAO, 2006). According to a systematic review by Gorecki et al. (2009), therapeutic relationships instill hope in people with pressure injuries, improve their adherence to treatment, and ultimately contribute to positive health outcomes. Health-care professionals are more likely to develop therapeutic relationships with persons with pressure injuries when they adopt a positive and friendly attitude (Gorecki et al., 2009). Although person-centred care has been defined in various ways in the literature, in principle this approach refers to the development of a genuine, respectful, and empowering relationship between the person, the person's circle of care, and the interprofessional team with regard to the person's health (RNAO, 2015).

Clinical treatment goals are typically directed toward pressure injury wound healing and closure. However, when healing does not occur, the interprofessional team should explore alternative treatment options with the person and his or her circle of care (RNAO, 2013a). If wound healing is not likely to occur, then the interprofessional team should establish mutually agreed-upon goals to improve the person's quality of life (RNAO, 2013a). For example, in palliative care, symptom management (i.e., control of pain, drainage, and odour) are typical goals when wounds fail to respond to treatment and when interventions interfere with the person's quality of life (Perry et al., 2014). For an example on how to identify the goals of symptom management in persons for whom wound healing is not a clinical expectation and where maintaining the person's comfort is key, please refer to **Appendix P**.

For additional information on therapeutic relationships, please refer to RNAO's (2006) *Establishing Therapeutic Relationships* (<http://rnao.ca/bpg/guidelines/establishing-therapeutic-relationships>) clinical BPG. For additional information on person- and family-centred care principles and strategies, please refer to RNAO's (2015) *Person- and Family-Centred Care* (<http://rnao.ca/bpg/guidelines/person-and-family-centred-care>) clinical BPG.

3.0 IMPLEMENTATION

A comprehensive treatment plan should include interventions that address all of the modifiable barriers to pressure injury healing in people with stage 1, 2, 3, or 4, unstageable, or deep tissue injury pressure injuries. The main modifiable risk factors for impaired wound healing include (1) malnutrition, (2) moisture, (3) pressure, and (4) shear (O’Tuathail and Raqi, 2011).

RECOMMENDATION 3.1

Reposition the person at regular intervals (i.e., every two to four hours) based on person-centred concerns. While sitting, weight-shift the person every 15 minutes.

Level of Evidence = V

Discussion of Evidence:

Reduced mobility and activity are two important risk factors for the development of pressure injuries. Frequent repositioning is therefore important in order to reduce pressure over vulnerable areas of the body while the person is immobile (NPUAP, EPUAP, & PPIIA, 2014). There is emerging evidence for pressure injury prevention regarding the frequency of turning for moderate- to high-risk persons in long-term-care settings (Bergstrom et al., 2014). However, there is limited research (i.e., randomized controlled trials) on the effects of repositioning on the healing of existing pressure injuries (Moore & Cowman, 2008). Despite this, the expert panel strongly recommends an individualized plan of care to optimize the person’s ability to reposition, in order to prevent shear in people with existing pressure injuries and to prevent the occurrence of additional pressure injuries. Other pressure ulcer/injury guideline groups support this recommendation (Houghton et al., 2013; NPUAP, EPUAP, & PPIIA, 2014).

The individualized plan of care for repositioning a person should involve all of the lying and sitting surfaces, including arm and pedal supports that the person uses throughout the day (e.g., beds, wheelchairs, geri-chairs, car seats, stretcher surfaces, operating room tables, foot rests, and shoes). Unless it is medically contraindicated (e.g., due to fractures, an unstable spine, etc.), the expert panel recommends that the person reposition himself/herself or be repositioned every two to four hours when lying down on a standard mattress^G or on a pressure redistribution mattress, and weight-shift every 15 minutes while sitting. The recommended frequency of repositioning and weight shifting in individual situations should take into consideration the person’s overall medical condition, tolerance, level of mobility, and equipment/resources (e.g., pressure redistribution products and caregiver availability). The frequency should be adjusted (i.e., increased or decreased) based on the wound healing response. Referral to an occupational therapist or a physical therapist in collaboration with other interprofessional team members (e.g., dietitian, front-line nurse), the person with the pressure injury, and the person’s circle of care is strongly recommended to support the development and implementation of an individualized care plan.

When transferring or repositioning a person with a pressure injury on or between any support surfaces, the following guidelines should be observed:

- Establish and follow a repositioning schedule, regardless of the support surface used.
- Educate the person and primary caregiver(s), as appropriate, about the repositioning plan and monitor regularly.
- Use proper transfer techniques. Do not lift and drag the person across surfaces (NPUAP, EPUAP, & PPIIA, 2014).

Repositioning in Bed

- Avoid positioning the person on existing pressure injuries or on bony prominences (NPUAP, EPUAP, & PPIIA, 2014).
- Use positioning devices such as a pillow or a wedge to maintain position and body alignment, and to redistribute pressure to avoid bony prominences (Perry et al., 2014; WOCN, 2010).
- Use assistive devices (e.g., bed rails, trapeze, transfer board, etc.) to enable the person to reposition and transfer himself/herself independently.
- If the person's medical condition permits, limit the amount of time the head of the bed is elevated and limit the elevation to 30 degrees (Semi-Fowler's position); ensure the person is positioned in the Semi-Fowler's position to prevent sliding (NPUAP, EPUAP, & PPIIA, 2014).

Repositioning in a Chair/Wheelchair

- After the wheelchair/seat has been assessed by a seating specialist (i.e., occupational therapist or physical therapist), establish a modified sitting schedule for people with pressure injuries on the ischial tuberosity, coccyx, or sacral areas (NPUAP, EPUAP, & PPIIA, 2014). The length of time that a person may be in the sitting position will depend on the person's quality-of-life goals, equipment availability, and the progression of wound healing.
- Do not use a donut-type device (Perry et al., 2014). Follow the seating recommendations provided by the seating specialist (i.e., occupational therapist or physical therapist).
- When appropriate, incorporate a tilting or reclining mechanism to facilitate proper positioning and prevent sliding (NPUAP, EPUAP, & PPIIA, 2014).
- Ensure that the person's feet are supported properly while in a seated position (i.e., on the floor or with foot support) (NPUAP, EPUAP, & PPIIA, 2014).
- Educate the person regarding proper weight-shifting techniques according to the interprofessional plan of care.

Transfers from a Bed to a Chair (or Chair to Bed)

- Refer the person to an occupational or physical therapist for recommendations regarding safe transfer techniques to minimize shearing and to develop a plan to maintain the person's strength and endurance.
- Remove the sling after transferring the person to the chair, or use a sling that is designed to be left under the person's body (NPUAP, EPUAP, & PPIIA, 2014).

Please refer to RNAO's (2011) *Risk Assessment and Prevention of Pressure Ulcers* (<http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers>) clinical BPG for additional information on best practices regarding repositioning and weight shifting. Although the recommendations are intended for use in the prevention of pressure injuries, the expert panel supports their application to repositioning and weight shifting in persons with existing pressure injuries.

RECOMMENDATION 3.2

Position all persons with a pressure injury on a pressure redistribution support surface at all times.

Level of Evidence = V

Discussion of Evidence:

According to several pressure ulcer/injury guidelines, support surfaces (e.g., mattresses, overlays, and wheelchair cushions) that help redistribute pressure away from vulnerable areas in the body should be used at all times for people with existing pressure injuries and those at risk for developing further injury (Houghton et al., 2013; Perry et al., 2014; NICE, 2014; NPUAP, EPUAP, & PPPIA, 2014; WOCN, 2010). Support surfaces refer to “specialized devices for pressure redistribution designed for management of tissue loads, microclimate, (heat, moisture and airflow should be controlled) and/or other therapeutic functions” (NPUAP, EPUAP, & PPPIA, 2014, p. 105). However, even when a support surface is used, continued and regular repositioning is still required (NPUAP, EPUAP, & PPPIA, 2014). Table 3 summarizes the various categories of support surfaces.

Table 3: Categories of Support Surfaces

TERM	DEFINITION
REACTIVE SUPPORT SURFACE	A powered or non-powered support surface with the capability to change its load distribution properties only in response to applied load.
ACTIVE SUPPORT SURFACE	A powered support surface, with the capability to change its load distribution properties, with or without applied load.
INTEGRATED BED SYSTEM	A bed frame and support surface that are combined into a single unit whereby the surface is unable to function separately.
NON-POWERED	Any support surface not requiring or using external sources of energy for operation. (Energy = D/C or A/C)
POWERED	Any support surface requiring or using external sources of energy for operation. (Energy = D/C or A/C)
OVERLAY	An additional support surface designed to be placed directly on top of an existing surface.
MATTRESS	A support surface designed to be placed directly on the existing bed frame.

Source: Reproduced with permission from the National Pressure Ulcer Advisory Panel (2007, p. 5).

Support Surface Selection

Selecting the optimal support surface to facilitate wound healing should be considered at all times for people with existing pressure injuries and those at risk for developing further skin injury (Houghton et al., 2013). A variety of support surface options have been tested in research studies, including alternating pressure overlays and alternating pressure replacement mattresses (Nixon et al., 2006); 3D overlays and gel overlays (Cassino, Ippolito, Cuffaro, Corsi, & Ricci, 2013); and reactive air mattresses and active alternating pressure mattresses (Malbrain et al., 2010). Three studies did not show clear clinical evidence in favour of one specialized mattress type over another (Nixon et al., 2006; Reddy, 2011; Reddy et al., 2008); however, four studies supported the use of a variety of mattresses/overlays in the management of pressure injuries (Cassino et al., 2013; Levine, Sinno, Levine, & Saadeh, 2013; Malbrain et al., 2010; Smith et al., 2013).

In the absence of evidence indicating the superiority of a particular type of support surface, the expert panel recommends the following be taken into consideration when selecting a support surface:

- Fit with the overall care plan and the person's goals of treatment (NPUAP, EPUAP, & PPIIA, 2014);
- The person's functional mobility and level of activity (NPUAP, EPUAP, & PPIIA, 2014);
- The need for microclimate control (i.e., the ability of the surface to control moisture from draining wounds, sweat, and incontinence) (NPUAP, EPUAP, & PPIIA, 2014);
- The ability to control the temperature of the support surface;
- The linens and pads used on the support surface, and management of shear (the use of multiple layers should be avoided; fabric texture can affect pressure management during transfers and repositioning) (NPUAP, EPUAP, & PPIIA, 2014);
- The lifespan, warranty, and maintenance required, and the need to reassess the support surface; (NPUAP, EPUAP, & PPIIA, 2014);
- The person's size and weight (NPUAP, EPUAP, & PPIIA, 2014);
- The person's preference, tolerance, and comfort;
- The risk for new pressure injuries, and the severity, number, and location of existing pressure injuries (Houghton et al., 2013; NPUAP, EPUAP, & PPIIA, 2014);
- The ease of use of the support surface by the person and the person's primary caregiver(s);
- The availability and compatibility of the support surface with the health-care or home setting (NPUAP, EPUAP, & PPIIA, 2014); and
- The financial cost and accessibility for the person.

Please refer to [Appendix Q](#) to review a therapeutic support surface selection tool to guide the selection of the most appropriate support surface for people with existing pressure injuries.

When selecting a support surface, the interprofessional team, in collaboration with the person and his/her circle of care, should select a support surface (i.e., a combination of the appropriate rails, mattress, and bed frame) that minimizes the risk of entrapment^G (RNAO, 2011). A risk of entrapment exists when the therapeutic support surface is not the same size as the original mattress creating excess space between the surface and the bed frame (RNAO, 2011). The interprofessional team should be aware that entrapment can occur in the home and in various health-care settings in seven ways (Health Canada, 2008):

1. within the rail,
2. under the rail (between the rail supports or next to a single rail support),

3. between the rail and mattress,
4. under the rail (at the ends of the rail),
5. between split bed rails,
6. between the end of the rail and the side edge of the headboard or footboard, and
7. between the headboard or footboard and the mattress end.

To minimize the risk of entrapment, the interprofessional team should consider the following (Norton, 2010):

- Selecting a surface that has a transfer border, as it may be less likely to compress as the person approaches the side of the surface;
- Evaluating the use of bed rails (e.g., the risk may be reduced when these are not in place);
- Implementing other devices (such as positioning wedges or a mattress cover with built-in bolsters); and
- Consulting with an occupational therapist or physical therapist skilled in this area, in order to complete an assessment and make specific recommendations.

For additional information on entrapment, please refer to Health Canada's (2008) *Guidance Document on Adult Hospital Beds: Patient Entrapment Hazards, Side Rail Latching Reliability, and Other Hazards* (http://www.hc-sc.gc.ca/dhp-mps/md-im/applic-demande/guide-ld/md_gd_beds_im_ld_lits-eng.php).

Once the appropriate support surface has been selected and installed, the expert panel recommends that the support surface continue to be monitored for effectiveness. The expert panel, in agreement with other pressure ulcer/injury guideline groups, recommends that a person be transitioned from an existing support surface to a higher level support surface when (NPUAP, EPUAP, & PPIA, 2014):

- the quality of the surface has deteriorated and is no longer effective in facilitating wound healing;
- the surface is deemed as a possible contributory/causative factor to the worsening or non-healing pressure injury;
- The person cannot be positioned to avoid placing pressure on an existing pressure injuries;
- The person has pressure injuries on two or more turning surfaces that limit repositioning while in bed;
- The person is at high risk for developing further pressure injury;
- The person is obese and requires a bariatric support surface that provides sufficient pressure redistribution; and/or
- The bed “bottoms out” on the current support surface. Bottoming out⁶ occurs when the support surface is compressed by high pressure (RNAO, 2007) and can no longer properly support the person.

The use of the “hand checking” method has been common practice for air floatation and low air loss support surfaces. In a recent position statement published by the NPUAP (2015), clinicians are cautioned on the increased safety risk and infection issues for the person and their caregivers related to hand checking. Hand checking should be limited to mattress overlay and seat cushions, and is not recommended for mattress replacement or integrated bed systems (NPUAP, 2015). Further research is required to develop the best method for evaluating whether the person on the support surface is “bottomed out.”

For additional information on the use of support surfaces for people who undergo surgical procedures or who must maintain complete best rest, please refer to Recommendations 3.6 and 3.7b of RNAO's (2011) *Risk Assessment and Prevention of Pressure Ulcers* (<http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers>) clinical BPG. Although this guideline refers to people at risk for pressure injuries, the principles pertaining to the recommendations on the use of support surfaces also apply to people with existing pressure injuries. For surgical

procedures lasting more than 90 minutes, the implementation of intraoperative pressure management devices is recommended. For additional information on the management of pressure injuries for people in the operating room, please refer to [Appendix D](#). The expert panel does not recommend complete bed rest for the treatment of pressure injuries because of the associated physical and psychological complications, including depression, delirium, pneumonia, and functional decline (i.e., impaired ability to perform activities of daily living).

Heel Off-Loading from a Bed or Wheelchair

Heels are susceptible to skin breakdown due to the thin layer of subcutaneous tissue covering the calcaneus, the shape of the calcaneus bone, and the risk for ischemia with minimal pressure and shearing forces (RNAO, 2011).

In addition to local wound care, the treatment of heel pressure injuries should focus on:

- Eliminating pressure and shear by suspending the heels off of the support surface using a pillow or heel suspension devices. Some of the heel suspension devices also help to prevent foot drop (i.e., difficulty lifting the front part of the foot) (NPUAP, EPUAP, & PPPIA, 2014). Despite the lack of studies demonstrating the effectiveness of heel suspension/protection devices on the healing of pressure injuries (McGinnis & Stubbs, 2014), the expert panel supports complete off-loading^c of the heels.
- Selecting a heel suspension/protection device, that considers the person's activity level, goals of care and comfort.
- Ensuring regular inspection of the skin under the device in order to prevent further skin breakdown (NPUAP, EPUAP, & PPPIA, 2014).
- Minimizing plantar pressure by assessing the person's footwear. If the person is ambulatory, a referral to a chiropodist may be warranted.

Overall, support surfaces for people with pressure injuries should be carefully selected, monitored, and replaced when necessary to ensure continued optimal pressure redistribution. The use of appropriate support surfaces does not negate the need to reposition people with wounds on a regular basis.

RECOMMENDATION 3.3

Implement an individualized nutritional plan of care in collaboration with the person and his/her circle of care that addresses nutritional requirements and provides adequate protein, calories, fluid, and appropriate vitamin and mineral supplementation to promote pressure injury healing.

Level of Evidence =V

Discussion of Evidence:

Once a person has been identified as being malnourished or at risk of malnutrition, the expert panel recommends that a registered dietitian, in collaboration with the person and his/her circle of care, develop and implement an individualized nutritional plan to meet the person's energy and nutritional needs for wound healing. First, it is important that the interprofessional team collaborate with the person, the person's circle of care, and the registered dietitian to identify any barriers to the successful implementation of the nutritional plan of care. Involving the person's primary caregiver(s), friends, and other supports may be necessary if the person cannot feed himself or herself, and to ensure that the food provided meets the person's cultural and individual preferences. The person's socio-economic status, living conditions, literacy, functional capacity, support systems, and medical condition(s) (e.g.,

kidney, liver, or cardiac diseases) must also be considered and addressed in tailoring the person's nutrition care plan to best meet their needs. For example, it may be necessary for a social worker to be involved to support a nutrition plan of care (e.g., access clean water and nutritious food).

It is generally recommended that if people are able (e.g., functionally, financially) to consume sufficient fluids and food—calories, protein, and the minerals listed below—they do not require extra supplementation to support pressure injury healing. If the person requires nutritional supplements in order to meet nutritional needs, a discharge nutritional plan should be provided upon discharge from the hospital to the home or other setting, such as long-term care.

According to current literature and other pressure ulcer/injury guidelines, the recommended dietary intake for people with pressure injuries is as follows:

- **30–35 kcal/kg/body weight** (Cereda, Gini, Pedrolli, & Vanotti, 2009; Perry et al., 2014; NPUAP, EPUAP, & PPIIA, 2014; Wong et al., 2014)
- **Protein: 1.25 to 1.5 g protein/kg body weight** (Perry et al., 2014; NPUAP, EPUAP, & PPIIA, 2014);
- **Arginine^G: 4.5 g/day** (Leigh, 2012)
- **Ascorbic acid: 500 mg/day** (Cereda et al., 2009; Chapman, Mills, Pearce, & Crowe, 2011)
- **Fluid: 1 ml/kcal/day** (Perry et al., 2014; NPUAP, EPUAP, & PPIIA, 2014).
- **Zinc:** Evidence for the use of zinc to support healing in people with pressure injuries is limited, and guidelines regarding dosage cannot be provided at the time of writing. Most zinc requirements can be achieved through a well-balanced diet (Expert Panel, 2015).

According to several studies, persons with stage 2, 3, and 4 pressure injuries should obtain their energy and nutrition requirements from a specialized diet of protein, vitamins, and minerals (Cereda et al., 2009; Chapman et al., 2011; Medical Advisory Secretariat, 2009; van Anholt et al., 2010; Wong et al., 2014). The recommended supplements include a combination of arginine, zinc, and vitamin C, which can be obtained through food and/or special nutrition supplements. In these studies, a specialized diet resulted in improved wound healing (e.g., reduction in pressure injury size and higher rates of healing), decreased wound care requirements, and improved tissue viability in some people with stage 2, 3, and 4 pressure injuries (Cereda et al., 2009; Chapman et al., 2011; Medical Advisory Secretariat, 2009; van Anholt et al., 2010; Wong et al., 2014).

Protein is particularly important to wound healing because of its ability to promote positive nitrogen balance and improve healing rates (NPUAP, EPUAP, & PPIIA, 2014). Three systematic reviews have demonstrated the importance of protein with regard to improving wound size and pressure injury healing (Lee, Posthauer, Dörner, Redovian, & Maloney, 2006; Reddy et al., 2008; Smith et al., 2013). Although protein is an important nutrient for pressure injury healing, people should be assessed for their ability to tolerate high protein supplementation. Kidney function should be assessed to ensure that the amount of protein recommended will not compromise kidney function (NPUAP, EPUAP, & PPIIA, 2014).

Arginine, an amino acid, has received particular attention in the literature with regard to its benefits for pressure injury healing. In general, it has been shown to influence tissue repair following trauma (AWMA, 2012). Two studies have demonstrated an almost twofold decrease in the time required to achieve complete pressure injury healing with arginine supplementation (Brewer et al., 2010; Leigh, 2012). In stage 2, 3, and 4 pressure injuries, lower doses of arginine (4.5 g compared to 9 g) were shown to be equally effective (Leigh, 2012). The expert panel recommends the lower dose of arginine, since it did not appear to have a different outcome than the higher dose. Specialized products that are enriched with arginine, vitamin C, and zinc may not be available and/or may not be affordable. These products are best administered in hospital during healing and while diligent assessment of wound healing can be measured. Once wound healing has started to progress, the person can likely move to a healthy, well-balanced diet to continue to facilitate the healing (Expert Panel, 2015).

The NPUAP, EPUAP, & PPPIA (2014) guideline group recommends that the interprofessional team encourage adequate fluid intake on a daily basis in order to support pressure injury healing. However, fluid intake should be compatible with the person's co-morbid conditions and goals of care (NPUAP, EPUAP, & PPPIA, 2014). Additional fluid will be required when the person is dehydrated, such as when they have been vomiting or sweating excessively, had diarrhea or an increased temperature, and/or have a pressure injury with a large amount of exudate (NPUAP, EPUAP, & PPPIA, 2014). The person should be provided with recommendations for daily fluid intake based on an assessment that accounts for any changes in the person's "weight, skin turgor, urine output, elevated serum sodium and/or calculated serum osmolality" (NPUAP, EPUAP, & PPPIA, 2014).

In general, the current literature supports the use of nutritional supplements (e.g., protein, arginine, vitamins, and minerals) to heal pressure injuries. However, the literature should be interpreted with caution because the majority of strong and moderate quality studies cited in this recommendation involve the elderly, people on specialized health-care units, and people with spinal cord injuries. Moreover, studies implemented various nutritional interventions with mixed study samples that involved people who were malnourished as well as people who were not. Nonetheless, the expert panel agrees with the application of current best evidence on nutrition supplementation to the general population with pressure injuries. The dosage limits provided above are based on the dosage ranges used in the research literature and in the NPUAP, EPUAP, & PPPIA (2014) and Perry et al. (2014) guidelines, with confirmation from the expert panel.

RECOMMENDATION 3.4

Provide local pressure injury care consisting of the following, as appropriate:

- cleansing (level of evidence = V);
- moisture balance (healable) or moisture reduction (non-healable, maintenance) (level of evidence = Ia–b, V);
- infection control (i.e., superficial critical colonization/localized infection and/or deep and surrounding infection/systemic infection) (level of evidence = Ia-b, V); and
- debridement (level of evidence = V).

Discussion of Evidence:

The appropriateness of wound cleansing, providing moisture balance, infection control, and debridement depends on whether or not the pressure injury is healable. The care plan for healable pressure injuries typically proceeds with the various treatment options (i.e., treating the cause, cleansing, moisture balance, infection control, and/or debridement) in order to close the wound.

For non-healable pressure injuries—that is, where there is an inadequate blood supply, and/or the cause or wound-exacerbating factors cannot be corrected—the care plan is more conservative, and interventions are focused primarily on the person's comfort and quality of life (e.g., reducing wound drainage and decreasing bacterial burden using antiseptics) (Sibbald et al., 2011). Only conservative methods of debridement are recommended to remove non-viable tissue and slough from non-healable pressure injuries (Sibbald et al., 2011). It must be emphasized that, prior to any lower extremity pressure injury debridement procedures, the interprofessional team must conduct a vascular assessment of the lower limbs. Please see Recommendation 1.7 of this Guideline for further details on a vascular assessment of the lower limbs.

A maintenance wound^G is when “the person refuses the treatment of the cause [e.g., a focus on comfort measures instead of treating the cause in persons in palliative care] or a health system error or barrier [e.g., the person cannot afford the appropriate pressure redistribution device]” (Sibbald et al., 2011, p. 417). In some cases, re-evaluation may be necessary when a person’s circumstances change (Sibbald et al., 2011). Regardless of the healability of the pressure injuries, the goals of care should be decided upon by the person with the pressure injuries, the person’s circle of care, and the interprofessional team within the context of available/accessible resources.

Cleansing the Wound (Level of Evidence = V)

Wound cleansing removes debris, bacteria, and fibrinous material from pressure injuries to facilitate wound healing (NPUAP, EPUAP, & PPIIA, 2014). Current literature on the cleansing of pressure injuries is very limited; this finding is supported by the NPUAP, EPUAP, & PPIIA (2014) pressure ulcer/injury guideline, which states that “most clinical articles regarding cleansing speak to general cleansing principles for any type of wound bed preparation” (p. 152). Moreover, current systematic reviews do not consistently provide confirmatory evidence on the cleansers or cleansing techniques that should be used to clean pressure injuries (Medical Advisory Secretariat, 2009; Moore & Cowman, 2013). Nonetheless, wound cleansing is a necessary first step to optimize visual inspection of the pressure injury, protect the healing wound, and prepare the wound for further intervention (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). It is recommended that pressure injuries, as well as the skin around the wound (i.e., the peri-wound) be cleansed at every dressing change in order to facilitate wound healing (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014; WOCN, 2010).

In light of limited evidence on pressure injury wound cleansing, the expert panel confirms the appropriateness and relevance of the recommendations in the 2007 edition of RNAO’s *Assessment and Management of Stage I to IV Ulcers* clinical BPG and the guidelines provided by other pressure ulcer/injury guideline groups, which state the following:

1. **Use normal saline, potable or sterile water, or non-cytotoxic wound cleansers for wound cleansing.** Normal saline is recommended for all types of wounds because it does not damage human tissue (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). Potable water^G is also recommended for most wounds (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014). Wound cleansing solutions with surfactants or antimicrobials (e.g., povidone iodine) are recommended for wounds with debris, high bacterial colonization, and suspected or confirmed infection (NPUAP, EPUAP, & PPIIA, 2014).
2. **Before cleansing, warm fluids to room temperature.** The expert panel recommends this in order to facilitate the person’s comfort during wound cleansing.
3. **Use sufficient irrigation pressure while ensuring that no trauma is caused to the wound bed.** Pressure should be sufficient to remove slough or necrotic tissue, thus ensuring proper cleansing, but should not cause trauma to the wound bed; traumatized wound tissue is more susceptible to infection and delayed wound healing (Perry et al., 2014). The expert panel does not recommend irrigating pressure injuries with extensive tunneling—that is, when the irrigating solution does not drain out or return from the wound. Instead, consider compressing^G pressure injuries (including any tunnels or sinus tracts^G within the wound). This is achieved by gently applying warm, saline-soaked gauze compresses into the pressure injury for 30 seconds before replacing it with another saline-soaked gauze.
4. **Gently irrigate the wound with at least 100 to 150 millilitres of solution.** Irrigation of the wound reduces surface bacteria and tissue trauma. A sufficient amount of wound cleanser is required to completely irrigate the entire wound surface (Perry et al., 2014). Large wounds may require larger volumes of cleansing solution to completely clean the open wound. Safe and effective ulcer irrigation pressures range from 4 to 15 psi.^G Pressures of 4 to 15 psi are achieved using (a) a 35-millilitre syringe with a 19-gauge angiocath to create 8 psi of pressure (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014; WOCN, 2010), or (b) a single-use 100-millilitre saline squeeze bottle (RNAO, 2007). As an acceptable

alternative to 35-millilitre syringes, which are not available in Canada, the expert panel recommends the use of 30-millilitre syringes. Although 100-millilitre squeeze bottles are available, bottles containing 118 millilitres of normal saline are also acceptable to use for wound irrigation.

5. **Consider person-centred goals.** Irrigation for healable pressure injuries may differ from irrigation for wounds that are non-healable or maintenance. For example, non-healable and maintenance pressure injuries may not require the same amount and force of irrigation. Moreover, if a person has a non-healable or maintenance wound and the goals of care are focused on comfort (e.g., as in palliative care), extensive irrigation will be unnecessary.

Throughout the wound cleansing process for stage 2, 3, and 4 pressure injuries, the interprofessional team should employ universal precautions (Perry et al., 2014). Aseptic (i.e., medical) technique is especially important when the person, the wound, or the wound environment is compromised (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014).

For a list of cleansing solutions, please refer to [Appendix R](#).

Moisture Balance (Healable) or Moisture Reduction (Non-healable, Maintenance) (Level of Evidence = Ia–Ib, V)

Wound dressings are an important part of pressure injury care, and there are many commercially available dressings to promote pressure injury healing and closure. Dressings can also be impregnated with analgesia, anti-inflammatories, and anti-infective agents, and can assist with wound debridement. In choosing a dressing, health-care providers must ensure their choice is: (a) directed by a comprehensive clinical assessment, (b) an appropriate treatment for the identified wound stage, and (c) guided by person-centred preferences and goals (Beeckman et al., 2013; NPUAP, EPUAP, & PPIIA, 2014; WOCN, 2010).

Dressing Selection

In light of the absence of new evidence regarding dressing selection for pressure injuries, the expert panel continues to support the recommendations outlined in RNAO's 2007 *Assessment and Management of Stage I to IV Pressure Ulcers* clinical BPG. According to the expert panel and several pressure ulcer/injury guideline groups, the interprofessional team, in collaboration with the person and his/her circle of care, should select a dressing that meets the following criteria:

- Matches the volume of wound exudate, so that the wound bed is kept moist and the peri-wound is kept dry and intact (RNAO, 2007);
- Is appropriate to the size, depth, and location of the ulcer (AWMA, 2012; NICE, 2014; NPUAP, EPUAP, & PPIIA, 2014; WOCN, 2010);
- Loosely fills the wound cavity (RNAO, 2007);
- Decreases the frequency of dressing changes (NICE, 2014);
- Is comfortable and cosmetically acceptable to the person (RNAO, 2007);
- Works in conjunction with adjunctive therapies (RNAO, 2007);
- Maintains a moist wound environment (NPUAP, EPUAP, & PPIIA, 2014);
- Controls exudates and keeps the peri-wound dry (AWMA, 2012; NICE, 2014; NPUAP, EPUAP, & PPIIA, 2014; WOCN, 2010);
- Provides thermal insulation and wound temperature stability (RNAO, 2007);
- Protects from contamination by outside micro-organisms (RNAO, 2007);
- May address bacterial bioburden (NPUAP, EPUAP, & PPIIA, 2014);

- Maintains its integrity while on the wound and does not leave behind fibers or foreign material when removed (RNAO, 2007);
- Minimizes pain and trauma to the wound bed, particularly on application and removal (AWMA, 2012; RNAO, 2007; WOCN, 2010);
- Is cost-efficient to the person and/or the person's primary caregiver(s) (AWMA, 2012; WOCN, 2010), and to the health-care system; and
- Honours person-centred preferences (RNAO, 2007), while being appropriate to the stage of the wound.

As the wound heals, the type of dressing used may change to ensure that it remains appropriate to the wound (Perry et al., 2014; NPUAP, EPUAP, & PPIA, 2014; WOCN, 2010). It is also important that the interprofessional team use dressing products according to manufacturers' recommendations—that is, follow their indicated use and be aware of dressing contraindications (NPUAP, EPUAP, & PPIA, 2014).

Dressing Use

For healable wounds, it is recommended that moisture-retentive dressings be used on stage 2, 3, and 4 pressure injuries (NICE, 2014). Dressings help wounds maintain a moist wound environment, and promote re-epithelialization and wound closure (NPUAP, EPUAP, & PPIA, 2014). An important exception to this recommendation involves heel ulcers. Black eschar, which protects the heel ulcer by separating viable from non-viable tissue (NPUAP, EPUAP, & PPIA, 2014), may develop on the heel. If present, it should be left dry and intact, and monitored for continued stability.

A range of moisture-retentive dressings have been studied in the literature, and the following benefits identified:

- Alginate dressings absorb excess wound exudate and keep the wound bed moist. They are available in sheet and rope forms, and can be left on pressure injuries for a maximum of several days, depending on the degree of exudate saturation (NPUAP, EPUAP, & PPIA, 2014) or according to health-care facility/agency policy or the manufacturer's recommendation.
- Collagen dressings bind to wound-bed fluid and metalloproteinases to control wound exudates (Piatkowski et al., 2012).
- Foam dressings wick exudate away from the wound bed and move it to the surface of the wound dressing (NPUAP, EPUAP, & PPIA, 2014) in a fluid balance mechanism that can cause peri-wound maceration^G. However, superabsorbent dressings can absorb and retain fluid with a “fluid lock.”
- Hydrocolloid dressings, which typically consist of materials such as polysiobutylene, sodium carboxymethylcellulose, gelatin, and pectin (Mao, Rivet, Sidora, & Pasko, 2010), absorb wound fluid and aid in debridement (Heyneman, Beele, Vanderwee, & Defloor, 2008; Mao et al., 2010).
- Hydrogel dressings help retain wound-bed moisture and rehydrate tissue (Sibbald et al., 2015).

Other major categories of moisture-retentive dressings not captured in the pressure injury literature but that may also be used for chronic wounds include hydrofibre dressings, which bind to exudates in low to moderate amounts (Sibbald et al., 2015), and superabsorbent, polymer-containing wound dressings, which absorb large amounts of exudates from wounds (Sibbald et al., 2015). For a complete listing of dressing categories used in chronic wounds (including pressure injuries) and their indications for use, please refer to [Appendix S](#).

Overall, the current literature does not provide confirmatory evidence of the superiority of one moisture-retentive “advanced” wound dressing over another (Brown-Etris et al., 2008; Mao et al., 2010; Medical Advisory Secretariat, 2009; Pott, Meier, Stocco, Crozeta, & Ribas, 2014; Reddy, 2011; Regan et al., 2009; Sibbald et al., 2015; Tricco et al., 2015). However, the evidence in general does seem to support the use of advanced rather than simple dressings to support pressure injury healing (Heyneman et al.,

2008; Medical Advisory Secretariat, 2009; Nicolas et al., 2012; Pott et al., 2014; Regan et al., 2009). Thus, because pressure injuries require a moist environment to heal (RNAO, 2007), the expert panel does not recommend dry gauze dressings/modalities. With respect to the use of moisture-retentive dressings on pressure injuries, the expert panel recommends the following:

- Dressings should be changed as required depending on the amount of exudate and fluid the dressing is able to hold.
- Dressing changes and dressing modifications should be based on ongoing wound assessments (i.e., wound characteristics) and, within reason, on person-centred preferences (NPUAP, EPUAP, & PPIA, 2014; WOCN, 2010).
- Minimize pain during wound dressing changes by considering pain management interventions, including medication and the use of hydrogel and foam dressings (Perry et al., 2014).
- Fill deep wounds, tunnels, and undermining with dressing material without causing trauma and plugging up the wound. Ensure that the dressing material has enough tensile strength so that it can be removed from the wound in one piece without disintegration.
- Ensure that the dressing has appropriate adhesion and conformity to the anatomic location of the pressure injury in order to avoid contributing to further friction and shear to the wound.

A number of factors must be considered when selecting and using dressings. Current evidence does not support the superiority of one type of dressing over others.

Treatment of Superficial Critical Colonization (Localized Infection) and Deeper and Surrounding Infection (Systemic Infection) (Level of Evidence = Ia-b, V)

Infection delays wound healing. As discussed in Recommendation 1.4 of this Guideline, there are two types of infections: superficial critical colonization (localized infection) and deeper and surrounding infection (systemic infection). All suspected and confirmed wound infections should be treated with cleansing. The preferred treatment for wounds exhibiting superficial critical colonization is local (topical) antimicrobial agents, whereas systemic antibiotics^G and debridement should be considered for deeper and surrounding bacterial infections to facilitate wound healing (Sibbald et al., 2007).

Currently, there is insufficient evidence regarding the treatment of superficial critical colonization (localized infection) and deeper and surrounding infection (systemic infection) control as it pertains specifically to pressure injuries. The following discussion has been informed by the expert panel, other pressure ulcer/injury guidelines, and general literature on wound-bed preparation and intervention.

In general, the decision to use local antimicrobials, antiseptics^G, or systemic antibiotics for pressure injury intervention is based on:

- whether the pressure injury is superficially critically colonized (localized infection) or whether there is a deeper and surrounding infection (systemic infection);
- whether the pressure injury is healable, maintenance, or non-healable; and
- goals of care (which have been determined in collaboration with the person with the pressure injury, the person's circle of care, and the interprofessional team).

Topical Antimicrobial Agents

An antimicrobial agent is “a substance that acts directly on a microorganism to destroy the bacteria and prevent the development of new bacterial colonies” (NPUAP, EPUAP, & PPIA, 2014). There are two broad categories of antimicrobial

agents: topical and systemic (i.e., antibiotics). According to several pressure ulcer/injury guideline groups, topical antimicrobial agents (e.g., dressings, creams) are generally not recommended for the treatment of locally infected pressure injuries because of the risk of antibiotic resistance, hypersensitivity, inability to penetrate deeper pressure injuries, and uncontrolled systemic absorption of the medication when applied to larger wounds (AWMA, 2012; NICE, 2014; NPUAP, EPUAP, & PPIIA, 2014). However, if topical antimicrobial agents are used to help control localized wound infection, these products should only be used for a short period of time (NPUAP, EPUAP, & PPIIA, 2014). In addition, different antimicrobial products should not be applied to a wound simultaneously.

Current literature identifies silver as an antimicrobial agent that may provide benefits in the healing of pressure injuries. Silver dressings and creams help control bacterial infection and inflammation (Mao et al., 2010), and there is emerging randomized controlled evidence on the effectiveness of silver on pressure injury healing rates and improved PUSH scores (Chuangsuwanich, Charnsanti, Lohsiriwat, Kangwanpoom, & Thong-In, 2011). There are also reviews that conclude that silver preparations promote faster healing; however, additional research is required to confirm these results (Mao et al., 2010; Medical Advisory Secretariat, 2009). The NPUAP, EPUAP, & PPIIA (2014) and AWMA (2012) guideline groups do not recommend that silver dressings be used for a prolonged period of time, because of the potential for tissue toxicity and the risk of bacterial resistance. Thus, silver dressings should be discontinued once superficial critical colonization is no longer a clinical concern (NPUAP, EPUAP, & PPIIA, 2014), as demonstrated by decreased exudates, decreased odour, improved wound measurements, and improvement in the peri-wound.

Although there is some evidence to support the use of honey dressings to treat bacterial infections in pressure injuries (Levine et al., 2013; Saha, Chattopadhyay, Azam, & Sur, 2012; Yapucu Gunes & Eser, 2007), higher-quality evidence is required before conclusions can be made about the efficacy of honey. Thus, the expert panel does not recommend the use of honey as an intervention for the healing of pressure injuries at the time of writing. With respect to other antimicrobial agents, such as polyhexamethylene biguanide (PHMB), gentian violet/MB, and iodine, although these agents have been recommended for use in other types of wounds, they have not been identified in the current literature as potential antimicrobials in the management of pressure injuries, specifically.

For a list of topical antimicrobials for use in chronic wounds (including pressure injuries), please refer to [Appendix T](#).

Systemic Antimicrobial Agents

An antibiotic is “a natural or synthetic substance administered systemically or topically that has the capacity to destroy or inhibit bacterial growth” (NPUAP, EPUAP, & PPIIA, 2014). Systemic antibiotics (i.e., antimicrobials) are used to treat deeper pressure injuries because of the potential of such ulcers to cause systemic infections such as sepsis,^G bacteremia, cellulitis and osteomyelitis^G, and death (AWMA, 2012; NICE, 2014; NPUAP, EPUAP, & PPIIA, 2014; Redelings, Lee, & Sorvillo, 2005). Unlike topical antimicrobial and antiseptic agents, which cannot penetrate to the base of the wound (NPUAP, EPUAP, & PPIIA, 2014), systemic antibiotics can be used with life-threatening pressure injury infections. Identification of the target pathogen(s)^G and confirmation of their antibiotic susceptibilities via wound swabs, tissue cultures, and sensitivity testing is required to ensure ongoing, effective antibiotic treatment (AWMA, 2012; NICE, 2014; NPUAP, EPUAP, & PPIIA, 2014).

Osteomyelitis, or bone infection occurs in approximately 32 percent of people with pressure injuries (Darouiche, Landon, Kilma, Musher, & Markowski, 1994; Sugarman et al., 1983; Thornill-Joyne et al., 1986). When pressure injuries involve exposed bone, osteomyelitis should be assessed and treated (NPUAP, EPUAP, & PPIIA, 2014). Osteomyelitis can be assessed through a range of diagnostic tests, such as MRIs (gold standard, if available), x-rays, blood work (e.g., serum, ESR, CRP), biopsies, and clinical assessment. If the bone feels gritty or soft when probing during a clinical assessment and the pressure injury has either failed to heal or has reopened with treatment, the interprofessional team should suspect

osteomyelitis and proceed with further investigation (i.e., referral to a medical specialist) and systemic antibiotic treatment (NPUAP, EPUAP, & PPIIA, 2014).

Topical Antiseptic Agents

Antiseptic^G agents “destroy or inhibit the growth and development of microorganisms in or on living tissue” (NPUAP, EPUAP, & PPIIA, 2014, p. 166). Compared to antimicrobials, which can only be used on bacteria, topical antiseptics can be used on wounds infected by a wider range of micro-organisms, such as bacteria, protozoa, fungi, and viruses (NPUAP, EPUAP, & PPIIA, 2014). However, as with antimicrobial agents, antiseptics can create tissue toxicity when used in larger and deeper pressure injuries (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014).

If there is a delay in pressure injury healing due to superficial critical colonization, antimicrobial agents should be considered before antiseptic agents (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014). If chosen, antiseptic agents should be used for a short time and should be discontinued when superficial critical colonization (localized infection) is no longer a clinical concern, once healing has progressed, or as soon as the person experiences any antiseptic-related adverse events (NPUAP, EPUAP, & PPIIA, 2014). In most clinical circumstances, antiseptic agents are most often used to reduce bacterial burden in non-healable pressure injuries, where the goal is to reduce bacterial burden rather than to heal the wound (Sibbald et al., 2015).

For a list of topical antiseptic agents safe to use on chronic wounds (including pressure injuries), please refer to [Appendix T](#).

Debridement (Level of Evidence = V)

Because there is insufficient evidence on pressure injury debridement, the following discussion has been informed by the expert panel, other pressure ulcer/injury guidelines, and general literature on wound bed preparation and intervention.

The expert panel recommends debridement for healable pressure injuries. Debridement is a technique used to remove non-viable tissue from pressure injuries and to prepare the wound bed for further intervention (NPUAP, EPUAP, & PPIIA, 2014). Removing necrotic tissue as part of wound-bed preparation prior to treatment/management is important, because such tissue can be a source of infection, inflammation, and delayed wound healing (NPUAP, EPUAP, & PPIIA, 2014). Non-viable tissue is usually “moist, yellow, green, tan, or gray and may become thick and leathery with dry black or brown eschar” (NPUAP, EPUAP, & PPIIA, 2014, p. 154).

Types of debridement include surgical/sharp^G, conservative sharp^G, autolytic^G, enzymatic^G, larval^G, and mechanical debridement^G (NPUAP, EPUAP, & PPIIA, 2014). The application of debridement depends on clinical need, person-centred concerns (e.g., pain associated with the procedure), available resources, health-care professional training/qualifications, and the availability of agency policies regarding the use of debridement on persons with pressure injuries (AWMA, 2012; Perry et al., 2014). In general, debridement can be performed at the bedside. The pressure injuries should be cleansed (see the discussion of cleansing the wound, above) prior to and after debridement (Expert Panel, 2015). Maintenance debridement should continue on an ongoing basis until all non-viable tissue has been removed from the wound bed and granulation tissue has developed in the wound (NPUAP, EPUAP, & PPIIA, 2014).

The expert panel concurs with other reputable pressure ulcer/injury guideline groups in recommending that, when selecting the most appropriate method of debridement, the following should be taken into consideration:

- The goals of care (e.g., the healing potential of the pressure injury) (AWMA, 2012; Sibbald et al., 2011);
- The person’s condition and co-morbidities (e.g., end-of-life, pain management) (AWMA, 2012; NICE, 2014);

- Risks and safety (e.g. risk of bleeding, immunocompromised) (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014; WOCN, 2010);
- Person-centred preferences (e.g. preference for more conservative treatment) (AWMA, 2012);
- Pain management prior to debridement (NICE, 2014; WOCN, 2010);
- The type, quantity, and location of non-viable, necrotic tissue (AWMA, 2012; NICE, 2014; WOCN, 2010);
- The depth of the pressure injury and the amount of drainage (RNAO, 2007);
- The availability of and access to qualified staff and appropriate resources (e.g., pain management, supplies, specialists) (AWMA, 2012; WOCN, 2010); and
- Cost-effectiveness (sharp wound^G debridement is the most cost-effective, followed by enzymatic debridement) (Woo, Keast, Parsons, Sibbald, & Mittman, 2013).

Lower-extremity ulcers, such as black eschar on heels, or pressure injuries in people who are gravely palliative with dry eschar need not be debrided if they do not exhibit signs and symptoms of infection, edema, erythema^G, fluctuance, or drainage (NPUAP, EPUAP, & PPIIA, 2014). Instead, these wounds should be assessed daily to monitor for complications (e.g., bacterial burden/damage) that would require debridement (NPUAP, EPUAP, & PPIIA, 2014).

Prior to debridement of lower-extremity ulcers, it is critical to assess for vascular compromise in the lower limbs (see Recommendation 1.7 of this Guideline). Debridement should only be performed when there is sufficient tissue perfusion to the pressure injuries (NPUAP, EPUAP, & PPIIA, 2014).

For a summary list of key factors to consider in deciding on the method of debridement, please refer to [Appendix U](#).

Sharp Wound Debridement

The expert panel recommends sharp wound debridement for healable wounds when clinical expertise is on hand, appropriate post-debridement monitoring is available, and person-centred concerns can be addressed (i.e., bleeding, pain). Sharp debridement (also known as sharp surgical debridement) is the most invasive and quickest form of debridement (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). It entails the removal of non-viable and minimal viable tissue using sharp instruments such as a scalpel and/or scissors (NPUAP, EPUAP, & PPIIA, 2014). General, intra-lesional, or local topical anesthesia may be required because surgical debridement extends to viable tissue and causes pain and bleeding (NPUAP, EPUAP, & PPIIA, 2014). Sharp debridement is best used when the need is urgent, such as with advancing cellulitis or sepsis, increased pain, exudate, and odour (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). Where appropriate, the interprofessional team can consider using regular sharp debridement to remove biofilm that can impede normal wound healing (NPUAP, EPUAP, & PPIIA, 2014).

Sharp debridement must be conducted in an appropriate clinical setting, with sufficient pain management and follow-up by a qualified health-care professional who understands its application and potential complications, and is able to solve problems that may arise during or after treatment (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). Sterile instruments must be used (NPUAP, EPUAP, & PPIIA, 2014).

Conservative Sharp Wound Debridement

Conservative sharp debridement involves “the use of scalpels, curettes, scissors, forceps and rongeurs to remove devitalized tissue without pain or bleeding” (NPUAP, EPUAP, & PPIIA, 2014); it differs from surgical debridement in that viable tissue is not excised (Perry et al., 2014). This type of debridement is used to control infection in non-healable wounds (e.g., persons in palliative care) (NPUAP, EPUAP, & PPIIA, 2014; Sibbald et al., 2011) and to reduce the load of necrotic tissue as part of wound-bed preparation in healable wounds. Conservative debridement must only be conducted

by a qualified health-care professional who understands its application and potential complications, and can solve problems that may arise during or after treatment (NPUAP, EPUAP, & PPIIA, 2014). Sterile instruments should be used to debride the wound (NPUAP, EPUAP, & PPIIA, 2014). For additional information on conservative sharp debridement, please refer to the *Evidence-Based Recommendations for Conservative Sharp Debridement* (<https://www.caet.ca/wp-content/uploads/2015/02/caet-ebr-cswd-2013-04.pdf>) document by The Canadian Association for Enterostomal Therapy (CAET) (CAET, 2011).

Autolytic Debridement

Autolytic debridement occurs naturally in pressure injuries when the wound environment is moist. When the wound bed is moist, macrophages, bacteria, and enzymes in the wound can digest devitalized tissue (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). Moisture-retentive dressings, such as hydrocolloids, hydrogels, transparent films, and alginates provide the moist wound environment required for autolytic debridement (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014; Sibbald et al., 2015). During autolytic debridement, the interprofessional team, the person, and his/her circle of care should be aware that the production of exudate may increase (Expert Panel, 2015). Thus, it is recommended that the appropriate dressing be chosen to accommodate the increased exudate (Expert Panel, 2015). (For additional information on moisture-retentive dressings, please see the discussion above.) It is also important to note that autolytic debridement should not be used when a wound infection has not been treated or for large pressure injuries (where necrotic tissue exceeds 50 percent) (NPUAP, EPUAP, & PPIIA, 2014).

Enzymatic Debridement

Enzymatic debridement involves applying commercially prepared proteolytic or fibrinolytic enzymes to an open wound (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014). These enzymes work together with the body's own enzymes to break down devitalized tissue in the wound bed (NPUAP, EPUAP, & PPIIA, 2014). Such products work best in a moist wound environment (Perry et al., 2014). It is important to follow manufacturers' instructions prior to using endogenous enzymes, because some products can be deactivated by heavy metals found in wound cleansers, topical dressings, and antimicrobial agents (Perry et al., 2014). Products with enzymatic properties include but are not limited to collagenase, papain, and streptokinase/streptodornase. Currently, there is some evidence to support the effectiveness of these products on pressure injury healing (Medical Advisory Secretariat, 2009; Milne, Ciccarelli, & Lassy, 2012; Ramundo & Gray, 2008; Waycaster & Milne, 2013). However, additional, higher-quality evidence is needed before their use can be recommended over other enzymatic debridement applications.

Mechanical Debridement

Mechanical debridement is slow and can be a “non-selective form of debridement that can result in the removal of both devitalized as well as viable tissue” (NPUAP, EPUAP, & PPIIA, 2014). Types of acceptable mechanical debridement include wound irrigation, wound compressing, and ultrasound^G (NPUAP, EPUAP, & PPIIA, 2014). Hydrosurgery is also considered to be a form of mechanical debridement; however, because of its cost, the need for specialized training, and the potential for infection control issues, the expert panel does not recommend its use to debride wounds.

Non-contact, low-frequency ultrasound (e.g., ultrasound mist) removes devitalized tissue by creating mechanical vibrations and a hydrodynamic effect, which break down necrotic tissue and fibrin (NPUAP, EPUAP, & PPIIA, 2014). Low-frequency contact ultrasound can also be used to debride pressure injuries. Irrigation is another form of mechanical debridement that may be used.

For additional information on wound irrigation, please refer to the preceding discussion.

Larval Debridement

Larval debridement involves the application of disinfected maggots to an open wound (NPUAP, EPUAP, & PPIA, 2014; Perry et al., 2014). Maggots release enzymes that break down devitalized tissue (NPUAP, EPUAP, & PPIA, 2014). The evidence on larval debridement is limited. According to a systematic review involving clients with spinal cord injury by Regan et al. (2009), there is evidence to support the use of maggot therapy as an adjunctive therapy for non-healing pressure injuries. Moreover, in a meta-analysis, larval debridement resulted in more complete debridement than conventional treatment (Medical Advisory Secretariat, 2009). However, as with other debridement techniques, additional high-quality research is required to determine its effectiveness over other debridement methods.

Overall, the use of debridement is influenced by the presence of deeper and surrounding infection and person-centred goals (e.g., healable, maintenance, or non-healing wounds). A number of debridement options exist, and current evidence does not demonstrate the superiority of any one method over the others.

RECOMMENDATION 3.5

Provide electrical stimulation (when available) as an adjunct to best practice wound care in order to speed healing and promote wound closure in stalled but healable stage 2, 3, and 4 pressure injuries.

Level of Evidence = Ia

Discussion of Evidence:

Stalled^G but healable stage 2, 3, and 4 pressure injuries that have not responded to wound care interventions directed at their cause(s) and local wound management may require advanced wound therapies. The implementation of such therapies after the optimization of standard intervention is known as the edge effect (Sibbald et al., 2011). The expert panel recommends that electrical stimulation^G (ES) be available and accessible to all people with stalled stage 2, 3, and 4 pressure injuries.

In ES, electrodes are applied directly to the wound bed or peri-wound and connected to a stimulator that is designed to create a small electrical charge in tissues (e.g., HVPC). Electrical stimulation promotes wound healing by inducing a physiological response in the tissue (NPUAP, EPUAP, & PPIA, 2014). If ES is provided, a skilled and knowledgeable health-care professional should assess the person before and after treatment (NPUAP, EPUAP, & PPIA, 2014). Health-care professionals who apply ES must possess the necessary knowledge, judgment, and skills in order to understand the application and potential complications of ES, and be able to solve any problems that may arise during or after treatment. Health-care professionals are responsible for determining whether ES is suitable, and for prescribing the exact type and course of treatment. They should also identify specific dressing protocols for the application of ES (i.e., indicated and contraindicated dressings).

A recent meta-analysis, which combined results from six clinical trials involving 365 people with pressure injuries, found that ES significantly increased wound size reduction compared to treatment with standard wound care or placebo^G ES (Koel and Houghton, 2014). Several systematic reviews have also evaluated the effect of ES on pressure injury healing. These studies consistently show that ES speeds the healing of pressure injuries (Barnes, Shahin, Gohil, & Chetter, 2014; Kawasaki et al., 2014; Koel & Houghton, 2014; Smith et al., 2013). However, in other systematic reviews that evaluated different pressure injury treatments, only a small proportion of studies captured in the literature involved ES therapy. These systematic reviews concluded that the evidence regarding the efficacy of ES and other physical therapies on

pressure injuries was inconclusive (Medical Advisory Secretariat, 2009; Nicolas et al., 2012; Reddy, 2011; Reddy et al., 2008). Overall, given the most recent, robust evidence that supports ES, the expert panel recommends ES for people with stalled but healable stage 2, 3, and 4 pressure injuries. This recommendation is consistent with other clinical guideline groups (NPUAP, EUPAP, & PPIA, 2014).

ES should not be used in people with certain medical conditions, including osteomyelitis or local cancer, or in people with implanted electronic devices or who have a blood clot in their leg. ES should also not be applied over the pregnant uterus, wound dressings containing metallic or ionic components, or certain body locations containing excitable tissue (e.g., perineum, anterior neck) (Houghton, Nussbaum & Hoens, 2010). ES treatment may result in minor skin irritation under the electrode, which usually resolves spontaneously within 24–72 hours.

RECOMMENDATION 3.6

Implement, as an alternative, the following treatments in order to speed closure of stalled but healable pressure injuries, as appropriate and if available:

- electromagnetic therapy (level of evidence = Ib),
- ultrasound (level of evidence = Ib), and
- ultraviolet light (level of evidence = Ib).

Do not consider the following treatment to speed closure of stalled but healable pressure injuries:

- laser therapy (not recommended)



Discussion of Evidence:

The expert panel recommends that the interprofessional team, in collaboration with the person and his/her circle of care, consider adjunctive therapies for stage 2, 3, and 4 pressure injuries, when the wound is not closing as expected in spite of the application of clinical best practices, and when electrical stimulation (ES) is not suitable or not available. This approach to wound care is known as the “edge effect” (Sibbald et al., 2011). When electromagnetic therapy, ultrasound, or light therapy is considered, the interprofessional team should consult with a health-care professional who is an expert in using these treatments. This expert can determine whether or not the treatments are contraindicated, optimize the treatment protocol, and administer the treatments. Moreover, their availability and accessibility to the person and the person’s circle of care may influence the decision to use one of these adjunctive therapies over another.

The expert panel recommends the use of electromagnetic therapy, ultrasound, and ultraviolet light^G for the treatment of pressure injuries even though the current research evidence regarding their effectiveness is mixed. They have been recommended because of the overall quantity and quality of the evidence that supports them, and their safety profiles (i.e., balance of clinical benefits over harm to the person).

Electromagnetic Therapy (Level of Evidence = Ib)

Electromagnetic therapy (EMT) refers to devices that induce an electric field within tissue through a single coiled electrode that does not need to be applied directly to the tissue (i.e., it can be placed on top of the dressing). Most EMT devices deliver short, non-thermal pulses that are termed pulsed electromagnetic fields^G (PEMF). The recommendation to use EMT is consistent with other recently published pressure ulcer/injury guidelines (NPUAP, EPUAP, & PPIA, 2014). One well-designed randomized controlled trial (Ozdemir, Kasapoglu, Oymak, & Murat, 2011) evaluated the effect of EMT for pressure injury treatment compared to standard wound care or placebo treatment. The authors concluded that with the use of EMT in the treatment of stage 2 and 3 pressure injuries, healing can be achieved in a shorter period of time. Another small study that examined the effect of full-body treatment with PEMF on neurologically impaired individuals did not produce a significant increase in pressure injury healing compared to the placebo-treated group (Gupta, Taly, Srivastava, Kumar, & Thyloth, 2009). However, given that there were only six people recruited to each group in the latter study, it was unlikely to be able to detect a “between group” difference (Gupta et al., 2009).

Two systematic reviews (McGaughey, Dhamija, Oliver, Porter-Armstrong, & McDonough, 2009; Regan et al., 2009) investigated the use of PEMF on pressure injury healing. Specifically, one (Regan et al., 2009) was based on a small randomized controlled trial that used PEMFs on 20 people with spinal cord injury and pressure injuries, while the other examined the effect of PEMFs on chronic wounds in general, of which 28 percent were pressure injuries (McGaughey et al., 2009). Both studies support the use of PEMF to improve pressure injury healing. In contrast, a recent Cochrane review concluded that there was no strong evidence to support the use of EMT to treat pressure injuries (Aziz & Flemming, 2012). Inconsistencies in the conclusions of these systematic reviews are likely explained by the fact that different published studies were included in the reviews.

At the time of writing, no significant adverse events have been documented with respect to the use of EMT as an adjunctive therapy for the treatment of pressure injuries (NPUAP, EPUAP, & PPIA, 2014). However, EMT is contraindicated in people with electrical device implants (e.g., pacemakers), people who have undergone an organ transplant, and women who are pregnant (NPUAP, EPUAP, & PPIA, 2014). Other contraindications to PEMF use include active bleeding, active deep vein thrombosis, and suspected or confirmed cancer (Houghton et al., 2010).

Ultrasound (Level of Evidence = Ib)

Ultrasound (US) is a form of vibratory or mechanical stimulus that oscillates at a frequency too high to be detected by the human ear. This type of acoustic energy is known to directly stimulate the cellular processes of wound repair and has been used to treat pressure injuries. Ultrasound treatment can be applied to open wounds using contact and non-contact technologies (NPUAP, EPUAP, & PPIA, 2014). A Cochrane review updated in 2009 identified three studies with a total of 146 patients that evaluated the effects of contact/traditional US on pressure injury healing. The review concluded that there is no evidence to support the use of US for the treatment of pressure injuries (Sari, Flemming, Cullum, & Wollina, 2009). Other systematic reviews have produced similarly inconclusive results (Medical Advisory Secretariat, 2009; Nicolas et al., 2012; Reddy, 2011; Regan et al., 2009; Smith et al., 2013).

However, additional studies have since been published that were not considered in the above systematic reviews. A randomized controlled trial was conducted with elderly people who were randomly assigned to receive low-dose, high-frequency, or pulsed ultrasound (Polak et al., 2014). At the end of the study, wound surface area was significantly smaller in those who had received US treatment compared to those who were treated with standard wound care; furthermore, US-induced reduction in wound size was more pronounced in stage 2 pressure injuries than in stage 3 pressure injuries (Polak et al., 2014). A retrospective study conducted on 85 patients with deep tissue pressure injuries (DTPIs) found a significant improvement in wound severity scores when non-contact ultrasound was delivered via a fine mist to the suspected DTPIs (Honaker, Forston, Davis, Wiesner, & Morgan, 2013). A small study with five patients suggested that ultrasound delivered through a wound dressing may stimulate pressure injury healing (Maeshige et al., 2010).

More robust and comprehensive research is required to determine the effectiveness of ultrasound therapy. The use of US as an adjunctive therapy for the treatment of pressure injuries is contraindicated in people with uncontrolled bleeding tissue, untreated hemorrhagic disorders, areas of suspected or known malignancy, active deep vein thrombosis (DVT) causing clot, recently radiated tissues or ectopic bone formation (e.g., myositis ossificans), and tissues with encapsulated or virulent infection (e.g., tuberculosis) (Houghton et al., 2010).

Ultraviolet Light (Level of Evidence = Ib)

Ultraviolet light has wavelengths that are shorter than those in the light that is visible to humans. The application of shorter wavelengths (e.g., 254 nm), also called ultraviolet light C (UVC), to open wounds including pressure injuries has been shown to reduce the number of bacteria, including antibiotic-resistant strains (e.g., methicillin-resistant staphylococcus aureus [MRSA]) (Thai, Houghton, Campbell, Keast, & Woodbury, 2005). The recommendation to use UVC is consistent with other guidelines (NPUAP, EPUAP, & PPIA, 2014).

Several studies have evaluated the effect of UVC (250nm) ultraviolet light on pressure injury healing. A recent and well-designed study published by Nussbaum and colleagues (2013) involving 58 people with pressure injuries and spinal cord injury showed that UVC significantly increased the healing rate of stage 2—though not stage 3 or 4—pressure injuries (Nussbaum et al., 2013). There is also some evidence to suggest that ultraviolet light can reduce the amount of purulent exudates and improve the appearance of pressure injuries (Onigbinde et al., 2010). Most systematic reviews that have evaluated the effect of light therapy on pressure injury healing either have not included any studies evaluating ultraviolet light therapy (Nicolas et al., 2012; Reddy, 2011; Regan et al., 2009; Smith et al., 2013) or have combined the results of UVC with the results of other forms of light therapy (Reddy, 2008). In a meta-analysis by the Medical Advisory Secretariat (2009), the efficacy of UVC therapy could not be clearly established, and concerns were raised about the potential mutagenic^G effect of UVC and the potential of such light causing skin cancer with prolonged exposures. The NPUAP, EPUAP, & PPIA (2014) guideline recommends only the short-term application of UVC, if other traditional therapies fail.

Laser Therapy is Not Recommended

Currently, there is limited evidence on the efficacy of laser^G therapy as a pressure injury treatment. Moreover, the results are mixed, it is unclear what type of laser should be used, and a potential for harm to or contamination of the person's pressure injury exists if an inexperienced health-care professional performs the therapy. Other reputable guidelines do not support the routine use of laser therapy at this time (NPUAP, EPUAP, & PPIA, 2014).

A recent Cochrane review that identified seven randomized controlled trials with 403 clients evaluated the effects of phototherapy for treating pressure injuries, and concluded that the effects of various forms of light therapy on pressure injury healing are uncertain (Chen, Hou, Chan, Yeh, & Lo, 2014). A meta-analysis by the Medical Advisory Secretariat (2009) found similarly inconclusive results, and a systematic review by Smith et al. (2013) with regard to the efficacy of light and laser therapy on pressure injury healing or closure also found inconclusive results. Taradaj et al. (2013) found that the effect of laser therapy on wound healing outcomes was dependent on the wavelength used, with 658 nm laser producing significantly better outcomes. A larger number of wounds treated with 658 nm laser compared to 808 and 940 nm laser also remained closed for three months following treatment.

The fact that outcomes depend on the length of the wavelength and light intensity used may explain why previous work evaluating the effect of laser on healing is conflicting, since each study used a light source with unique characteristics (Taradaj et al., 2013). Given the mixed research results of laser therapy on pressure injury healing and closure, and the potential of such therapy to alter wound bioburden, the expert panel does not recommend laser therapy.

RECOMMENDATION 3.7

Provide negative pressure wound therapy to people with stage 3 and 4 pressure injuries in exceptional circumstances, including enhancement of quality of life and in accordance with other person-/family-centred preferences.

Level of Evidence = V

Discussion of Evidence:

Overall, there is insufficient evidence in the current literature to support the routine use of negative pressure wound therapy^G (NPWT) for pressure injury healing. Thus, the expert panel cannot recommend its use as an adjunctive therapy for the *routine* treatment of pressure injuries at this time. However, person- and family-centred circumstances should be taken into consideration when the decision to use NPWT is made, including exceptional circumstances (e.g., complications following surgical repair of a pressure injury), caregiver challenges, and the person's quality of life (e.g., control of large amounts of exudates as a bridge to surgery, reducing the need for frequent dressing changes while the person is at home).

Four studies have confirmed the effectiveness of NPWT. A randomized controlled trial (RCT) with 24 patients with difficult-to-heal wounds was randomized to either treatment with NPWT or standard dressing therapy with sodium hypochlorite. This study reported that wounds treated with topical negative pressure healed twice as quickly compared to those treated with sodium hypochlorite (de Laat et al., 2011). In an RCT of 10 patients with stage 3 or 4 sacral pressure injuries (5 patients were randomized to the vacuum-assisted closure group and 5 patients were assigned to the Redon bottles group), vacuum-assisted closure was found to be more reliable, efficient, and user-friendly, and produced significantly better wound healing parameters (Wild et al., 2008). An RCT involving 18 patients with stage 3 and 4 pressure injuries who were randomized to “novel” NPWT foam or “standard” NPWT foam reported that the novel foam was less traumatic and painful in patients with stage 3 or 4 pressure injuries (Wagstaff, Driver, Coghlan, & Greenwood, 2014). A weak quality meta-analysis also stated that NPWT appeared to be more effective compared to standard wound care in the treatment of chronic wounds (types not specified). However, the analysis was not specific to pressure injuries (Suisa, Danino, & Nikolis, 2011).

In contrast to the findings above, a literature review with two studies (of five) that only included patients with pressure injuries did not show statistically significant positive results for topical negative pressure therapy (van den Boogaard, de Laat, Spauwen, & Schoonhoven, 2007). A systematic review by Reddy and colleagues (2008) stated that, among 21 RCTs that explored various adjunctive therapies, there was no clear benefit to negative vacuum therapy. Furthermore, an observational study of spinal cord injured patients with stage 3 or 4 pelvic pressure injuries did not find that NPWT significantly influenced the rate of healing (Ho, Powell, Collins, Bauman, & Spungen, 2010).

In addition to evidence that opposes the effectiveness of NPWT, two reviews reported inconclusive results regarding the benefits of NPWT (Levine et al., 2013; Nicolas et al., 2012). Nicolas et al. (2012) stated that there is a lack of evidence regarding the beneficial effects of vacuum-assisted closure, and that the relevant studies with varied results and heterogeneity in the population had low power. Similarly, four studies of varying methodological quality and study designs concluded that more research is needed to determine the effectiveness of NPWT (Ashby et al., 2012; Medical Advisory Secretariat, 2009; Nelson, 2007; Reddy, 2010).

RECOMMENDATION 3.8

Collaborate with the person and his/her circle of care to implement a pressure injury self-management plan.

Level of Evidence = Ia

Discussion of Evidence:

According to a systematic review/meta-synthesis by Gorecki et al. (2009), people with pressure injuries generally do not possess full knowledge and understanding regarding pressure injury development and prevention. The expert panel recommends that the person and his/her circle of care collaborate with the interprofessional team to share and acquire the knowledge and skills needed to engage effectively in wound-care self-management^G as they move through different sectors of the health-care system over the course of treatment.

The term *self-management* refers to “the tasks that individuals must undertake to live well with one or more chronic conditions. These tasks include having the confidence to deal with medical management, role management and emotional management of their conditions” (RNAO, 2010). In order to help facilitate self-management, the interprofessional team must collaborate with the person and his/her circle of care as they progress through the health-care system, to ensure they have the knowledge required to understand their condition, and the confidence and the ability to take an active role in their treatment (RNAO, 2010). According to Gorecki et al. (2009), people want to be independent and be actively involved in decisions that affect their well-being (Gorecki et al., 2009). Thus, education in self-management should provide people with the independence and ability to participate in their health care (Gorecki et al., 2009). Ultimately, acceptance by a person of his or her pressure injuries has a positive impact on psychological well-being (Gorecki et al., 2009). Gorecki et al. (2009) suggest various ways to improve patient and caregiver knowledge, including establishing peer support groups for persons with pressure injuries in the community (Gorecki et al., 2009).

The expert panel recommends that the interprofessional team, in collaboration with the person and his/her circle of care, use multiple educational avenues (e.g., online programs, community self-management programs, referrals to reputable websites) that accommodate different learning styles and abilities. For an example on how to effectively facilitate self-management in persons with pressure injuries, please refer to [Appendix V](#).

According to current pressure ulcer/injury guidelines and the expert panel, in providing health education to the person and his/her circle of care, the interprofessional team should address components of the wound-bed preparation paradigm, including the following:

1. Risks for Pressure Injuries

- Causes of pressure injuries (RNAO, 2007); and
- Strategies to reduce the risk of additional pressure injuries (NPUAP, EPUAP, & PPIIA, 2014).

2. Assessment of Pressure Injuries

- Identifying the stage of a pressure injury (NICE, 2014); and
- Wound inspection (WOCN, 2010).

3. Management of Pressure Injuries

- Strategies to address the causes of pressure injuries (e.g., positioning, support surfaces, mobility, and diet) (NPUAP, EPUAP, & PPIIA, 2014);
- Wound care (e.g., cleansing, applying dressings) (WOCN, 2010);
- Treatment options (RNAO, 2007);
- Pain management (Gorecki et al., 2009);
- Opportunity to practice with the equipment and devices used in pressure injury management (NICE, 2014); and
- Information on how to address psychosocial concerns (e.g., body image) (Perry et al., 2014).

4. Resources for Pressure Injuries

- Information regarding credible sources of information on pressure injury care (NPUAP, EPUAP, & PPIIA, 2014);
- Information regarding available and accessible support services in the community (e.g., peer support groups) (NPUAP, EPUAP, & PPIIA, 2014);
- Information regarding the availability of and ways to access equipment and devices that support pressure injury management;
- Information regarding financial assistance, if required (Perry et al., 2014); and
- Information regarding support services that can be used to help the person manage activities of daily living (Perry et al., 2014).

The interprofessional team should tailor educational strategies to the unique needs of the person with the pressure injury, including the following: degenerative conditions, impaired mobility, neurological impairment, cognitive impairment, and impaired tissue perfusion (e.g., peripheral arterial disease) (NICE, 2014, p. 18).

For additional information on developing and implementing self-management programs for persons and their primary caregiver(s), please refer to RNAO's (2010) *Strategies to Support Self-Management in Chronic Diseases: Collaboration with Clients* (<http://rnao.ca/bpg/guidelines/strategies-support-selfmanagement-chronic-conditions-collaboration-clients>) clinical BPG and Recommendation 2.2 of this Guideline.

RECOMMENDATION 3.9

Implement a person-centred pain management plan using pharmacological and non-pharmacological interventions.

Level of Evidence = V

Discussion of Evidence:

According to a study by Gorecki et al. (2009), pain is the most significant problem reported by people with pressure injuries. Pain affects many aspects of a person's life. For example, pressure injury pain causes feelings of frustration, anger, annoyance, and inconvenience, because of its interference with activities of daily living, comfort, sleep, and appetite (Gorecki et al., 2009). Moreover, pressure injury pain interferes with a person's social interactions and personal relationships (Gorecki et al., 2009). People with pressure injuries feel that they are responsible for communicating their pain symptoms to the interprofessional team, and in turn they expect their pain to be addressed (Gorecki et al., 2009).

Despite limited research evidence regarding the management of pain in people with pressure injuries, because of its significant impact on quality of life there is consensus among the expert panel, various guideline groups, and clinical experts with regard to best practices for the management of pressure injury pain. Once pain has been assessed using a validated pain assessment tool, various pharmacological and non-pharmacological strategies can be applied. A combination of pain interventions should be considered in developing a person's plan of care.

Local Wound Care and Pain Management

- Consider the temperature of wound cleansers to facilitate the person's comfort.
- Consider superficial critical colonization (localized infection) or deeper and surrounding infection (systemic infection) as a source of pain, and manage the infection accordingly. (Please refer to Recommendations 1.4 and 3.4 of this Guideline for additional information on the assessment and management of wound infection.)
- Soak dressings that adhere to the wound edges prior to removal to help minimize pain.
- Keep the wound bed moist and the pressure injury covered with an appropriate, non-adherent dressing to help minimize pain (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014).
- Choose dressings that reduce the need for dressing changes (e.g., foam, alginates, hydrocolloids, and hydrogels) or that may be embedded with analgesia or anti-inflammatory medication, including topical opioids, topical anaesthetics, or ibuprofen (AWMA, 2012; NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014).
- Choose dressings that do not exert unnecessary pressure on the wound (AWMA, 2012).
- Allow the person to declare "time out" periods during painful procedures (NPUAP, EPUAP, & PPIIA, 2014).
- Administer additional medication prior to painful procedures (e.g., dressing changes, debridement) (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014; WOCN, 2010).
- Encourage the person to reposition to help minimize pain (NPUAP, EPUAP, & PPIIA, 2014; Perry et al., 2014; WOCN, 2010).
- Use appropriate support surfaces to help minimize pain (WOCN, 2010).
- Address anticipatory anxiety and other psychosocial challenges prior to local wound care procedures.

Pharmacological and Non-Pharmacological Pain Management

- If the person wishes to receive pain medication (e.g., prior to dressing changes or debridement), administer pain medication using the World Health Organization (WHO) Pain Dosing Ladder (AWMA, 2012; NPUAP, EPUAP, & PPPIA, 2014). In general, start with non-opioids and, if pressure injury pain continues, consider the addition of opioids to the pain management care plan (AWMA, 2012). Tricyclics and gabapentin should be considered for neuropathic pain. For additional information on the Pain Dosing Ladder, please refer to WHO's *Cancer Pain Ladder for Adults* (<http://www.who.int/cancer/palliative/painladder/en/>) (WHO, 2016).
- Apply non-pharmacological pain management strategies in accordance with the person's wishes (e.g., music, progressive relaxation, TENS, visualization techniques, imagery, therapeutic touch and other holistic therapeutic modalities) (AWMA, 2012, NPUAP, EPUAP, & PPPIA, 2014; Perry et al., 2014).

Pain Management Resources

- Refer the person to pain services and other clinical resources if additional pain management is required (NPUAP, EPUAP, & PPPIA, 2014; WOCN, 2010).
- Educate the person and his/her primary caregivers on pain assessment and management strategies (NPUAP, EPUAP, & PPPIA, 2014).
- Refer the person to his/her family doctor to manage wound-related pain (e.g. following discharge home).

Pain management is an important component of person-centred care. Adequate pain control improves all aspects of a person's quality of life, including mood (e.g., stress, anxiety anger), sleep, cognition, ability to cope, and ability to perform the activities of daily living (Solowiej, Mason & Upton, 2010). For additional information on pharmacological and non-pharmacological strategies for pain management, please refer to RNAO's (2013) *Assessment and Management of Pain* (<http://rnao.ca/bpg/guidelines/assessment-and-management-pain>) clinical BPG.



4.0 EVALUATION

RECOMMENDATION 4.1

Use the initial risk assessment tool to reassess the person's risk for developing additional pressure injuries on a regular basis and whenever a change in the person's health status occurs.

Level of Evidence = V

Discussion of Evidence:

A person with one pressure injury is at risk for developing additional pressure injuries (NPUAP, EPUAP, & PPIA, 2014). The expert panel therefore endorses the practice of reassessing all people with existing pressure injuries on a regular basis, as determined by the interprofessional team, and *whenever changes occur* in the person's health status, as determined by the health-care setting and agency guidelines. Regular monitoring of a person's risk for pressure injuries should help identify unresolved or new risk factors that can prevent the development of additional pressure injuries. The same tool that was used for the initial risk assessment should be used consistently to conduct ongoing assessments of the person's risk for additional pressure injuries. This practice helps the interprofessional team, in collaboration with the person and his/her circle of care, to monitor changes in risk consistently so that the results can be compared over time.

Interprofessional teams should refer to RNAO's (2011) *Risk Assessment & Prevention of Pressure Ulcers* (<http://rnao.ca/bpg/guidelines/risk-assessment-and-prevention-pressure-ulcers>) clinical BPG for further information on the following recommendations, which are applicable to persons with existing pressure injuries who are at risk for additional pressure injuries:

- Use clinical judgment in combination with a structured, valid, and reliable risk assessment tool. (Please refer to Recommendation 1.2a.)
- Assess for intrinsic/extrinsic risk factors that are associated with the development of pressure injuries. (Please refer to Recommendation 1.2b.)
- Assess and reassess risk for skin breakdown in vulnerable populations. (Please refer to Recommendation 1.3.)

RECOMMENDATION 4.2

Use the initial wound assessment tool to monitor the person's pressure injuries for progress toward person-centred goals on a regular basis and at dressing changes.

Level of Evidence = V

Discussion of Evidence:

The healing process of a person's pressure injuries should be reassessed on a regular basis (as determined by the interprofessional team) and during dressing changes using the same wound assessment tool that was used on initial examination, as determined by the health-care setting and agency guidelines (NPUAP, EUPAP, & PPIA, 2014). Periodic assessment of wound healing assists the interprofessional team, the person, and his/her circle of care to determine (1) the trajectory of wound healing, and (2) whether continued intervention or modifications to treatment are required (Pillen et al., 2009).

Ideally, the interprofessional team should see an improvement in wound healing within one to two weeks of intervention in the case of partial thickness injuries, and within two to four weeks in the case of full thickness injuries (NPUAP, EPUAP, & PPPIA, 2014; WOCN, 2010).

Signs of wound healing include:

- improvements in the dimensions and depth of the pressure injury,
- a decrease in exudate and improvements in infection,
- a decreased amount of devitalized tissue in the wound bed, and
- the appearance of healthy tissue (i.e., granulation and re-epithelialization) (NPUAP, EPUAP, & PPPIA, 2014).

The rate of pressure injury healing may be affected by factors including variations in the initial size and stage of the wound, the extent of infection, the person's co-morbidities (if any), the person's nutritional status, and the appropriateness of the initial intervention plan (NPUAP, EPUAP, & PPPIA, 2014). Non-healing may also occur despite appropriate local wound care and interventions directed at the causes of the pressure injuries (NPUAP, EPUAP, & PPPIA, 2014). For additional information on wound healing, please refer to *The Basic Principles of Wound Healing* (<http://cawc.net/images/uploads/Principles-of-Wound-Healing.pdf>) (Keast and Orsted, n.d.) on the Canadian Association of Wound Care website.

Because of the risk of complications—including squamous cell cancer (i.e., Marjolin's ulcer), cellulitis, sepsis, osteomyelitis, abscess formation, fistula, and heterotopic bone formation—it is important that non-healing pressure injuries be identified and treated (WOCN, 2010). When progress toward wound healing does not occur, the interprofessional team should reassess the person for additional correctable factors and modify the intervention plan.

If wound healing is not a realistic goal, the interprofessional team, in collaboration with the person and his/her circle of care, should focus on limiting the impact of the pressure injury on the person's quality of life. This may mean providing treatment to prevent the pressure injury from becoming bigger, controlling infection, and seeking to limit the amount of exudates and odour emanating from the wound. It is very important to establish and reassess a person's plan and goals of care during this process.

According to the expert panel and in accordance with the NPUAP, EPUAP, & PPPIA (2014) pressure ulcer/injury guideline, objective and reproducible evaluation of wound healing is best achieved by implementing a valid and reliable wound assessment tool that is responsive to wound changes over time. It is also important to use clinical judgment to assess for signs of healing or non-healing. A standardized and systematic approach to measuring wound healing promotes consistency in clinical interpretation and communication, and increases the reliability of measured data. Evaluative tools or outcome measures that are used more frequently (e.g., weekly) also tend to contain fewer components, which means they take less time to complete. Please refer to chart in **Appendix I**, which lists and describes the assessment tools that are suggested for monitoring pressure injury healing (i.e., evaluative assessment tools).

Education Recommendations

5.0 EDUCATION

Successful education programs need to be linked to: (1) interprofessional care, (2) health-care professional performance outcomes, and (3) person-level outcomes. Educational program development follows the knowledge translation^G (KT) process, which includes a needs assessment, an interprofessional education committee, determination of goals and objectives, interactive longitudinal education delivery methods, and evaluation. Evaluation is required in order to continuously improve the educational process and its impact on health-care and person-level outcomes (Canadian Institutes of Health Research [CIHR], 2015).

The education recommendations in this Guideline are based on the principles of knowledge translation, which the Canadian Institutes of Health Research (CIHR) defines as “a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the healthcare system” (CIHR, 2015, para. 4).

In the KT process, education is a key dissemination strategy. Successful KT strategies start with the identification of the appropriate participants, and any barriers to or supports for knowledge implementation. Next, both the content (i.e., the message) and the method of delivery (i.e., the medium) must be tailored to the audience (i.e., to the local context). Examples of methods of delivery include enablers for practice (e.g., concise summaries, education sessions, care plans or pathways, resource tools, and material) that are available 24-hours per day, seven days per week (CIHR, 2015).

Knowledge translation (KT) is about closing the gap between “what we know” and “what we do” by reducing the knowledge-to-action gap (Straus, Tetroe, Graham, Zwarenstein, & Bhattacharyya, 2009). Education and knowledge dissemination is ineffective if there is no uptake or implementation of new knowledge by the learners. To assess the effectiveness of education strategies, the KT process should monitor the application of health-care-professional knowledge in clinical practice and the impact of knowledge transfer on client outcomes.

The RNAO *Toolkit: Implementation of Best Practice Guidelines* (http://rnao.ca/sites/rnao-ca/files/RNAO_ToolKit_2012_rev4_FA.pdf) (2nd ed.; 2012) provides valuable strategies for facilitating the KT process. KT strategies should also be implemented to sustain current knowledge use, and to re-start the process when new evidence or knowledge becomes available.

RECOMMENDATION 5.1

Develop and implement comprehensive and sustainable interprofessional pressure injury education programs for clinicians and students entering health-care professions.

Level of Evidence = V

Discussion of Evidence:

The delivery of optimal pressure injury care requires an interprofessional team. Typically, the interprofessional team members include physicians who have received advanced training in wound care, occupational therapists, physical therapists, dietitians, nurses, nurse practitioners, medical students, and nursing students. The expert panel recommends that these health-care professionals receive the education necessary for them to provide optimum management and treatment for people with pressure injuries. Although the primary end-user of this Guideline is the

interprofessional team, the expert panel recommends that other health-care providers in the person's circle of care also seek pressure injury education.

Current evidence suggests that interprofessional teams need to improve their knowledge of pressure injury prevention, assessment/identification, and management. For example, in an Australian study, spinal medicine specialists, clinical nurse consultants, unit nurses, and rehabilitation registrars (i.e., doctors training to be rehabilitation medicine specialists) were assessed for their knowledge of pressure injury prevention and management in persons with spinal cord injury (Gupta, Loong, & Leong, 2012). Although the study showed some differences in knowledge among health-care professionals (e.g., physicians demonstrated more knowledge regarding the prevention of pressure injuries compared to nurses, but nurses scored better on the pressure injury management questions compared to doctors), overall the results showed a general gap in core knowledge among all health-care professionals regarding pressure injury care (Gupta et al., 2012).

Similarly, in a hospital-based study, medical teams did not perform well in correctly identifying the presence, site, and grading of pressure injuries in people on in-patient units (Gunawardena, Blackman, & Walsgrove, 2013). Moreover, medical teams did not do well in recognizing pressure injury infections in hospitalized patients (Gunawardena et al., 2013). Overall, these studies highlight the need to provide targeted education regarding pressure injury assessment and management to the members of interprofessional teams, and the implications for patient care of failing to do so.

Limited evidence also suggests that nursing students do not receive sufficient training in undergraduate schooling to allow them to provide competent pressure injury care in practice. For instance, in a cross-sectional study of pre-registration nursing students in England, “68% received less than 10 hours of formal teaching in skin integrity over their 3-year courses” (Ousey, Stephenson, Cook, Kinsey, & Batt, 2013, p. 57). Other studies have tested various interventions to improve pressure injury knowledge and training among undergraduate students (Beeckman, Schoonhoven, Boucque, Van Maele, & Defloor, 2008; Morente, Morales-Asencio, & Veredas, 2014). For example, one randomized controlled trial successfully introduced an e-learning tool to help students distinguish pressure injury from moisture lesions and to classify and stage pressure injuries (Beeckman et al., 2008). Given the interprofessional nature of pressure injury management, the expert panel believes that students entering other health-care professions may also benefit from enhanced, comprehensive pressure injury knowledge and skills training at both the undergraduate and graduate levels.

Current evidence from around the world shows that education regarding pressure injury prevention and management improves nurses' ability to correctly classify pressure injuries (Altun & Demir Zencirci, 2011; Beeckman, 2010; Briggs, 2006; Thomas, 2012). In the studies, content foci and strategies used to educate participants included:

- a focus on pressure injury prevention, assessment, management, and documentation (Thomas, 2012);
- knowledge and management of pressure injuries (Altun & Demir Zencirci, 2011);
- theory and practice of pressure injuries and pressure injury care (Morente et al., 2014);
- use of patient safety modules (AbuAlRub & Abu Alhijaa, 2014); and
- photographs of pressure injuries (Beeckman, 2010; Beeckman et al., 2008; Bergquist-Beringer et al., 2009; Briggs, 2006).

Common to the various studies is an in-person teaching modality (Altun & Demir Zencirci, 2011; Beeckman, 2010; Briggs, 2006; Thomas, 2012), followed by the use of online/e-learning involving an independent review of learning content (AbuAlRub & Abu Alhijaa, 2014). Although the literature available at the time of writing is primarily concerned with the education of nurses and does not address the outcomes of pressure injury education on the knowledge base of interprofessional teams more generally, efforts should be made to provide education regarding pressure injury prevention and treatment strategies to the entire interprofessional team (Zulkowski, Ayello, & Wexler, 2007).

The interprofessional team, in collaboration with education and technical consultants, should be responsible for planning the education program. Pressure injury education programs must relate to clinical practice, and use enabling and reinforcing strategies to sustain health-care-professional knowledge. To date, the literature does not provide standard curricula or teaching techniques for the delivery of effective pressure injury prevention and management education. However, the literature does suggest that knowledge of core pressure injury principles is important for all health-care professionals to acquire. For example, in a large Australian survey of respondents from the general health workforce, experts, and health consumers, “the greatest training and education need was related to the basics of wound management, wound assessment, diagnosis and prevention” (Innes-Walker & Edwards, 2013).

Because of the holistic, person-centred, principled approach of the wound-bed preparation paradigm (see the discussion in the Guiding Framework section) to education and care, the expert panel recommends that it be used to direct the development of education programs on the management of pressure injuries. Table 4 outlines the components of the wound-bed preparation paradigm that should be incorporated into pressure injury education programs. **Appendix W** lists additional resources to assist with the development of education programs.

Table 4: Suggested Topics for Pressure Injury Education Programs

Assessment of the Cause	<ul style="list-style-type: none"> ■ Assessment for factors that may impair healing (e.g., coexisting diseases, medications used, and general health status) ■ Skin assessment and documentation for the development of a treatment program
Pressure Injuries	<ul style="list-style-type: none"> ■ Etiology and pathology of pressure injuries ■ Differential diagnosis, including moisture-associated skin damage, skin tears, and skin infections/abscesses ■ Staging of pressure injuries using the National Pressure Ulcer Advisory Panel (NPUAP) staging system ■ Risk assessment and documentation for the development of a management program, including: <ul style="list-style-type: none"> □ Selection and use of pressure redistribution support surfaces □ Rehabilitation specialists to optimize mobility □ Repositioning and use of appropriate equipment □ Nutrition assessment and interventions related to optimizing health and wound healing □ Incontinence control (stool/urine) to prevent aggravating pressure injuries □ Assessment of wound healability (i.e., healable, maintenance, or non-healable wounds)
Person-Centered Concerns	<ul style="list-style-type: none"> ■ Pain control ■ Optimization of activities of everyday living ■ Psychosocial support of the person and the person’s circle of care ■ Provision of pressure injury education to the person and person’s circle of care ■ Lifestyle

Local Wound Care

- Local wound documentation
- Cleansing
- Debridement
- Critical colonization (localized infection) and deep and surrounding infection (systemic infection) control using local antimicrobial and antiseptic dressings and/or systemic antimicrobials, as appropriate
- Use of moisture-retentive dressings

Interprofessional Care

The expert panel recommends that health-care professionals with a specialized interest in pressure injuries form an integrated and coordinated interprofessional team. An interprofessional team is made up of “different professions working together to reach a common goal and share decision making to achieve this goal” (RNAO, 2013b, p. 64). To practice as an interprofessional team, health-care professionals as a collective need to develop the appropriate team dynamics to work together effectively. Interprofessional education (IPE) “occurs when two or more professions learn with, from and about each other to improve collaboration and the quality of care” (Centre for Advancement of Interprofessional Education, 2002).

The expert panel recommends that pressure injury curricula include information on the role and importance of the interprofessional team in pressure injury management, and the person as the central focus of all decision making within the interprofessional team.

For additional information on best practices in interprofessional care, please refer to RNAO’s (2013b) *Developing and Sustaining Interprofessional Health Care: Optimizing patients/clients, organizational, and system outcomes* (<http://rnao.ca/bpg/guidelines/interprofessional-team-work-healthcare>) nursing BPG. The expert panel recommends the use of this Guideline when developing, implementing, and evaluating pressure injury education programs for the interprofessional team.

Ongoing Learning

Although there is an expectation that organizations provide education to students and the interprofessional team regarding collaborative pressure injury care, the expert panel believes that students and health-care professionals should also be personally accountable for continuously updating their knowledge, skills, and practices.

There is limited research literature on the acquisition of pressure injury knowledge and skills through self-directed, lifelong learning. An example of ongoing learning assessment is using a competency-based, self-directed learning program in which the “competencies” are the acquisition of the components of best practice in pressure injury management. The learner indicates that they have read the journal articles or watched the webinars and feels that they have gained the specific knowledge for each competency.

Currently, professional bodies such as the College of Nurses of Ontario, the College of Dietitians of Ontario, the College of Physiotherapists of Ontario, the College of Occupational Therapists of Ontario, and The College of Physicians and Surgeons of Ontario require that their registered members take part in a quality assurance program. Generally speaking, quality assurance programs help ensure that health-care professionals demonstrate continued competence and commitment to quality improvement in their respective practices. Opportunities for self-directed learning include learning plans, self-reflective practice, and peer assessments.

In summary, studies show that a knowledge deficit exists in relation to pressure injuries among health-care professionals. Both formal (e.g., education programs) and informal (i.e., self-directed learning) wound-care education and reflection is required for all members of the interprofessional team, in order to improve clinical knowledge related to pressure injury care and, ultimately, support improved health outcomes for people with pressure injuries.

RECOMMENDATION 5.2

Assess health-care professionals' knowledge, attitudes, and skills related to the assessment and management of existing pressure injuries before and following educational interventions using an appropriate, reliable, and validated assessment tool.

Level of Evidence = IV, V

Discussion of Evidence:

It is important to assess health-care professionals' knowledge, attitudes, and skills regarding pressure injury assessment and management both prior to developing and delivering an education program (pre-tests), and after. Although the primary end-user of this Guideline is the interprofessional team, the expert panel recommends that the knowledge, attitudes, and skills of other health-care providers in the person's circle of care also be evaluated with regard to the effectiveness of pressure injury education.

Health-care Professional Knowledge (Level of Evidence = IV)

Beyond the typical short-term assessment of participants' immediate uptake of new information, the results of such assessments can be used in various ways. The pre-test results may also serve as an environmental scan and be used to direct educational program planning. It is recommended that an evaluation of health-care professionals' knowledge be completed following educational interventions in conjunction with other activities (e.g., chart audits or case studies on pressure injury assessment and management) to measure participants' application of their newly acquired knowledge in clinical practice. Although current literature does not provide clear recommendations with regard to the frequency and timing of post-education evaluations, a post-test to assess knowledge, attitudes, and skills, combined with reinforcement from the initial educational intervention, should be considered. To review the Pieper Pressure Ulcer Knowledge Test (PPUKT), please refer to [Appendix W](#).

Health-care Professional Attitudes (Level of Evidence = V)

According to Gorecki et al. (2009), therapeutic relationships instil hope in people with pressure injuries, improve their adherence to treatment, and ultimately contribute to positive health outcomes. Health-care professionals' attitudes can affect their ability to establish therapeutic relationships with persons with pressure injuries; for example health-care professionals are more likely to develop such relationships when they adopt a positive and friendly attitude (Gorecki et al., 2009). For these reasons, assessing for changes in health-care professionals' attitudes after they have received education related to working with people with existing pressure injuries is important. Although at the time of writing the expert panel is unaware of specific tools that can be used for this purpose, various informal methods—such as focus groups, interviews, and self-reflection—can be used to gauge changes.

Health-care Professional Skills (Level of Evidence = V)

It is important to monitor and evaluate the impact of the interprofessional team's newly acquired knowledge on the care they provide to people with pressure injuries. The knowledge translation (KT) process (outlined above) includes the key steps in assessing the *implementation* or *application* of the interprofessional team's knowledge of pressure injury best practices. Monitoring and evaluating knowledge use provides interprofessional teams with an indication of the extent to which best practices are known, accepted, applied, and successful in changing clinical practice at the client, health-care-provider, health-care-unit, organization, and/or system levels of care (RNAO, 2012).

Behavioural knowledge use refers to the application of knowledge in practice (RNAO, 2012). Behavioural knowledge use can be measured in various ways, including by observation, content analysis of questionnaire and interview data, and scales (RNAO, 2012). Likewise, a number of strategies can be used to evaluate the impact of knowledge use at the client, health-care-provider, and system/organizational levels of care—for example, measuring changes in patients' health status (e.g., quality of life, morbidity), measuring health-care provider satisfaction, and measuring changes in the health-care system (e.g., length of stay, readmissions, health-care visits).

For additional information on strategies that can be used to facilitate the KT process, please see Chapter 5: Monitor Knowledge Use and Evaluate Outcomes of the RNAO *Toolkit: Implementation of Best Practice Guidelines* (http://rnao.ca/sites/rnao-ca/files/RNAO_ToolKit_2012_rev4_FA.pdf) (2nd ed.; 2012).



System, Organization, and Policy Recommendations

6.0: SYSTEM, ORGANIZATION, AND POLICY

RECOMMENDATION 6.1

Organizations must lead and provide the resources to integrate pressure injury management best practices into standard and interprofessional clinical practice, with continuous evaluation of outcomes.

Level of Evidence = IV

Discussion of Evidence:

In order to successfully implement pressure injury best practices at the organizational level, the expert panel recommends that the clinical and education recommendations of this Guideline be integrated into standard and interprofessional clinical practice, with continuous evaluation of person-level and organizational outcomes. According to the expert panel, the successful implementation of pressure injury best practices should include organizational support, identification of barriers to implementation, decision support tools, a communication mechanism, and standardized metrics^G.

Organizational Support

Appropriate fiscal and human resources are required to support the implementation of pressure injury best practices in organizations (Ploeg, Davies, Edwards, Gifford, & Miller, 2007; Timmerman, Teare, Walling, Delaney, & Gander, 2007). For example, additional funding may be required to purchase and maintain equipment (e.g., therapeutic support surfaces, dressing materials), and the organization may need to purchase standardized order sets to facilitate the implementation of best practices into standard clinical care. In addition, data collection tools may need to be purchased and created in order to support clinical documentation and the evaluation of pressure injury interventions on person-level and health-care outcomes. The identification of the resources required to support best practices in wound care should be done in collaboration with the interprofessional team.

The expert panel believes that sufficient interprofessional human resources play a significant role in quality pressure injury management. In terms of human resources, there may be a need to hire additional staff and allocate time and resources to staff education. Several studies have linked staffing turnover and other characteristics with pressure injury incidence. A national nursing home survey by Trinkoff et al. (2013), for instance, demonstrated that nursing homes with a high turnover of certified nursing assistants were significantly more likely to have higher rates of low-risk pressure injuries than those with lower turnovers. A recent systematic review concluded that there is an association between a decreased incidence of pressure injuries and increased nursing staff (Backhaus, Verbeek, van Rossum, Capezuti, & Hamers, 2014). Other studies have reported an association between a higher incidence of pressure injuries and high nurse-to-patient ratios, as well as the number of overtime hours worked (Liu, Lee, Chia, Chi, & Yin, 2012).

Identification of Barriers to Implementation

When creating a culture of evidence-based practice in wound care, it is important to assess and attempt to address potential barriers to the implementation of this and other guidelines in collaboration with the interprofessional team, the person with the pressure injury, and his/her circle of care. The literature divides potential barriers to guideline implementation into health-care-professional and health-care-structure factors (Athlin, Idvall, Jernfalt, & Johansson, 2010). Negative health-care-professional views, values, attitudes, beliefs, sense of responsibility, level of commitment, communication, and cooperation regarding pressure injury management limit the uptake of wound-care best practices in health care (Athlin et al., 2010; Meesterberends, Halfens, Lohrmann, Schols, & de Wit, 2011; Ploeg et al., 2007). In addition, the literature and the expert panel identify the following as barriers to guideline implementation (Athlin et al., 2010; Meesterberends et al., 2011; Meijers et al., 2007; Ploeg et al., 2007):

- challenges associated with continuity of care, when care is provided to persons by several health-care professionals and other health-care providers;
- inexperience among health-care professionals and other health-care providers with using guidelines to inform their clinical practice;
- heavy clinical workloads;
- lack of pressure injury knowledge and skills;
- clinician inexperience with routine pressure injury care;
- lack of continuity of a care plan and resource discrepancies between health-care settings when a person with a pressure injuries is transferred, admitted, or discharged; and
- lack of accessibility to pressure redistribution surfaces and devices for the timeframe required to achieve healing of existing pressure injuries, regardless of health delivery setting (i.e., acute/continuing complex or rehabilitation hospital, long-term care, or community-based settings).

From a health-care-structure perspective, potential barriers to the implementation of evidence-based practice in organizations include high nurse-to-client ratios, resource constraints, and insufficient integration of best practices into organizational structures and processes (Athlin et al., 2010; Ploeg et al., 2007). Although these identified barriers are important for health-care organizations to consider and address, organizations should also conduct a gap analysis^G in order to identify all potential barriers and facilitators to guideline implementation, so that pressure injury interventions can be successfully customized to the organization/program/unit. In Canada, for example, the expert panel recommends using Accreditation Canada's (2016) *Required Organizational Practices Handbook* (<https://accreditation.ca/rop-handbooks>), which outlines expected standards for clinical care across most health-care settings, as a checklist to inform an organization's gap analysis regarding pressure injury care (refer to the Risk Assessment—Pressure Ulcer Prevention section).

Decision Support Tools

The expert panel recommends that decision support tools informed by best practices and feedback (e.g., on workflow) from health-care professionals and other health-care providers is important to assist health-care teams in the selection of appropriate care strategies and devices for treating pressure injuries. Decision support tools refer to algorithms or pathways that have been informed by synthesized evidence (RNAO, 2012).

Communication Mechanism

The expert panel believes that an effective communication mechanism is required in order to allow vital information about the person's pressure injury risk, status, and management plan to be communicated among all members of the interprofessional team, the person and the person's circle of care, and during health-care transitions (e.g., across health-care settings and when the person returns home). For additional information on effective interprofessional care and communication strategies, please refer to RNAO's (2013b) *Developing and Sustaining Interprofessional Health Care: Optimizing patients/clients, organizational, and system outcomes* (<http://rnao.ca/bpg/guidelines/interprofessional-team-work-healthcare>) nursing BPG. For additional information on facilitating transitions in care, please refer to RNAO's (2014) *Care Transitions* (<http://rnao.ca/bpg/guidelines/care-transitions>) clinical BPG.

Standardized Metrics

The expert panel recommends that standardized metrics be used to evaluate the organizational incidence and prevalence of pressure injuries, and that this information be collected on an ongoing basis using a validated and reliable wound assessment tool. For example, according to a Canadian long-term-care quality improvement project conducted by Lynn et al. (2007), ongoing (e.g., monthly) monitoring and evaluation of pressure injury incidence, prevalence, and healing, combined with the adoption of recommended practices, was reported to be effective in capturing improvements in stage 2 pressure injuries and in determining the association between new pressure injuries and “hospital transfer, admission, scars, obesity, and immobility and with noncompliant, younger, or newly declining residents” (p. 1663).

The successful implementation of wound care best practices is a complex process. Organizations can use frameworks such as the knowledge-to-action process to identify key considerations, strategies, and the resources needed to facilitate a culture of evidence-based practice. According to the expert panel, the key factors indicated in this recommendation are important for the implementation of best practices in wound care. To view an example of a knowledge-to-action progress framework, please refer to the RNAO *Toolkit: Implementation of Best Practice Guidelines* (http://rnao.ca/sites/rnao-ca/files/RNAO_ToolKit_2012_rev4_FA.pdf) (2nd ed.; 2012).

RECOMMENDATION 6.2

Lobby and advocate for investment in pressure injury management as a strategic quality and safety priority in jurisdictions in order to improve health outcomes for people with pressure injuries.

Level of Evidence = V

Discussion of Evidence:

According to the expert panel, interprofessional teams, in collaboration with individuals personally affected by pressure injuries and their circle of care, are in an ideal position to lobby and advocate for enhanced pressure injury care as a strategic priority in jurisdictions. Front-line health-care staff are well aware of the complex knowledge, skills, and resources required to provide quality care to people with existing pressure injuries. Jurisdictions must recognize interprofessional pressure injury management best practices and mandates as a safety and quality care priority, and provide adequate financial support.

For example, the expert panel recommends that safe and effective pressure injury management be informed by best practices related to care transitions. Care transitions refer to a set of actions designed to ensure the safe and effective coordination and continuity of care as persons experience a change in health status, care needs, health-care providers, or location (within, between, or across settings) (Coleman & Boulton, 2003). For example, according to Accreditation Canada (2013a, 2014), care transitions include but are not limited to visits to primary care providers; referral to specialists, health services, or providers; handovers at shift change, transfers or discharges; and relocations to another health-care setting. Effective care transitions are required in order to allow an interprofessional team whose services are situated across the health-care system (i.e., acute, out-patient clinic, long-term care, community and home care) to provide comprehensive quality care. A focus on care transitions as they relate to pressure injury prevention and management may contribute to improved pressure injury outcomes for persons, their primary caregivers, and the health-care system. For more information on care transition best practices, please refer to RNAO's (2014) *Care Transitions* (<http://rnao.ca/bpg/guidelines/care-transitions>) clinical BPG.

It is ideal that the development of a pressure injury quality and safety strategy in jurisdictions is in line with other initiatives and mandates. In Canada for example, alignment with organizations such as Accreditation Canada and Health Quality Ontario, in turn, will help leverage a provincial strategic priority on pressure injury safety. For example, Accreditation Canada (2013b) “helps health care organizations improve their performance for the benefit of their clients and the health system” (para. 1), and has developed and adopted organizational practices for pressure injury prevention in long-term care, rehabilitation, acute care, and community care sectors (Accreditation Canada, 2016). Moreover, in 2015 Health Quality Ontario's role and mandate were expanded when the *Excellent Care for All Act, 2010* was passed by the Ontario legislature. Currently, the expanded functions of Health Quality Ontario are to:

- Monitor and report to the people of Ontario on access to publicly funded health services, health human resources in publicly funded health services, consumer and population health status, and health system outcomes;
- Support continuous quality improvement; and
- Promote health care that is supported by the best available scientific evidence. This is accomplished by making recommendations to health-care organizations and other entities on standards of care in the health system, based on clinical practice guidelines and protocols.

The expert panel also recommends that jurisdictions recognize and financially support the evaluation of pressure injury outcomes as a safety and quality care priority in health care. For example, according to Health Quality Ontario (2016), the public should engage in a province-wide “health quality agenda to standardize measures and indicators to track long-term progress to meet health system goals, and provide transparency and accountability for pressure injury care.” At a provincial level, organizations are currently expected to publicly report on quality indicators around pressure injury management (for example, pressure injury outcome reporting is mandatory in both community and long-term care sectors in Ontario). In acute care, long-term care, and home care, for instance, pressure injuries are one of the key outcome indicators that organizations are required to publicly report (Health Quality Ontario, 2016).

Interprofessional teams, in collaboration with individuals personally affected by pressure injuries and their circle of care, should advocate for the improved evaluation of pressure injury outcomes by supporting the implementation of updated data systems, (e.g. MDS InterRAI 3.0 in Canada). A commitment to improving the monitoring and evaluation of pressure injury care and outcomes will, in turn, allow stakeholders in the health-care system to better assess the effectiveness of pressure injury prevention and management practices. For additional information on how to advocate for health care, please refer to RNAO's (2015) *Taking Action: A toolkit for becoming politically involved* (<http://rnao.ca/policy/political-action/political-action-information-kit>).

Research Gaps and Future Implications

The Registered Nurses' Association of Ontario (RNAO) expert panel, in reviewing the evidence for this Guideline, identified the priority areas for research set out in Table 5. They are broadly categorized into practice, outcome, and health-system research.

Table 5: Priority Practice, Outcome, and Health-System Research Areas

CATEGORY	PRIORITY RESEARCH AREA
Practice Research	<ul style="list-style-type: none"> ■ Assessment of pressure injuries using ultrasound technology ■ Assessment of pressure injury status by testing for markers in wound-bed fluid ■ Development of an interprofessional team approach, including persons with pressure injuries and their families, to develop, implement, and evaluate care plans ■ The impact of nutrition on pressure injury healing ■ Management of medical device-related pressure injuries, cartilage pressure injuries, and mucosal membrane pressure injuries ■ Microclimate and its impact on pressure injury tissue repair and healing ■ Biofilm and its impact on pressure injury healing and closure ■ Solutions and techniques to clean pressure injuries (e.g., irrigation, compresses)
Outcome Research	<ul style="list-style-type: none"> ■ Effectiveness of biological agents on pressure injury healing and closure ■ Determination of the most effective pressure injury dressings in different clinical situations ■ Determination of the most effective redistribution support surfaces for people with existing pressure injuries ■ Effectiveness of alternative medications on pressure injury healing and closure (e.g. resin salve, traditional Chinese medicine) ■ Effectiveness of establishing peer support groups with partners in the community for persons with existing pressure injuries ■ Effectiveness and safety of growth factors (e.g., PDGF) on pressure injury healing and closure ■ Effectiveness of phenytoin on pressure injury healing and closure ■ Effectiveness of negative pressure wound therapy as a treatment for pressure injuries (particularly stage 3 and 4 pressure injuries) ■ Effectiveness of hyperbaric oxygen on pressure injury healing and closure ■ Effectiveness of topical oxygen on pressure injury healing and closure ■ Effectiveness of different types and methods of debridement on necrosis, pressure injury healing, and wound closure ■ Effectiveness of silver and hydrogel products on pressure injury healing ■ Effectiveness of fluid mattresses and air mattresses on pressure injury healing ■ Effectiveness of heel suspension devices to relieve pressure and promote wound healing outcomes ■ Effectiveness of alternative dressings on pressure injury healing and closure (e.g., wrap therapy, polyvinylidene film dressing)

RECOMMENDATIONS

<p>Health-System Research</p>	<ul style="list-style-type: none"> ■ Effect of pressure injury education programs on health-care-provider and caregiver wound-care knowledge and skills, pressure injury prevention, identification, and wound healing over time ■ Effect of interprofessional care teams on pressure injury prevention, identification, and wound healing over time
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The above table, though not exhaustive, is an attempt to identify and prioritize the research needed with respect to existing pressure injuries. Many of the recommendations in this Guideline are based on quantitative and qualitative research evidence; others are based on RNAO expert panel opinion or grey literature sources. Further substantive research is required to validate some of these recommendations. Increasing the research evidence will lead to improved practice and outcomes for persons with existing pressure injuries.



Implementation Strategies

Implementing guidelines at the point of care is multi-faceted and challenging; it takes more than awareness and distribution of guidelines to get people to change how they practice. Guidelines must be adapted for each practice setting in a systematic and participatory way, to ensure recommendations fit the local context (Harrison, Graham, Fervers, & Hoek, 2013). The RNAO *Toolkit: Implementation of Best Practice Guidelines (2nd ed.; 2012)* provides an evidence-informed process for doing this (see [Appendix Y](#)).

The *Toolkit* is based on emerging evidence that successful uptake of best practice in health care is more likely when:

- Leaders at all levels are committed to supporting guideline implementation;
- Guidelines are selected for implementation through a systematic, participatory process;
- Stakeholders for whom the guidelines are relevant are identified and engaged in the implementation;
- Environmental readiness for implementing guidelines is assessed;
- The guideline is tailored to the local context;
- Barriers and facilitators to using the guideline are assessed and addressed;
- Interventions to promote use of the guideline are selected;
- Use of the guideline is systematically monitored and sustained;
- Evaluation of the guideline’s impact is embedded in the process; and
- There are adequate resources to complete all aspects of the implementation.

The *Toolkit* uses the “Knowledge-to-Action” framework (Straus, Tetroe, Graham, Zwarenstein, & Bhattacharyya, 2009) to demonstrate the process steps required for knowledge inquiry and synthesis. It also guides the adaptation of the new knowledge to the local context and implementation. This framework suggests identifying and using knowledge tools, such as guidelines, to identify gaps and to begin the process of tailoring the new knowledge to local settings.

RNAO is committed to widespread deployment and implementation of our Best Practice Guidelines (BPGs). We use a coordinated approach to dissemination, incorporating a variety of strategies, including: (1) the Nursing Best Practice Champion Network[®], which develops the capacity of individual nurses to foster awareness, engagement, and adoption of BPGs; (2) nursing order sets^g, which provide clear, concise, actionable intervention statements derived from the BPGs’ practice recommendations that can be readily embedded within electronic medical records or used in paper-based or hybrid environments; and (3) the Best Practice Spotlight Organization[®] (BPSO[®]) designation, which supports implementation at the organization and system levels. BPSOs[®] focus on developing evidence-based cultures with the specific mandate to implement, evaluate, and sustain multiple RNAO BPGs. In addition, we offer capacity-building learning institutes on specific BPGs and their implementation annually.

Information about our implementation strategies can be found at:

- RNAO Best Practice Champions Network[®]: <http://RNAO.ca/bpg/get-involved/champions>
- RNAO Nursing Order Sets: <http://RNAO.ca/bpg/initiatives/nursing-order-sets>
- RNAO Best Practice Spotlight Organizations[®]: <http://RNAO.ca/bpg/bpso>
- RNAO capacity-building learning institutes and other professional development opportunities: <http://RNAO.ca/events>.

Evaluating and Monitoring This Guideline

As you implement the recommendations in this Guideline, we ask you to consider how you will monitor and evaluate their implementation and impact.

Table 6 is based on a framework outlined in the RNAO *Toolkit: Implementation of Best Practice Guidelines* (2nd ed.; 2012) and illustrates some specific indicators for monitoring and evaluating implementation of this Guideline.

Table 6: Organizational/System Structure, Process, and Outcome Indicators for Monitoring and Evaluating This Guideline

TYPE OF INDICATOR		
Organizational/System Structure	Process	Outcome
These indicators refer to the supports and resources required in order for a health system, health service organization, or academic institution to implement the RNAO BPG <i>Assessment and Management of Pressure Injuries for the Interprofessional Team, Third Edition</i> , successfully.	These indicators evaluate whether best practices directed at the education, training, and practice of health-care professionals to improve the care of clients with pressure injuries have been implemented.	These indicators evaluate the impact of implementing the Guideline recommendations on health-care organizations, health-care professionals, and client outcomes.
System-wide integration of policies consistent with best practices and Guideline recommendations for care of clients with pressure injuries	Percentage of nurses and other health-care professionals who attend educational programs related to the care of clients with pressure injuries	New graduates, nursing staff and other health-care professionals demonstrate the knowledge and skills required to care for clients with pressure injuries
Organizations establish pressure injury assessment and management as a clinical strategic priority	Percentage of nursing students who attend educational programs related to the care of clients with pressure injuries	*Pressure injury incidence: Percentage of clients who develop new stage 2 to 4 pressure injuries during the measurement period
Organizations adopt, implement, and integrate evidence-based policies and procedures related to the assessment and management of clients with pressure injuries	Percentage of newly admitted clients with an existing pressure injury who are reassessed for the risk of developing additional pressure injuries	* Percentage of stage 2 to 4 pressure injuries with demonstrated evidence of healing after a 2–4 week measurement period
Organizational availability of educational resources and programs for nurses and other health-care professionals that address clinical assessment and management of pressure injuries	*Percentage of newly admitted clients with an existing stage 2 or higher pressure injury who had a comprehensive assessment of the injuries completed on admission	*Percentage of clients with stage 2 to 4 pressure injuries that healed during the measurement period

TYPE OF INDICATOR		
Organizational/System Structure	Process	Outcome
Organizational availability and access to resources required for care of clients with pressure injuries (e.g., support surfaces, dressing materials, etc.)	*Percentage of clients who have a stage 1 or higher pressure injury with documented evidence of a treatment plan for pressure reduction management	*Pressure injury prevalence on admission: Percentage of all clients admitted during the measurement period that have a pre-existing stage 2 or higher pressure injury
Availability of educational resources for undergraduate nursing and health-care professional programs that are consistent with best practices for the assessment and management of pressure injuries	Percentage of clients with a stage 2 or higher pressure injury who receive appropriate pressure injury wound care (cleansing, moisture balance, infection control, and debridement) according to the suggested schedule	*Pressure injury point prevalence: Percentage of clients with a stage 2 or higher pressure injury during a prevalence study
	Percentage of clients with a pressure injury who receive education related to pressure injury management	*Healthcare associated pressure injury incidence: Percentage of clients who develop a stage 2 or higher pressure injury after admission
		Incidence rate of pressure injury infection in clients with existing pressure injuries

*These process and outcome indicators have been taken from the NQuIRE® Data Dictionary for the RNAO BPG *Assessment & Management of Pressure Injuries for the Interprofessional Team, Third Edition* (2016).

Other RNAO Resources for the Evaluation and Monitoring of Best Practice Guidelines:

- Nursing Quality Indicators for Reporting and Evaluation (NQuIRE®) were designed for RNAO’s Best Practice Spotlight Organizations® (BPSO®) to systematically monitor the progress and evaluate the outcomes of implementing RNAO BPGs in their organizations. NQuIRE® is the first international quality improvement initiative of its kind consisting of a database of quality indicators derived from recommendations of selected RNAO clinical Best Practice Guidelines. Please visit <http://RNAO.ca/bpg/initiatives/nquire> for more information.
- Nursing order sets embedded within electronic medical records provide a mechanism for electronic data capture of process indicators. The ability to link structure and process indicators with specific client outcome indicators aids in determining the impact of BPG implementation on specific client health outcomes. Please visit <http://RNAO.ca/ehealth/nursingordersets>.

Process for Update and Review of Best Practice Guidelines

The Registered Nurses' Association of Ontario (RNAO) commits to updating its Best Practice Guidelines as follows:

1. Each nursing BPG will be reviewed by a team of specialists in the topic area every five years following publication of the previous edition.
2. The International Affairs and Best Practice Guidelines (IaBPG) Centre staff monitor regularly for new systematic reviews, randomized controlled trials, and other relevant literature in the field.
3. Based on that monitoring, staff may recommend an earlier revision period. Appropriate consultation with members of the original expert panel and other specialists and experts in the field will help inform the decision to review and revise the guidelines earlier than planned.
4. Three months prior to the review milestone, the staff commences planning of the review by:
 - a) Inviting specialists in the field to participate on the expert panel. It will be comprised of members from the original expert panel as well as other recommended specialists and experts.
 - b) Compiling feedback received and questions encountered during the implementation, including comments and experiences of Best Practice Spotlight Organizations[®] and other implementation sites regarding their experiences.
 - c) Compiling new clinical best practice guidelines in the field and conducting a systematic review of the evidence.
 - d) Developing a detailed work plan with target dates and deliverables for developing a new edition of the Guideline.
5. New editions of guidelines will be disseminated based on established structures and processes.

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Appendix A: Glossary of Terms

Acetate tracing: Tracing of the wound margin using an acetate sheet.

Analytical studies: Analytical studies test hypotheses about exposure–outcome relationships. The investigators do not assign an intervention, exposure, or treatment but do measure the association between exposure and outcome over time, using a comparison group (Centers for Disease Control and Prevention, 2013). Analytical study designs include case-control studies and cohort studies.

Cohort study: An observational study in which a defined group of people (the cohort) is followed over time, either prospectively or retrospectively (The Cochrane Collaboration, 2005).

Case-control study: A study that compares people with a specific disease or outcome of interest (cases) to people from the same population without that disease or outcome (controls) (The Cochrane Collaboration, 2005).

Ankle brachial pressure index: “A comparison between the brachial systolic pressure and the ankle systolic pressure. It gives an indication of arterial perfusion. The normal resting pressure is 1.0” (RNAO, 2004, p. 74).

Anthropometric measures: “A set of non-invasive, quantitative techniques for determining an individual’s body fat composition by measuring, recording, and analyzing specific dimensions of the body, such as height and weight; skin fold thickness; and bodily circumference at the waist, hip, and chest” (“Anthropometric measures,” 2005).

Antibiotic: “A natural or synthetic substance administered systemically or topically that has the capacity to destroy or inhibit bacterial growth” (NPUAP, EPUAP & PPPIA, 2014, p. 280).

Antimicrobial: “A substance that acts directly on a micro-organism to destroy the bacteria and prevent the development of new bacterial colonies. The term antimicrobial is a broad term that includes antiseptics, disinfectants, and antibiotics” (NPUAP, EPUAP & PPPIA, 2014, p. 280).

Antiseptic: “Agents that destroy or inhibit growth and development of micro-organisms in or on living tissue” (NPUAP, EPUAP & PPPIA, 2014, p. 166).

Arginine: An essential amino acid that promotes pressure injury healing during periods of stress (NPUAP, EPUAP & PPPIA, 2014).

Autolytic debridement: “A highly selective form of slow debridement that occurs naturally in wounds and is promoted the use of moisture-retentive dressings” (NPUAP, EPUAP & PPPIA, 2014, p. 282).

Best practice guidelines: Systematically developed statements to assist practitioner and client decisions about appropriate health care for specific clinical (practice) circumstances (Field & Lohr, 1990).

Biofilm: “A polysaccharide matrix in which organisms attach, live, and multiply on wound surfaces, and which can affect wound healing by creating chronic inflammation or infection” (WOCN, 2010, p. 42).

Bottoming out/bottom out: “The effect that occurs when the deepest point of the patient’s immersion in a reactive or an active support surface provides insufficient support to adequately redistribute pressure, so the patient presents as sitting or lying on the underlying structure of the bed or chair” (AWMA, 2012, p. 7).

Cartilage pressure injuries: “pressure injuries that have exposed cartilage. These should be classified as stage 4 pressure injuries. The bridge of the nose, ear, occiput, and malleolus do not have (adipose) subcutaneous tissue and injuries in these locations are typically shallow. Stage 4 injuries can extend into muscle and/or supporting structures (e.g., fascia, tendon, or joint capsule), increasing the likelihood of osteomyelitis” (NPUAP, 2012).

Colonization: “The presence and growth of bacteria on the surface of the skin without any evident tissue damage” (WOCN, 2010, p. 43).

Compressing: Gently compressing saline-soaked gauze into the pressure injury for 30 seconds before placing another saline-soaked gauze into the wound .

Conservative sharp wound debridement: “The removal of devitalized tissue using a sharp instrument (e.g., scalpel, scissors, or curette)” (NPUAP, EPUAP & PPPIA, 2014, p. 282).

Contamination: “The entry of bacteria, other micro-organisms, or foreign material into a previously clean or sterile wound or skin” (WOCN, 2010, p. 43).

Controlled study: A clinical trial in which the investigator assigns an intervention, exposure, or treatment to participants who are not randomly allocated to the experimental and comparison or control group (The Cochrane Collaboration, 2005).

Critical colonization: “Term used to refer to a wound that has an increasing bacterial burden, and which is intermediate between the category of colonization and infection into viable tissues” (WOCN, 2010, p. 43).

Debridement: “The removal of devitalized (non-viable) tissue from the wound or the area adjacent to a wound” (AWMA, 2012, p. 8).

Descriptive studies: Studies that generate hypotheses and describe characteristics of a sample of individuals at one point in time. The investigators do not assign an intervention, exposure, or treatment to test a hypothesis, but merely describe the who, where, or when in relation to an outcome (Centers for Disease Control and Prevention, 2013; The Cochrane Collaboration, 2005). Descriptive study designs include cross-sectional studies.

Cross-sectional study: A study measuring the distribution of some characteristic(s) in a population at a particular point in time (also called a survey) (The Cochrane Collaboration, 2005).

Edge effect: “If all five components of WBP have been corrected (cause, patient-centered concerns, and the three components of local wound care) and a healable wound is stalled, re-evaluation of the current diagnosis and treatment plan is necessary to be sure each component has been idealized before considering active local advanced therapies” (Sibbald et al, 2011, p. 417).

Education recommendations: Statements of educational requirements and educational approaches/strategies for the introduction, implementation, and sustainability of the best practice guideline.

Electrical stimulation: “The use of an electrical current to transfer energy controlled by an electrical source. In the prevention and treatment of pressure injuries, electrical stimulation is emerging as a wound healing therapy. In wound electrical stimulation, electrodes are usually placed over a wet conductive medium in the wound bed and on the skin some distance away from the wound; electrodes may also be placed on opposite sides of the wound to provide indirect stimulation” (NPUAP, EPUAP & PPPIA, 2014, p. 282).

Electromagnetic field: “A field consisting of both electric and magnetic components, which promotes wound healing by inducing a physiological response in wound tissue” (NPUAP, EPUAP & PPPIA, 2014, p. 185).

Entourage: A team consisting of the person in need of health-care services, the person’s primary caregivers, and his or her health-care providers.

Entrapment: An event in which a person is caught, trapped, or entangled in the space in or about the bed rail, mattress, or hospital bed frame. Entrapments may result in deaths and serious injuries (Health Canada, 2008).

To minimize the risk of entrapment, health-care professionals should consider:

- Selecting a surface that has a transfer border, as it may be less likely to compress as the person approaches the side of the surface;
- Evaluating the use of bed rails (the person may be at less risk when these are not in place);
- Implementing other devices, such as positioning wedges or a mattress cover with built-in bolsters; and/or
- Consulting with an occupational or physical therapist skilled in this area, to complete an assessment and make specific recommendations.

The seven zones of entrapment are (Norton, 2010):

1. within the rail,
2. under the rail (between the rail supports or next to a single rail support),
3. between the rail and mattress,
4. under the rail (at the ends of the rail),
5. between split bed rails,
6. between the end of the rail and the side edge of the headboard or footboard, and
7. between the headboard or footboard and the mattress end.

Enzymatic debridement: “The removal of devitalized tissue by applying exogenous proteolytic or fibrinolytic enzymes to a wound” (NPUAP, EPUAP & PPPIA, 2014, p. 282).

Erythema: “Redness of the skin due to dilation of the superficial capillaries” (NPUAP, EPUAP & PPIIA, 2014, p. 283).

Blanchable erythema: “An area of the skin that temporarily turns white or pale when pressure is applied to the skin. Over a pressure site, this is due to a normal hyperemic response” (NPUAP, EPUAP & PPIIA, 2014, p. 283).

Nonblanchable erythema: “Redness that persists following the application of fingertip pressure, usually over a bony prominence. Darkly pigmented skin may not have visible blanching. This is a sign of stage 1 pressure injury” (NPUAP, EPUAP & PPIIA, 2014, p. 283).

Evidence: Evidence is information that comes closest to the facts of a matter. The form it takes depends on context. The findings of high-quality, methodologically appropriate research provide the most accurate evidence. Because research is often incomplete and sometimes contradictory or unavailable, other kinds of information are necessary supplements to, or stand-ins for, research. The evidence base for a decision is the multiple forms of evidence combined to balance rigour with expedience while privileging the former over the latter (Lomas, Culyer, McCutcheon, McAuley, & Law, 2005).

Extrinsic risk factors: Risk factors derived from the environment (e.g., shear injury) that predispose a person to pressure injuries (RNAO, 2007).

Exudate: “Any fluid that has been extruded from a tissue or its capillaries, such as fluid, cells, or cellular debris that has escaped from blood vessels and has been deposited in tissue surfaces. Exudate is characteristically high in protein and white blood cells” (WOCN, 2010, p. 45).

Friction (frictional force): “The resistance to motion in a parallel direction relative to the common boundary of two surfaces e.g. when skin is dragged across a coarse surface” (NPUAP, EPUAP & PPIIA, 2014).

Full thickness wound: “Ulceration extending through dermis to involve subcutaneous tissue and possibly muscle/bone (e.g. stage 3 and 4 pressure injury)” (WOCN, 2010, p. 45).

Gap analysis: “A gap analysis provides a summary of information that may come from a number of sources, including system analysis, outcome root cause analysis, chart audits, formal/informal interviews, meetings with interdisciplinary teams, discussions at the practice committee level, surveys, policy reviews, related documentation review, staff skill-set analysis, and equipment inventory” (RNAO, 2012, p. 26).

Healability: “A term used to indicate the categorization of a wound according to its ability to heal—i.e., healable, maintenance, or non-healable. Categorizing a wound in this way assists the clinician in making an accurate diagnosis and developing a realistic individualized treatment approach” (Sibbald et al, 2011, p. 422).

“**Healable** pressure injuries refer to wounds that have the ability to heal” (Sibbald et al., 2011, p. 147).

“Pressure injuries are classified as **maintenance** in situations where the patient either refuses to treat the cause (e.g., will not wear compression) or where a health-system error or barrier exists (e.g., no plantar pressure redistribution is provided in the form of footwear, or the patient cannot afford the device). As these circumstances may change, periodic re-evaluation may be indicated” (Sibbald et al., 2011, p. 417).

“**Non-healable** pressure injuries refer to wounds that are unable to heal. This may be due to inadequate blood supply, the inability to treat the cause, and/or wound-exacerbating factors that cannot be corrected” (Sibbald et. al., 2011, p. 417).

Hemosiderin staining: Staining that causes darkening of the skin; colour changes are apparent around acute (inflamed—red or violet) and chronic open wounds (pigmentation—dark brown) (Sussman and Bates-Jensen, 2007).

Incidence: “The number of new occurrences of something in a population over a particular period of time, e.g., the number of cases of a disease in a country over one year” (Cochrane Collaboration, 2005, p. 21).

Induration: “Tissue that is hardened to touch” (NPUAP, EPUAP & PPPIA, 2014, p. 284).

Infection: “The presence of bacteria or other micro-organisms in sufficient quantity to damage tissue or impair healing. Clinical signs of infection may not be present in the immune-compromised individual or the individual with a chronic wound” (NPUAP, EPUAP & PPPIA, 2014, p. 284).

Inflammation: “A local response to cellular injury that is marked by capillary dilatation, leukocyte infiltration, redness, heat, and pain and that serves as a mechanism initiating the elimination of noxious agents and of damaged tissue” (“Inflammation,” n.d.).

Interprofessional team: A team made up of individuals from different professions working together to reach a common goal and who share decision making to achieve that goal. The goal in health care is to work in collaboration with persons and their families to provide treatment that reflects their goals and values (Ferris et al., 2002).

Interventions: Encompasses the specific treatment strategies, therapies, or techniques that are used to treat one or more pressure injuries.

Intrinsic risk factors: A person’s physical, psychosocial, or medical conditions (e.g., risk factors such as impaired mobility) that predispose him/her to pressure injuries (RNAO, 2007).

Knowledge translation: “A dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the healthcare system” (CIHR, 2015, para. 4).

Larval debridement: “The use of sterile fly larvae to remove devitalized tissue. Larvae are believed to secrete a proteinase enzyme that degrades necrotic tissue, digests bacteria, and stimulates granulation tissue” (NPUAP, 2014, p. 282).

Laser: “Coherent and monochromatic light; a phototherapeutic agent that is part of the electromagnetic spectrum” (NPUAP, 2014, p. 284).

Levine technique: A procedure for performing quantitative swab cultures by applying the following steps:

1. Cleanse the wound with normal saline.
2. Remove/debride non-viable tissue.
3. Wait two to five minutes.
4. If the ulcer is dry, moisten the swab with sterile normal saline.
5. Culture the healthiest looking tissue in the wound bed.
6. Do not culture exudates, pus, eschar, or heavily fibrous tissue.
7. Rotate the end of a sterile alginate-tipped applicator over a 1 cm² area for 5 seconds.
8. Apply sufficient pressure to the swab to cause tissue fluid to be expressed.
9. Use sterile technique to break the tip of the swab into a collection device designed for quantitative cultures (NPUAP, EPUAP & PPIA, 2014, p. 164).

Local wound care: “The three components of local wound care are debridement, inflammation/infection, and moisture balance management. Local wound care should be addressed after completing the comprehensive patient assessment, including the division of wounds into healable, maintenance, and non-healable healing potential categories” (Sibbald et al, 2015, p. 467).

Maceration: “The act of softening by wetting or soaking” (NPUAP, EPUAP & PPIA, 2014, p. 284).

Maintenance wound: See *healability*

Mechanical debridement: “The non-selective removal of devitalized tissue by physical forces” (NPUAP, 2014, p. 282).

Medical device-related pressure injuries: This describes the etiology of the injury. Medical device related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device. The injury should be staged using the NPUAP staging system” (NPUAP, 2016, para 10).

Meta-analysis: A systematic review of randomized controlled trials that uses statistical methods to analyze and summarize the results of the included studies (The Cochrane Collaboration, 2005).

Metrics: A standard of measurement (Webster’s Dictionary, 2015).

Microclimate: Temperature, moisture (increased moisture may lead to maceration and increased susceptibility to friction or shear forces) along with airflow (Baharestani et al., 2010).

Moisture balance: “Moist wound environments enhance wound healing and promote new tissue growth. Excess or insufficient moisture impairs the healing process and causes breakdown of the wound bed and surrounding skin; these tissue alterations increase the risk of bacterial damage from superficial critical colonization and deep/surrounding wound infection” (Sibbald et al., 2015, p. 467). Low moisture levels may also lead to necrosis and eschar formation, hindering wound re-epithelialization and closure. Moisture balance of the wound bed is critical for wound healing (Sibbald et al, 2015).

Mucosal membrane pressure injuries: “Mucosal membrane pressure injury is found on mucous membranes with a history of a medical device in use at the location of the injury. Due to the anatomy of the tissue these ulcers cannot be staged” (NPUAP, 2016, para 11).

Mutagenic: An agent (e.g., a chemical or various radiations) that tends to increase the frequency or extent of mutation (Webster’s Dictionary, 2015).

Negative Pressure Wound Therapy (NPWT): “A wound treatment modality that promotes healing through the removal of third-space edema, thus enhancing nutrient and oxygen delivery; removal of wound exudates (the medium for bacterial colonization); promotion of granulation tissue; promotion of angiogenesis; and removal of wound inhibitory factors” (NPUAP, EPUAP & PPIA, 2014, p. 285).

Non-healable wound: See *healability*

Nursing order sets: A group of evidence-based interventions that are specific to the domain of nursing; they are ordered independently by nurses (i.e., without a physician’s signature) to standardize the care provided for a specific clinical condition or situation.

Off-loading: “The removal of pressure from a skin surface” (AWMA, 2012, p. 9).

Osteomyelitis: Inflammation of bone and marrow, usually caused by pathogens that enter the bone during an injury or surgery (WOCN, 2010).

Partial thickness: Confined to the superficial skin layers; damage does not penetrate below the dermis and may be limited to the epidermal layers only (e.g., stage 1 and 2 pressure injury) (WOCN, 2010).

Pathogen: A specific causative agent (e.g., a bacterium or virus) of disease (Webster’s Dictionary, 2015).

Patient-/person- and family-centred concerns: A patient/person- and family-centred approach to care demonstrates certain practices that put the person and their family members at the centre of health care and services. Person- and family-centred care respects and empowers individuals to be genuine partners with health-care providers for their health (RNAO, 2015).

The Wound Bed Preparation (WBP) paradigm assessment should identify patient-/family-centred concerns (Sibbald et al, 2015). The concept of WBP includes the treatment of the whole patient (treat the cause and patient-centred concerns) (Sibbald et al, 2011).

Peri-wound: “The area immediately adjacent to the wound edge and extending out as far as the tissue colour and consistency changes extend” (NPUAP, EPUAP & PPIA, 2014, p. 285).

Person (persons, people): An individual with whom a health-care professional is engaged in a therapeutic relationship. In most circumstances, the person is an individual, but the term may also include the person’s family members and/or substitute decision-makers (group or community) (CNO, 2013).

Placebo: An inert or innocuous substance used especially in controlled experiments testing the efficacy of another substance (e.g., a drug) (Webster’s Dictionary, 2015).

Potable water: “Water that is fit for consumption by humans and animals” (NPUAP, EPUAP & PPIA, 2014, p. 286).

Practice recommendations: Statements of best practice directed at the practice of health-care providers that are ideally evidence-based.

Pressure injury: “A pressure injury is localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue” (NPUAP, 2016, para 3).

Pressure mapping: “Pressure mapping systems, which are comprised of a sensor array in a flexible mat, measure interface pressures between the body and support surface. The pressure sensors are connected to a computerized system that displays the pressures measured at each sensor, using a colour-coded image and a number. These outputs display the level of pressure at each sensor, the overall amount of contact area for pressure distribution, and pressure asymmetries. Higher areas of pressure may indicate bony prominences, but manual palpation is necessary to confirm this” (Houghton, Campbell and CPG Panel, 2013, p.75).

Pressure redistribution: “The ability of a support surface to distribute load over the contact areas of the human body to reduce the overall pressure and avoid areas of focal pressure” (WOCN, 2010, p. 47).

Prevalence: “The proportion of a population having a particular condition or characteristic” (Cochrane Collaboration, 2005, p. 34); e.g., the percentage of people in an organization with a pressure injury.

PSI (pounds per square inch): “A unit of pressure; with regard to pressure injury, the pressure exerted by a stream of fluid against one square inch of skin or wound surface” (WOCN, 2010, p. 47).

Qualitative research: Research that uses an interactive and subjective approach to investigate and describe phenomena (e.g., lived experience) and to give them meaning. The nature of this type of research is exploratory and open-ended. Analysis involves the organization and interpretation of non-numerical data (e.g., phenomenology, ethnography, grounded theory, case study, etc.) (Speziale & Carpenter, 2007).

Quasi-experimental study: A study that lacks randomization and a control group and therefore is not considered a “true” experimental design (e.g., a randomized controlled trial). The investigator controls the assignment to the intervention, exposure, or treatment by using some criterion other than random assignment (e.g., pre-post design) (Polit, Beck, & Hungler, 2001).

Randomized controlled trial (RCT): An experiment in which the investigator assigns an intervention, exposure, or treatment to participants who are randomly allocated to either the experimental group (receives intervention) and the comparison (conventional treatment) or control group (no intervention or placebo) (The Cochrane Collaboration, 2005). The participants are followed and assessed to determine the efficacy of the intervention. Includes double-blind, single-blind, and non-blind trials.

Reliable: “In regard to an assessment tool, the consistency of a set of measurements or measuring instrument” (WOCN, 2010, p. 48).

Repositioning: “Changing a person’s body position in order to redistribute the pressure on the bony points that were in contact with the surface supporting the body. The frequency is determined by skin response, the support surface in use, and the person’s general condition” (AWMA, 2012, p. 10).

Reverse staging of pressure injuries: The use by clinicians of pressure injury staging systems in reverse order to describe improvement in a pressure injury, due to a lack of research validated tools to measure pressure injury healing (NPUAP, 2012).

Self-management: The tasks that individuals must undertake to live well with one or more chronic conditions. These tasks include having the confidence to deal with medical management, role management, and emotional management of their conditions (RNAO, 2010).

Semi-quantitative wound culture: A standard procedure for determining the relative number of organisms colonizing wound tissue. This is similar to a quantitative wound swab, except that the processing of the swab is not as complex. The bacterial colonization results are reported as minimal, moderate, or extensive (WOCN, 2010).

Sepsis: “A condition in which the body is fighting a severe infection that has spread via the bloodstream” (WOCN, 2010, p. 48).

Sharp wound debridement: “Rapid wound debridement in which devitalized tissue is removed from the wound using scalpel and/or scissors under general or local topical anaesthetic” (NPUAP, EPUAP & PPIIA, 2014, p. 282).

Shear: “The term shear refers to a force that is parallel to the skin surface” (NPUAP, EPUAP & PPPIA, 2014, p. 18).

Sinus tract: The course or path of tissue destruction occurring in any direction from the surface or edge of the wound; results in dead space with potential for abscess formation. Also sometimes called “tunneling” (can be distinguished from undermining by the fact that sinus tract involves a small portion of the wound edge, whereas undermining involves a significant portion of the wound edge) (WOCN, 2010).

Slough: “Soft, moist, avascular (devitalized) tissue; may be white, yellow, tan, or green; may be loose or firmly adherent” (WOCN, 2010, p. 48).

Stakeholder: An individual, group, or organization with a vested interest in the decisions and actions of organizations, who may attempt to influence decisions and actions (Baker et al., 1999). Stakeholders include all individuals or groups who will be directly or indirectly affected by the change or solution to a problem.

Stalled wound: “When a healable wound does not progress at the expected rate, a chronic and stalled wound results” (Sibbald et al., 2011, p. 422).

Standard mattress: “A term used to describe the standard mattress provided within a facility and generally used as the comparative intervention in research trials investigating the effectiveness of pressure redistribution support surfaces. The qualities of a standard hospital mattress vary according to the historical and clinical context, and are rarely reported in detail in clinical trials. In most cases, it is assumed that a standard hospital mattress is a non-powered foam or spring-based mattress” (NPUAP, EPUAP & PPPIA, 2014, p. 287).

Support surface: “A specialized device for pressure redistribution, designed for the management of tissue loads, microclimate, and/or other therapeutic functions. Support surfaces include but are not limited to mattresses, integrated bed systems, mattress replacements or overlays, and seat cushions and seat cushion overlays” (NPUAP, EPUAP & PPPIA, 2014, p. 288).

Systematic review: A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review (The Cochrane Collaboration, 2005).

System, organization, and policy recommendations: Statements of conditions required for a practice setting that enables the successful implementation of the best practice guideline. The conditions for success are largely the responsibility of the organization, although they may have implications for policy at a broader governmental or societal level.

Toe pressure index: “Assesses the presence or severity of peripheral arterial disease (PVD) of the lower extremity. Toe brachial index (TBI) is a calculation based on the systolic blood pressures of the arm and the systolic blood pressures of the toes. The examination is performed with a photoplethysmograph (PPG) infrared light sensor and a very small blood pressure cuff placed around the toe” (Michigan Physicians Group, 2012).

Tunnelling: See *sinus tract*

Ultrasound: “A mechanical vibration (acoustic energy) transmitted in a wave formation at frequencies beyond the upper limit of human hearing. Its vibratory property affects the cells of biologic tissues, and can be used to assess and treat soft tissues” (NPUAP, EPUAP & PPPIA, 2014, p. 291).

Ultraviolet light: “A form of light therapy that uses an invisible light that is part of the electromagnetic spectrum and can be used as a phototherapeutic agent” (NPUAP, EPUAP & PPPIA, 2014, p. 291).

Undermining: “Area of tissue destruction extending under intact skin along the periphery of a wound; commonly seen in shear injuries. Can be distinguished from sinus tract by fact that it involves a significant portion of the wound edge” (WOCN, 2010, p. 50).

Valid: “In regard to an assessment tool, concerned with the study’s success in measuring what the researchers set out to measure” (WOCN, 2010, p. 50).



Appendix B Guideline Development Process

The Registered Nurses' Association of Ontario (RNAO) has made a commitment to ensure that this Best Practice Guideline is based on the best available evidence. In order to meet this commitment, a monitoring and revision process has been established for each Guideline every five years.

For this revised Guideline, RNAO assembled a panel of experts who represent a range of sectors and practice areas (see the RNAO Expert Panel section at the beginning of this Guideline). A systematic review of the evidence was based on the purpose and scope of the original guideline, *Assessment and Management of Stage I to IV Pressure Ulcers* (RNAO, 2007), and was supported by four clinical questions. The systematic review captured relevant literature and guidelines published between January 2006 and October 2014. The following research questions were established to guide the systematic review:

1. What are the most effective methods for the assessment of existing pressure ulcers/injuries in clients?
2. What are the most effective interventions to manage existing pressure ulcers/injuries in clients?
3. What education and training is required to ensure the provision of effective pressure ulcer/injury assessment and management among practicing health care professionals?
4. How do health-care organizations and the broader health-care system support and promote the optimal assessment and management of existing pressure ulcers/injuries in clients?

The expert panel's mandate was to review the original Guideline in light of the new evidence to ensure the continuing validity, appropriateness, and safety of the recommendations. This new revised Guideline is the result of the expert panel's work to integrate the most current and best evidence into the recommendations with the supporting evidence from the original Guideline (where applicable).

Appendix C: Process for Systematic Review and Search Strategy

Guideline Review

The Registered Nurses' Association of Ontario (RNAO) guideline development team's project coordinator searched an established list of websites for guidelines and other relevant content published between 2006 and 2014. This list was compiled based on knowledge of evidence-based practice websites, recommendations from the literature, and key websites related to pressure ulcers/injuries. Furthermore, expert panel members were asked to provide guidelines from their own personal libraries. Detailed information about the search strategy for existing guidelines, including the list of websites searched and inclusion criteria, is available online at www.RNAO.ca.

Two of RNAO's BPG nursing research associates and a BPG program manager critically appraised 16 international guidelines using the *Appraisal of Guidelines for Research and Evaluation Instrument 2* (Brouwers et al., 2010). From this review, the following eight guidelines were selected to inform the recommendations and discussions of evidence:

American Medical Directors Association. (2008). *Pressure ulcers in the long-term care setting*. Columbia, MD: American Medical Directors Association.

Australian Wound Management Association. (2012). *Pan Pacific clinical practice guideline for the prevention and management of pressure injury*. Cambridge Media Osborne Park, WA: Author.

Beeckman, D., Matheï, C., Van Lancker, A., Vanwalleghem, G., Van Houdt, S., Gryson, L., ... Van Den Heede, K. (2013). *A national guideline for the treatment of pressure ulcers—Synthesis*. Brussels, Belgium: Belgian Health Care Knowledge Centre.

Houghton, P.E., Campbell, K.E., & CPG Panel. (2013). *Canadian best practice guidelines for the prevention and management of pressure ulcers in people with spinal cord injury: A resource handbook for clinicians*. Mississauga, ON: Katika Integrated Communications.

National Institute for Health and Care Excellence. (2014). *Pressure ulcers: Prevention and management of pressure ulcers*. London, UK: Author.

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, & Pan Pacific Pressure Injury Alliance. (2014). *Prevention and treatment of pressure ulcers: clinical practice guideline*. Washington, DC: National Pressure Ulcer Advisory Panel.

Perry, D., Borchert, K., Burke, S., Chick, K., Johnson, K., Kraft, W., Patel, B., Thompson, S. (2014). *Pressure ulcers prevention and treatment protocol*. Bloomington, MN: Institute for Clinical Systems Improvement.

Wound, Ostomy and Continence Nurses Society. (2010). *Guideline for prevention and management of pressure ulcers*. Mount Laurel, NJ: Author.

Systematic Review

A comprehensive search strategy was developed by RNAO's research team and a health sciences librarian, based on inclusion and exclusion criteria created with the RNAO expert panel. A search for relevant articles published in English between January 2006 and October 2014 was applied to the following databases: Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), Embase, Educational Resources Information Center (ERIC), MEDLINE, MEDLINE in Process, and PsycINFO. In addition to this systematic search, panel members were asked to review personal libraries for key articles not found through the above search strategies.

Detailed information about the search strategy for the systematic review, including the inclusion and exclusion criteria as well as search terms, is available online at <http://rnao.ca/bpg/guidelines/pressure-injuries>.

Once articles were retrieved, two RNAO BPG nursing research associates (nurses holding master's degrees) independently assessed the eligibility of the studies according to established inclusion/exclusion criteria. The RNAO's BPG program manager, involved in supporting the RNAO expert panel, resolved disagreements.

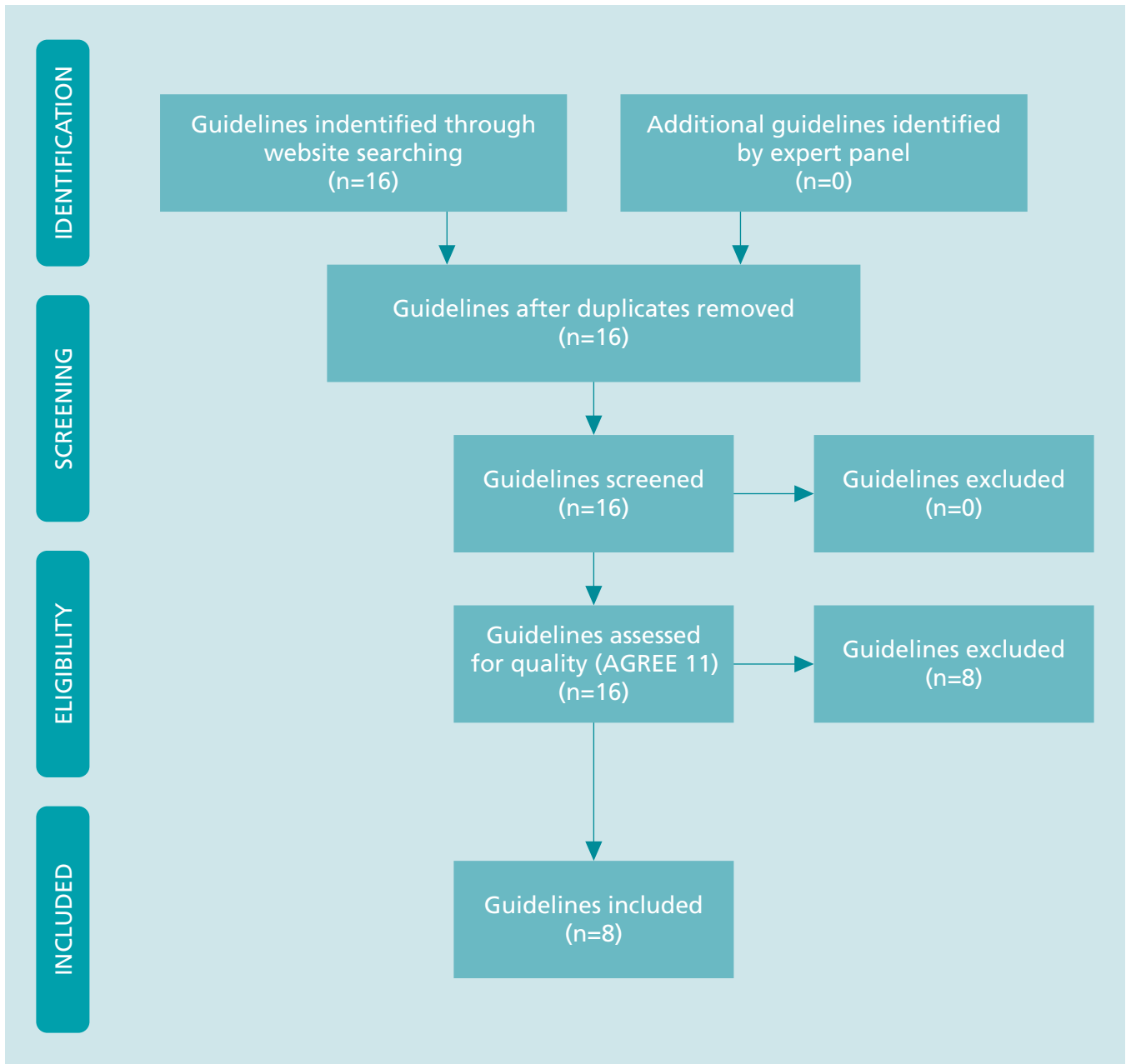
Quality appraisal scores for 16 articles (a random sample of 10 percent of articles eligible for data extraction and quality appraisal) were independently assessed by RNAO BPG research associates. Acceptable inter-rater agreement (kappa statistic, $K=0.706$) justified proceeding with quality appraisal and data extraction by dividing the remaining studies equally between the two research associates (Fleiss, Levin, & Paik, 2003). A final summary of literature findings was completed. The comprehensive data tables and summary were provided to all expert panel members for review and discussion.

A review of the most recent literature and relevant guidelines published between January 2006 and October 2014 resulted in an update of the existing recommendations as well as the inclusion of new recommendations.

Prior to publication, the systematic review was updated, and a search for relevant articles published in English between October 2014 and December 31, 2015 was applied to the following databases: Medline, CINAHL, CENTRAL, and CDSR. The purpose of this systematic review update was to capture any relevant research that would prompt an update to the current recommendations. A total of 2,042 research articles were retrieved, and one RNAO BPG nursing research associate assessed the eligibility of the studies according to established inclusion/exclusion criteria. Any uncertainties were resolved by the RNAO's Best Practice Guideline program manager. In total, six research articles were included in the systematic review update. The included research articles continue to support the current recommendations in this Guideline.

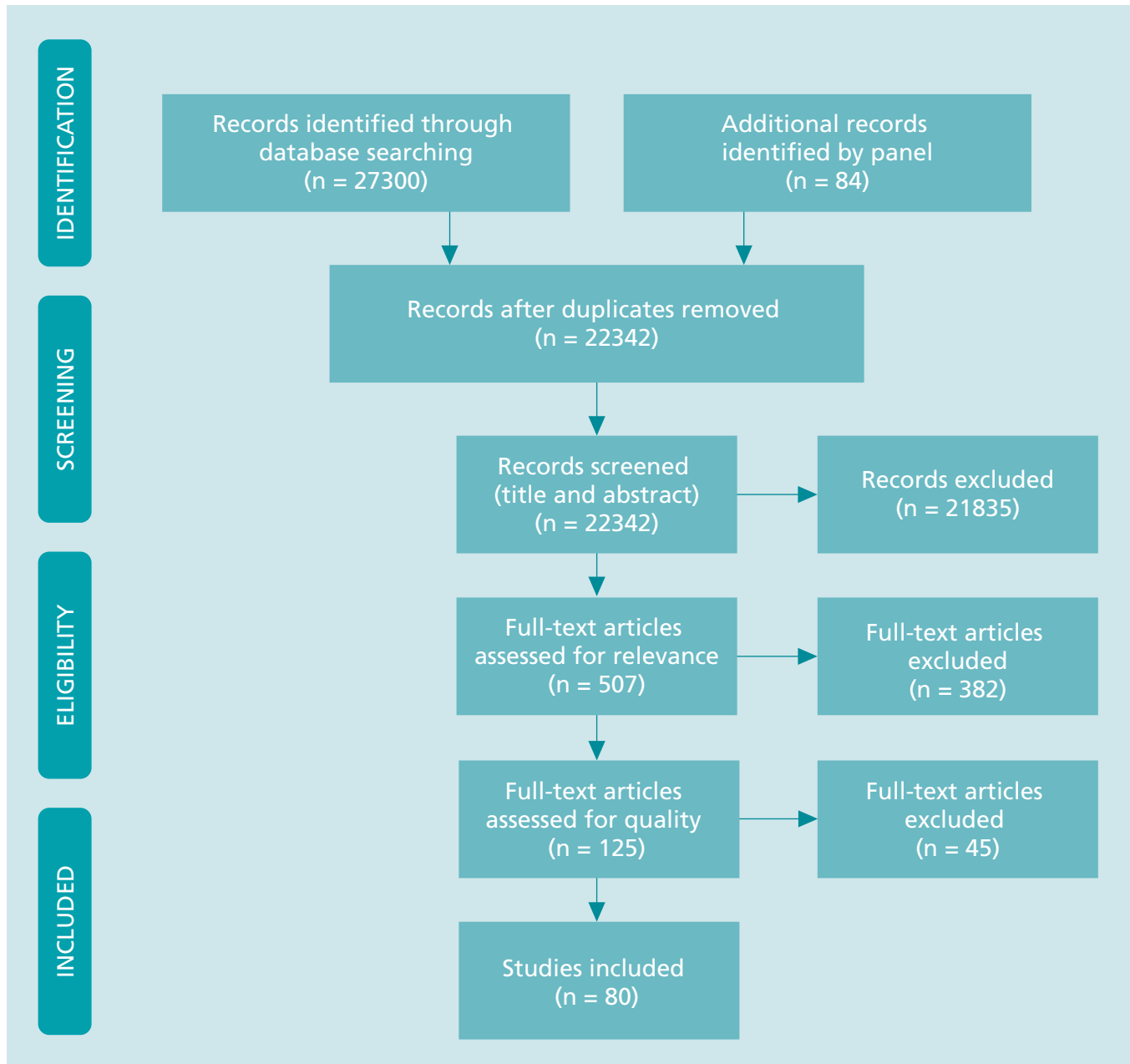
A complete Bibliography of all full text articles screened for inclusion is available at <http://rnao.ca/bpg/guidelines/pressure-injuries>.

Guidelines Review Process Flow Diagram



Flow diagram adapted from D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *BMJ* 339, b2535, doi: 10.1136/bmj.b2535

Article Review Process Flow Diagram



Flow diagram adapted from D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *BMJ* 339, b2535, doi: 10.1136/bmj.b2535

Appendix D: Resources for Pressure Injuries in Special Populations

The following is not an exhaustive list of resources on pressure injuries in special populations. The resources below have been suggested as examples of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

RESOURCE	LINK TO RESOURCE
Medical Device-Related Pressure Injuries	
<i>Best Practices for Prevention of Medical Device-Related Pressure Ulcers Posters</i> (NPUAP, n.d.)	http://www.npuap.org/resources/educational-and-clinical-resources/best-practices-for-prevention-of-medical-device-related-pressure-ulcers/
<i>Medical Device-Related Pressure Ulcers (MDRPU): The Hidden Epidemic Across the Lifespan</i> (NPUAP, 2013)	http://www.npuap.org/resources/educational-and-clinical-resources/webinars-archived-also-available/
Mucosal Membrane Pressure Injuries	
<i>Mucosal Membrane Pressure Ulcers: An NPUAP Position Statement</i> (NPUAP, 2008)	http://www.npuap.org/wp-content/uploads/2012/01/Mucosal_Pressure_Ulcer_Position_Statement_final.pdf
Cartilage Pressure Injuries	
<i>Pressure Ulcers with Exposed Cartilage Are Stage IV Pressure Ulcers</i> (NPUAP, 2012)	http://www.npuap.org/resources/position-statements/
Pressure Injuries in Children	
Baharestani, M. M., & Ratliff, C. R. (2007). Pressure Injuries in Neonates and Children: An NPUAP White Paper <i>Advances in Skin and Wound Care</i> , 20(4), 208–220.	http://www.npuap.org/wp-content/uploads/2012/01/peds_white_paper.pdf
<i>Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline</i> (NPUAP, EPUAP, & PPPIA, 2014) See “Special Populations—Pediatric Individuals” chapter	http://www.npuap.org/resources/educational-and-clinical-resources/prevention-and-treatment-of-pressure-ulcers-clinical-practice-guideline/

Pressure Injuries in People with Spinal Cord Injury

Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline (NPUAP, EPUAP, & PPPIA, 2014)
See “Special Populations—Individuals with Spinal Cord Injury” chapter

<http://www.npuap.org/resources/educational-and-clinical-resources/prevention-and-treatment-of-pressure-ulcers-clinical-practice-guideline/>

Canadian Best Practice Guidelines for the Prevention and Management of Pressure Ulcers in People with Spinal Cord Injury: A Resource Handbook for Clinicians (Houghton et al., 2013)

http://onf.org/system/attachments/168/original/Pressure_Ulcers_Best_Practice_Guideline_Final_web4.pdf

Pressure Injuries in Obese, Critically Ill, Older Adults, Operating Room, and Palliative Care

Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline (NPUAP, EPUAP, & PPPIA, 2014)
See “Special Populations” chapter

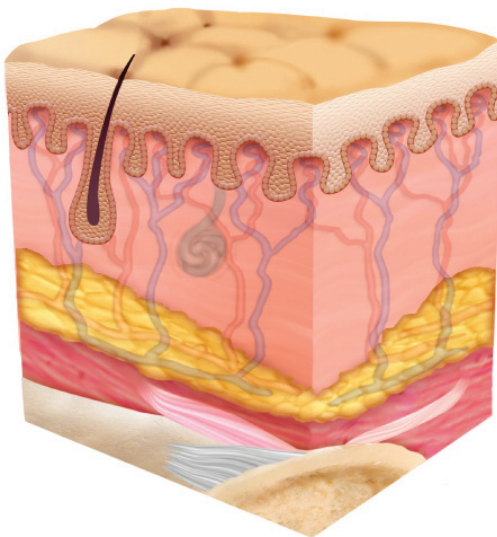
<http://www.npuap.org/resources/educational-and-clinical-resources/prevention-and-treatment-of-pressure-ulcers-clinical-practice-guideline/>

Appendix E: Pressure Injury Staging System by the National Pressure Ulcer Advisory Panel (NPUAP)

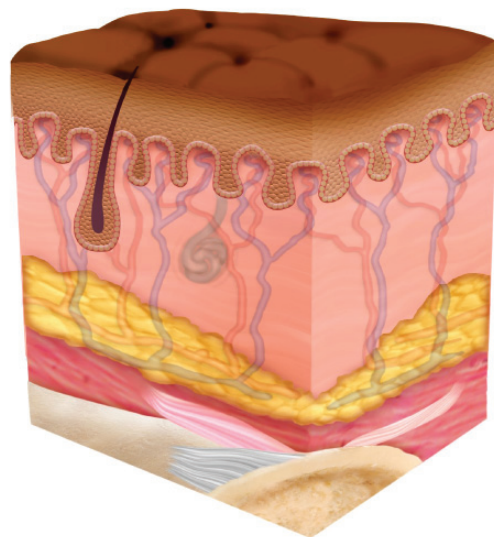
The National Pressure Ulcer Advisory Panel redefined the definition of a pressure injury during the NPUAP 2016 Staging Consensus Conference that was held April 8-9, 2016 in Rosemont (Chicago), IL.

The updated staging definitions were presented at a meeting of over 400 professionals. Using a consensus format, Dr. Mikel Gray from the University of Virginia adeptly guided the Staging Task Force and meeting participants to consensus on the updated definitions through an interactive discussion and voting process. During the meeting, the participants also validated the new terminology using photographs.

The updated staging system includes the following definitions:



Healthy skin – Caucasian



Healthy skin – Non Caucasian

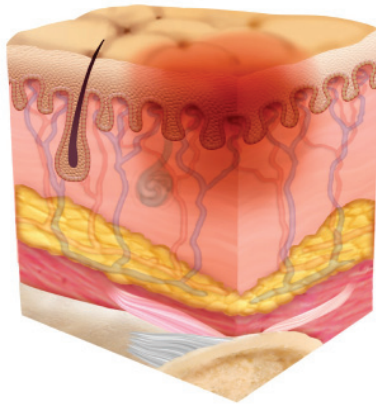
Pressure Injury

A pressure injury is localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue.

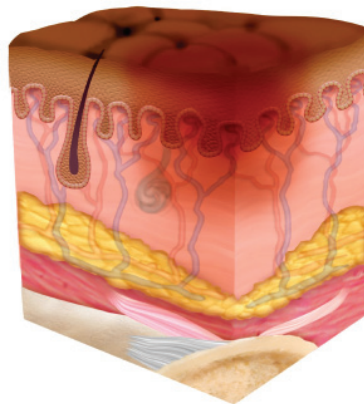
Source: Reprinted from “NPUAP Pressure Injury Stages,” by National Pressure Ulcer Advisory Panel, 2016 (<http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages/>, <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-injury-staging-illustrations/>). Copyright 2016 by National Pressure Ulcer Advisory Panel. Reprinted with permission.

Stage 1 Pressure Injury: Non-blanchable erythema of intact skin

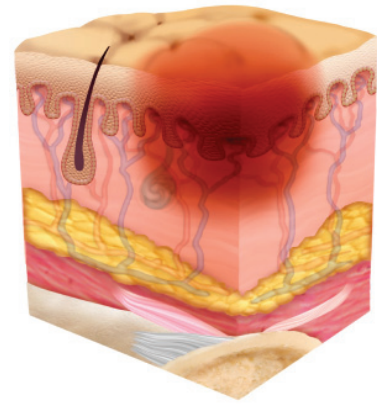
Intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes do not include purple or maroon discoloration; these may indicate deep tissue pressure injury.



Pressure Injury Caucasian



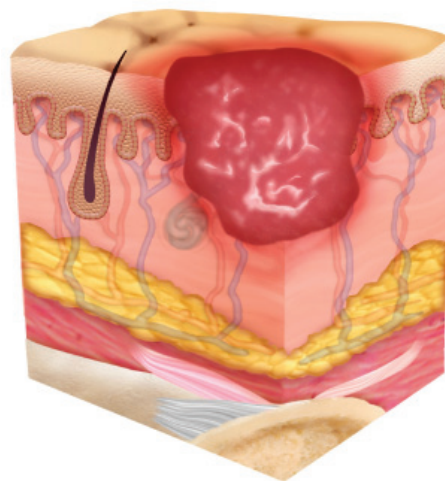
Pressure Injury Non Caucasian



Pressure Injury Edema

Stage 2 Pressure Injury: Partial-thickness skin loss with exposed dermis

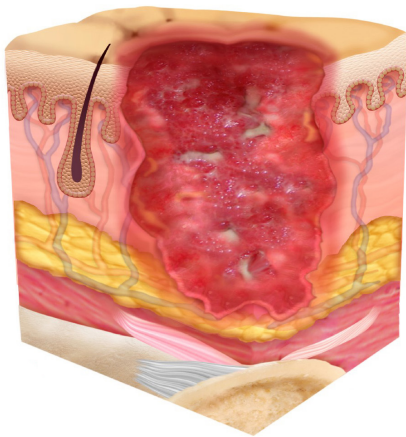
Partial-thickness loss of skin with exposed dermis. The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel. This stage should not be used to describe moisture associated skin damage (MASD) including incontinence associated dermatitis (IAD), intertriginous dermatitis (ITD), medical adhesive related skin injury (MARS), or traumatic wounds (skin tears, burns, abrasions).



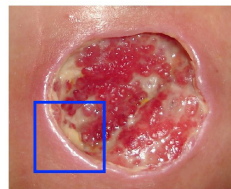
Source: Reprinted from “NPUAP Pressure Injury Stages,” by National Pressure Ulcer Advisory Panel, 2016 (<http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages/>, <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-injury-staging-illustrations/>). Copyright 2016 by National Pressure Ulcer Advisory Panel. Reprinted with permission.

Stage 3 Pressure Injury: Full-thickness skin loss

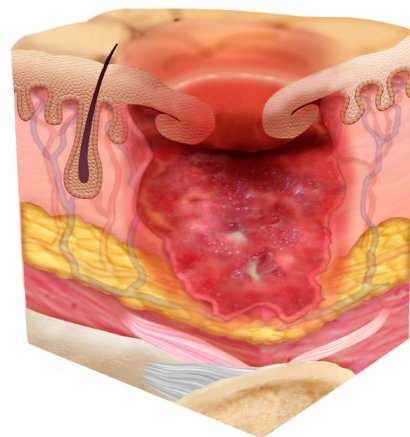
Full-thickness loss of skin, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage and/or bone are not exposed. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.



Pressure Injury



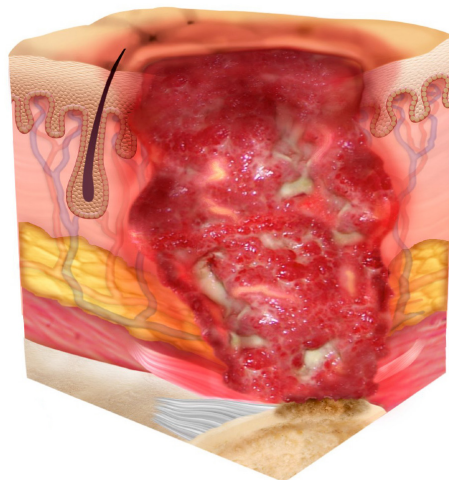
Area of Focus



Pressure Injury with Epibole

Stage 4 Pressure Injury: Full-thickness skin and tissue loss

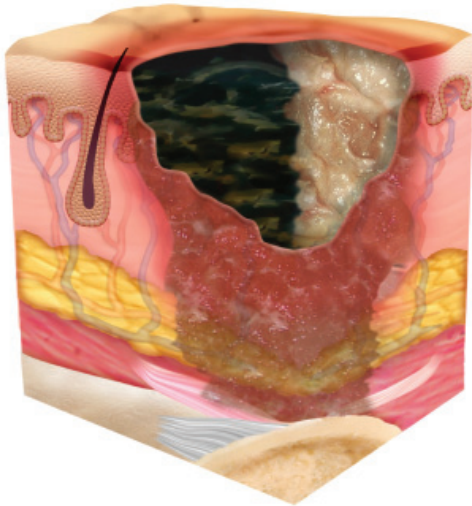
Full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage or bone in the ulcer. Slough and/or eschar may be visible. Epibole (rolled edges), undermining and/or tunneling often occur. Depth varies by anatomical location. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.



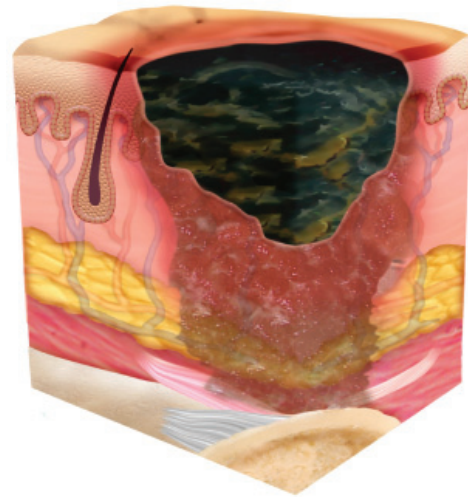
Source: Reprinted from “NPUAP Pressure Injury Stages,” by National Pressure Ulcer Advisory Panel, 2016 (<http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages/>, <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-injury-staging-illustrations/>). Copyright 2016 by National Pressure Ulcer Advisory Panel. Reprinted with permission.

Unstageable Pressure Injury: Obscured full-thickness skin and tissue loss

Full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar. If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar (i.e. dry, adherent, intact without erythema or fluctuance) on an ischemic limb or the heel(s) should not be removed.



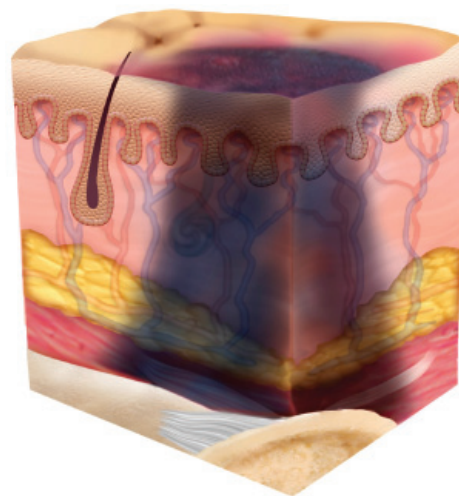
Unstageable Pressure Injury Slough and Eschar



Unstageable Pressure Injury Dark Eschar

Deep Tissue Pressure Injury: Persistent non-blanchable deep red, maroon or purple discoloration

Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (Unstageable, Stage 3 or Stage 4). Do not use DTPI to describe vascular, traumatic, neuropathic, or dermatologic conditions.



Source: Reprinted from “NPUAP Pressure Injury Stages,” by National Pressure Ulcer Advisory Panel, 2016 (<http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-injury-stages/>, <http://www.npuap.org/resources/educational-and-clinical-resources/pressure-injury-staging-illustrations/>). Copyright 2016 by National Pressure Ulcer Advisory Panel. Reprinted with permission.

Appendix F: Sample Medical History Template

<p>Chief Complaint The one or more concerns that have prompted the person to seek care</p>
<p>History of Presenting Illness (Pressure Injury)</p> <ul style="list-style-type: none">• Description of how the pressure injury developed• Thoughts and feelings about the pressure injury• What tests/treatments have been carried out• Responses to treatment
<p>Past Medical History</p> <p>Medical: Illnesses (e.g., diabetes, spinal cord injury, hypertension, etc.); weight gain or loss</p> <p>Surgical: Dates, indications, and type of operations</p> <p>Psychiatric: Illness, diagnoses, and treatments (including timeframes/dates)</p>
<p>Allergies List all allergies and type of reaction</p>

Family History Outline or diagram age and health, or death/cause of death, of immediate relatives (parents and siblings)

Personal and Social History Sources of support, coping style, source of income, lifestyle habits (smoking, alcohol, street drugs), dietary intake, exercise, description of place of residence.

Devices currently used, and funding sources for these: type of wheelchair, cushions, bed, mattress, and aids to mobility and transfers. Record the age of the devices and current function.

Systems Review

CNS: any strokes, headaches, chronic diseases that affect sensation or mobility (e.g., Parkinson’s, MS, etc.)

ENT: problems with eyes, ears, nose, or throat; problems swallowing

RESP: any breathing problems (e.g., COPD, asthma), cancer

Psychiatric: problems with mood, anxiety, psychosis, addiction, sleep pattern, cognitive problems

CVS: heart issues, hypertension, hypotension, PVD

GI: bowel, stomach, gallbladder problems; issues with bowel movements; dietary issues, intake, weight loss, or gain

GU: History of urinary tract issues (e.g. infections, frequency, incontinence)

Integumentary: skin issues, rashes, cancers, previous pressure injuries

Endocrine: diabetes, thyroid issues

Diagnostic Tests Blood work, x-rays, scans, biopsies, ultrasounds (record date and results)

Appendix G: Tools for Assessing Anxiety, Depression, and Stress

This following is not an exhaustive list of tools to assess people for anxiety, depression, and stress. The tools below have been suggested as examples of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

TOOL	DESCRIPTION OF TOOL	WEBSITE ACCESS
Hospital Anxiety and Depression Scale (HADS)	<ul style="list-style-type: none"> ■ Used to measure anxiety and depression in clinical practice (e.g., medical outpatient settings) ■ Consists of 14 questions and should take about 10 minutes to complete ■ Higher scores on the questionnaire are indicative of greater anxiety or depression ■ Questionnaire can be used to monitor progress ■ Scores may be subject to bias (biased responses or if the person misinterprets the instructions) (Solowiej, Mason, & Upton, 2010). 	http://www.scalesandmeasures.net/files/files/HADS.pdf
Perceived Stress Scale (PSS)	<ul style="list-style-type: none"> ■ Used to measure the degree to which situations in a person's life are perceived to be stressful ■ Scale can be applied in a variety of settings ■ The scale has three versions (PPS-14, PPS-10, and PSS-4) ■ The full scale (PPS-14) should take about 10 minutes to complete ■ The short scale (PPS-4) can be used to conduct short interviews ■ Scores may be subject to bias (biased responses or if the person misinterprets the instructions) (Solowiej, Mason, & Upton, 2010). 	http://www.psy.cmu.edu/~scohen/PSS.html (PPS-10)
The State-Trait Anxiety Inventory (STAI)	<ul style="list-style-type: none"> • Can be used in clinical practice to determine state and trait anxiety in relation to a specific situation • State anxiety is temporary, whereas trait anxiety is long-term (the scale can be used to differentiate) • The scale consists of 40 items and should take about 10 minutes to complete • Scores may be subject to bias (biased responses or if the person misinterprets the instructions) (Solowiej, Mason, & Upton, 2010). 	http://www.mindgarden.com/ (to purchase the tool)

Appendix H: Pressure Injury Risk Assessment Tools

The most commonly used and validated risk assessment tools for adults are (in no particular order of importance):

- **the Braden Scale for Predicting Pressure Sore Risk** (Bergstrom, Braden, Kemp, Champagne & Ruby, 1988; Braden and Bergstrom, 1994; Garcia-Fernandez, Pancorbo-Hidalgo, & Agreda, 2014; Kring, 2007);
- **the Norton Scale** (Garcia-Fernandez et al., 2014);
- **the Waterlow Score** (Garcia-Fernandez et al., 2014); and
- **the Pressure Ulcer Risk Scale (PURS)** (Carreau, Niezgodna, Trainor, Parent, & Woodbury, 2015; Poss et al., 2010).

Studies have demonstrated that the above tools are reliable and valid (AWMA, 2012; NPUAP, EPUAP, & PPPIA, 2014; Perry et al., 2014; RNAO, 2011). They are currently endorsed by reputable guideline groups, such as the Australia Wound Management Association (AWMA), the Institute for Clinical Systems Improvement (ICSI), the National Pressure Ulcer Advisory Panel (NPUAP)/European Pressure Ulcer Advisory Panel (EPUAP), and Pan Pacific Pressure Injury Alliance (PPPIA).

The following is not an exhaustive list of pressure injury risk assessment tools. The tools below have been suggested as examples identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

TOOL	VALIDATION STUDIES	WEBSITE ACCESS
Braden Scale	<p>Bergstrom, N., Braden, B., Kemp, M., Champagne, M., & Ruby, E. (1998). Predicting pressure ulcer risk: A multi-site study of the predictive validity of the Braden scale. <i>Nursing Research</i>, 47(5), 261–9.</p> <p>Kring, D.L. (2007). Reliability and validity of the Braden Scale for Predicting Pressure Ulcer Risk. <i>Journal of Wound, Ostomy and Continence Nursing</i>, 34(4), 399–406.</p> <p>Garcia-Fernandez, E. P., Pancorbo-Hidalgo, P. L., & Agreda, J. J. (2014). Predictive capacity of risk assessment scales and clinical judgement for pressure ulcers: A meta-analysis. <i>Journal of Wound, Ostomy and Continence Nursing</i>, 41(1), 24–34.</p>	<p>http://www.education.woundcarestrategies.com/coloplast/resources/BradenScale.pdf</p>
Norton Scale	<p>Garcia-Fernandez, E. P., Pancorbo-Hidalgo, P. L., & Agreda, J. J. (2014). Predictive capacity of risk assessment scales and clinical judgement for pressure ulcers: A meta-analysis. <i>Journal of Wound, Ostomy and Continence Nursing</i>, 41(1), 24–34.</p>	<p>http://www.health.vic.gov.au/_data/assets/file/0010/233668/Norton-scale.pdf</p>
Waterloo Pressure Ulcer Risk Assessment	<p>Garcia-Fernandez, E. P., Pancorbo-Hidalgo, P. L., & Agreda, J. J. (2014). Predictive capacity of risk assessment scales and clinical judgement for pressure ulcers: A meta-analysis. <i>Journal of Wound, Ostomy and Continence Nursing</i>, 41(1), 24–34.</p>	<p>http://www.judy-waterlow.co.uk/index.htm</p>

TOOL	VALIDATION STUDIES	WEBSITE ACCESS
<p>Pressure Ulcer Risk Scale (PURS)</p>	<p>Carreau, L., Niezgodna, H., Trainor, A., Parent, M., & Woodbury, M.G. (2015). Pilot study compares scores of the Resident Assessment Instrument Minimum Data Set version 2.0 (MDS 2.0) Pressure Ulcer Risk Scale with the Braden Pressure Ulcer Risk Assessment for Patients in Complex Continuing Care. <i>Advances in Skin and Wound Care</i>, 28(1), 28–33.</p> <p>Poss, J., Murphy, K. M., Woodbury, M. G., Orsted, H., Stevenson, K., Williams, G., ... Hirdes, J. P. (2010). Development of the interRAI Pressure Ulcer Risk Scale (PURS) for use in long-term care and home care settings. <i>BMC Geriatrics</i>, 10(67). doi:10.1186/1471-2318-10-67</p>	<p>http://ltc toolkit.rnao.ca/sites/ltc/files/resources/pressure_ulcer/AssessmentTools/AppedixkPUBPG.pdf</p> <p>Please refer to Appendix K:</p> <p>http://rnao.ca/sites/rnao-ca/files/storage/related/7749 PRESSURE-ULCERS Supplement 2011.pdf</p>



Appendix I: Pressure Injury Assessment Tools

According to expert panel consensus and current wound care guidelines, the most common, valid, and reliable wound assessment tools for use in adults are the following (in no particular order of importance):

- **the Pressure Ulcer Scale for Healing (PUSH)** (NPUAP, EPUAP, & PPIA, 2014; WOCN, 2010);
- **the Photographic Wound Assessment Tool (PWAT)** (Houghton et al., 2013; Thompson, Gordey, Bowles, Parslow, & Houghton, 2013); and
- **the Bates-Jensen Wound Assessment Tool (BWAT)** (NPUAP, EPUAP, & PPIA, 2014; WOCN, 2010).

The following is not an exhaustive list of pressure injury assessment tools. The tools below have been suggested as examples of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

TOOL	SOURCE/WEB ACCESS	DESCRIPTION
<p>Pressure Ulcer Scale for Healing (PUSH)</p>	<p>National Pressure Ulcer Advisory Panel (1998): http://www.npuap.org/resources/educational-and-clinical-resources/push-tool/</p>	<ul style="list-style-type: none"> ■ Developed by the Task Force of the National Pressure Ulcer Advisory Panel (NPUAP) to help clinicians determine whether a wound was healing or improving over time (Thomas et al., 1997). ■ Created in response to misuse of NPUAP staging system, which was being used inappropriately to describe wound progress or healing. ■ Original version of the PUSH had several different domains; however, a statistical technique was used to determine that three items (surface area, exudate amount, and wound base) defined the best model of healing (Gardner, Frantz, Bergquist, & Shin, 2005). Each of the three subscales are weighted; the size domain determined after measuring the wound length and width using a ruler counts for 10 of the 17 total score (Thomas et al., 1997). ■ The content validity of the PUSH has been established, and a good correlation between total PUSH scores and acetate tracings illustrates good concurrent validity (Thomas et al., 1997). ■ Reliability between raters has not been reported, and considering the wide variation known to occur when different raters measure wound extent using a ruler, poor inter-rater reliability is to be expected. However, several studies have shown that repeated measures of the PUSH in wounds over time are able to detect differences between healing and non-healing wounds (Gardner et al., 2005; Stotts et al., 2001). This has been shown not only for pressure injuries, but also for other types of wounds (Hon, Lagden, McLaren, Orr, & O’Sullivan., 2010). ■ The PUSH tool has been used in randomized controlled trials to show statistically significant differences in healing between groups and over time (Lee et al., 2006). ■ Given that it takes less than 2 minutes to complete the tool, this assessment tool is recommended for repeated use on people with pressure injuries to determine whether the wound is getting better or worse.

TOOL	SOURCE/WEB ACCESS	DESCRIPTION
Photographic Wound Assessment Tool (PWAT)	Hodgkinson, Bowles, Gordy, Parslow, & Houghton (2010): http://www.southwesthealthline.ca/healthlibrary_docs/B.9.3b.PWATInstruc.pdf	<ul style="list-style-type: none"> • Developed as an instrument that could be used to determine ulcer status from a photograph rather than at the bedside (Houghton, Kincaid, Campbell, Keast, & Woodbury, 2000). • Originally, the PWAT was based on components of the Pressure Sore Status Tool (PSST) that could be determined from a visual image, including wound size, the composition of the wound base, and the peri-ulcer skin (Houghton et al., 2000). A revision to the tool was produced and validated in 2012, so that it now contains eight items, each scored on a five-point scale from 0 to 4, yielding a total score out of 32, with zero representing a completely healed wound (Thompson et al., 2013). Content validity was not assessed with this tool. • An evaluation of 300 photographs taken of 139 wounds of different etiology showed excellent reliability and 89 percent agreement between total PWAT scores attained when wounds were evaluated at the bedside compared to using a digital image (Thompson et al., 2013). • The PWAT was able to detect differences between healing and non-healing wounds (Houghton et al., 2000), and it has been used to detect differences between treatment groups in three randomized controlled trials (Houghton et al., 2010; Houghton et al., 2003; Thompson et al., 2013). • This instrument may be useful to clinicians and researchers who wish to photograph wounds and who find that the PWAT contains the items that are relevant to their needs. • Standardized equipment and a consistent technique should be used with serial wound photography. It must be emphasized, however, that photographs should not replace bedside clinical wound assessment (NPUAP, EPUAP, & PPPIA, 2014).

TOOL	SOURCE/WEB ACCESS	DESCRIPTION
Bates-Jensen Wound Assessment Tool (BWAT)	Bates-Jensen (2001): http://geronet.med.ucla.edu/centers/borun/modules/Pressure_ulcer_prevention/puBWAT.pdf Pictorial guide: Harris, C., Bates-Jensen, B., Parslow, N., Raizman, R., Singh, M., & Ketchen, R. (2010). Bates-Jenson Wound Assessment Tool: Pictorial Guide Validation Project. <i>Journal of Wound, Ostomy and Continence Nursing</i> , 37(3), 254–259.	<ul style="list-style-type: none"> ■ One of the most widely adopted assessment tools used in wound-care practice in Canada. ■ The PSST, which was developed by Barbara-Bates-Jensen, is a comprehensive discriminative tool that consists of 13 items, including wound extent (size and depth), the quality and amount of tissue in the wound base, the edges, and peri-ulcer skin. Each item is scored on five-point scale and summed to give a scale range of 13–65, where a score of 13 represents a completely healed wound. ■ The PSST has previously been shown to have very high content validity, meaning that the tool contains all of the appropriate domains to fully describe the wound (Bates-Jensen, Vredevoe, & Brecht, 1992). ■ Further validation showed the PSST had excellent concurrent validity when compared with the NPUAP staging system and good intra-rater and inter-rater reliability (Bates-Jensen and McNeese, 1995). ■ In 2001, the PSST was revised and renamed the BWAT to signify that it could be used to evaluate more than just pressure injuries (RNAO, 2007). The revisions were considered minor, and further validation of the BWAT has been limited (Karahana et al., 2014). ■ The BWAT has been used to detect differences in wound status over time and to determine whether new treatment interventions accelerated wound healing over control or standard wound treatments. ■ Results have been mixed where significant differences between groups and over time have or have not been detected (Gardner et al., 2005; Gupta et al., 2009; Houghton et al., 2003; McCallon & Frilot, 2015). ■ Since there are no published reports that demonstrate the responsiveness of either the PSST or BWAT, it is not possible to determine whether conflicting results are due to an ineffective treatment or because the assessment tool is not sensitive to changes. ■ Given that results derived from the PSST were found to be more accurate and reliable when used by experienced rather than novice clinicians (Bates-Jensen et al., 1992) and that it takes an average of 3.4 (experienced) and 15 minutes (novice) to complete the assessment (RNAO, 2007), the PSST/BWAT may be more appropriate for use by experienced wound-care clinicians as a discriminative assessment tool to fully describe the wound during the initial assessment. ■ Using the tool repeatedly to detect changes in wound status over time is not recommended at this time, since responsiveness of the PSST/BWAT has not yet been demonstrated.

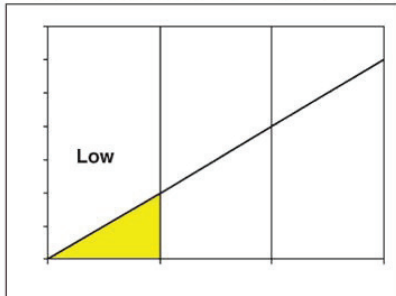
CHARACTERISTIC	NPUAP PRESSURE INJURY STAGING SYSTEM	PUSH	PWAT	PSST/ BWAT
DISCRIMINATIVE ASSESSMENT TOOL				
Describes wound extent and severity. Used only on initial assessment.	Yes	No	No	No
Describes wound characteristics (extent, base, edges, peri-ulcer skin)	No	No	Some	Yes
CONTENT VALIDITY				
Can be used on wound photographs	No	No	Yes	No
CONCURRENT VALIDITY				
Can be used with multiple assessors	Yes	No	Yes	Yes
RELIABILITY				
EVALUATIVE ASSESSMENT TOOLS				
Can detect if the wound is healing (i.e., getting better or worse) RESPONSIVENESS	No	Yes	Yes	No

The following definitions (adapted from Guyatt, Rennie, Meade, & Cook, 2008) are provided as an aid to interpreting the chart above:

- Discriminative assessment tools** are developed to distinguish between individuals on the basis of whether certain characteristics are present or absent. Such tools tend to be quite extensive, covering the whole spectrum of characteristics related to the type of wound being described, and thus provide a wealth of information to describe the status of the wound at a particular point in time.
- Evaluative assessment tools** measure the magnitude of a change (e.g., healing) that occurs over time. Therefore, the items included in an evaluative assessment should only be those that will change as a wound heals. Because evaluation tools can detect changes in wound status, they can be used as an outcome measure to determine the effectiveness of treatment interventions.
- Content validity** is the extent to which an assessment tool evaluates what it is intended to measure; typically, it is confirmed by a panel of experts who agree that the tool has enough items to adequately describe the type of wound being assessed. In general, the more information that is available to illustrate content validity, the greater the confidence that can be placed in the measurement instrument.
- Concurrent validity** is established when there is a sufficiently strong association or agreement between the results obtained using a newly developed tool and those obtained using a well-established measure, or gold standard. The closer the correlation coefficient is to one, the stronger the relationship between the new tool and a gold standard is—and the more accurate the instrument can be considered.
- Reliability** refers to the extent to which measurements made with a particular measurement tool are reproducible either by the same assessor on repeated occasions (intra-rater) or by two different assessors (inter-rater). An assessment tool that contains domains that are selected based on subjective opinion and individual interpretation will likely have poor inter-rater reliability; however, such a tool may still be useful if the same clinician performs all of the assessments. Because a reliable instrument provides consistent measurements, a smaller effect of treatment must occur for the change to be detected or for the change to be real. In general, reliability coefficients between 0.75 and 1.0 are considered acceptable.
- Responsiveness**, or sensitivity to change, is the ability of an assessment tool to detect a change over time that can be attributed to a treatment effect. It is critical that an instrument be responsive if it is to be used as an outcome measure to evaluate the effectiveness of a treatment program.

Appendix J: Progression from Bacterial Balance to Bacterial Damage

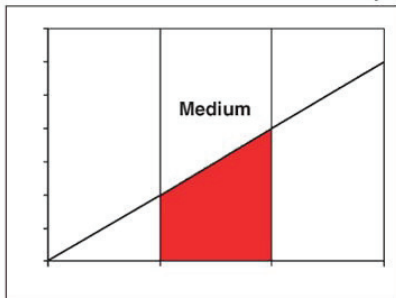
Contaminated or colonized



Bacteria are present on the wound surface (contaminated). A steady state of replicating organisms are attaching to the wound tissue and multiplying but they are not associated with tissue damage or delayed healing (colonization).



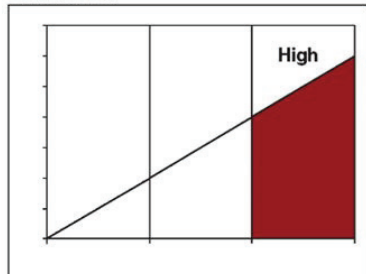
Critically colonized (local infection, covert infection, increased bacterial burden)



- The bacterial burden in the wound bed is increasing.
- Initiates the body's immune response (inflammation).
- The wound is no longer healing at the expected rate: wound size is not decreasing.
- Look for the signs outlined in the enabler NERDS.



Infected



- Bacteria are present within the wound and have spread to the deeper and surrounding tissue. They are multiplying and causing tissue damage.
- There is an associated host inflammatory response that has now spread to the deeper tissue and surrounding skin.
- The wound is painful and may increase in size with potential satellite areas of breakdown.
- Look for the signs outlined in the enabler STONES.



Source: Reprinted from "Increased Bacterial Burden and Infection: NERDS and STONES," by R. G. Sibbald, K. Woo, and E. A. Ayello, 2007, *Wounds UK*, 3(2), pp. 25–46. Copyright 2007 by Wolters Kluwer Health, Inc. Reprinted with permission.

Appendix K: Assessment for Infection

This is one method to systematically assess for superficial critical colonization (localized infection) and deeper and surrounding infection (systemic infection) in people with pressure injuries. This is not intended to be a comprehensive list but rather suggestions identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

Both kinds of infections must be treated in order to avoid delays in wound healing.

NERDS[®]

This method has been validated for the assessment of bacterial burden in wounds (Woo & Sibbald, 2009). A person must meet **at least three of the following criteria** to be considered for superficial wound infection treatment (Perry et al., 2014; Sibbald et al., 2007; Sibbald et al., 2011):

N – non-healing wound. This refers to wounds that have not healed, despite the implementation of appropriate wound care interventions (e.g., the cause of the wound was treated and person-/family-centred concerns were addressed).

E – exudate. Increased exudate from a pressure injury indicates bacterial imbalance (in the absence of an autolytic debridement process), which in turn can cause peri-wound maceration.

R – red and bleeding. A red and bleeding wound surface and granulation tissue is indicative of bacterial imbalance.

D – debris. Yellow or black necrotic tissue and debris on the wound surface stimulates infection by acting as a food source for bacteria.

S – smell. The unpleasant smell from a pressure injury generally results from bacterial imbalance, tissue inflammation, and the release of bacterial byproducts from tissue necrosis. Different bacteria produce different smells—for example, *Pseudomonas* diffuses a sweet scent, while anaerobes produce a putrid smell.

STONEES®

This is one method to systematically assess for deeper and surrounding wound infections (systemic infections). This method has been validated for the assessment of bacterial burden in wounds (Woo and Sibbald, 2009). A person must meet **at least three of the following criteria** to be considered for deep and surrounding wound infection intervention:

S – size. An increased wound size may be due to (1) deeper and surrounding tissue damage caused by bacteria, (2) the cause of the wound not having been treated, or (3) a local or systemic cause that is impairing wound healing (Sibbald et al., 2007).

T – temperature. Infection should be highly suspected if there is greater than a 3-degree temperature difference between the two mirror-image sites (e.g., the left heel and the right heel) (Sibbald, Elliott, Ayello, & Somayaji, 2015; Sibbald et al., 2007).

O – os (probe to or exposed bone). Osteomyelitis should be highly suspected if a health-care professional can probe to bone or if the bone is exposed (Sibbald et al., 2007).

N – new or satellite areas of breakdown. Satellite breakdown refers to areas of skin breakdown that are separate from the main pressure injury. This may occur when (1) the cause of the wound has not been treated, (2) local damage is present, or (3) there is an infection (Sibbald et al., 2007).

E – exudate. Increased exudate is indicative of increased bacterial burden and damage (Sibbald et al., 2015; Woo & Sibbald, 2009).

E – erythema and/or edema (cellulitis). Erythema and/or edema is indicative of increased bacterial burden and bacterial damage. The bacterial burden and damage in turn causes inflammation, vasodilation (i.e., erythema), and leakage of fluid into the tissue (i.e., edema) (Sibbald et al., 2015; Sibbald et al., 2007; Woo & Sibbald, 2009).

S – smell. Bacteria that invade tissue cause wounds to have a “foul” smell (Sibbald et al., 2007).

Appendix L: Swabbing Technique

The Levine technique⁶ is one method of obtaining a semi-quantitative wound culture swab to guide the use of appropriate anti-infective agents (or tissue culture, in appropriate settings) (NPUAP, EPUAP, & PPIIA, 2014; WOCN, 2010). It may also be appropriate to take a tissue culture. This is not intended to be a comprehensive list but rather suggestions of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

The Levine technique for performing quantitative swab cultures:

1. Cleanse the wound with normal saline.
2. Remove/debride non-viable tissue.
3. Wait two to five minutes.
4. If the ulcer is dry, moisten the swab with sterile normal saline.
5. Culture the healthiest looking tissue in the wound bed.
6. Do not culture exudates, pus, eschar, or heavily fibrous tissue.
7. Rotate the end of a sterile alginate-tipped applicator over a 1 cm² area for 5 seconds.
8. Apply sufficient pressure to the swab to cause tissue fluid to be expressed.
9. Use sterile technique to break the tip of the swab into a collection device designed for quantitative cultures (NPUAP, EPUAP & PPIIA, 2014, p. 164).



Appendix M: Nutrition Screening and Assessment Tools

The following is not an exhaustive list of nutrition screening and assessment tools but rather suggestions of tools identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

TOOL	WEB ACCESS	DESCRIPTION
Canadian Nutrition Screening Tool	Canadian Malnutrition Taskforce (2014): http://nutritioncareincanada.ca/wp-content/uploads/2014/11/CNST.pdf	The CNST, which asks questions about recent changes in weight and food intake, was tested for reliability when used by a variety of health-care professionals (e.g., registered dietitians, registered nurses, registered practical nurses, and diet technicians (Laporte et al., 2014). The CNST tool asks two questions: (1) <i>Have you lost weight in the past 6 months without trying to lose this weight?</i> and (2) <i>Have you been eating less than usual for more than a week?</i> A person who answers “yes” to both questions is considered to be at nutritional risk.
Subjective Global Assessment	Canadian Malnutrition Taskforce (2014): http://nutritioncareincanada.ca/resources/	SGA is a quick assessment tool that determines (i.e., diagnoses) nutritional status and helps to triage care. It combines information about an individual’s dietary intake, weight status, gastrointestinal symptoms, functional capacity, and metabolic requirements with a physical assessment (Detsky et al., 1987) to create a global assessment of the person’s nutritional status. The evaluator assigns a rating of A (well-nourished), B (mildly malnourished), or C (severely malnourished). Individuals who are rated as a B or a C will require a more comprehensive nutritional assessment (NPUAP, EPUAP & PPPIA, 2014).

Appendix N: Pain Assessment Tools

The following is not an exhaustive list of pain assessment tools but rather suggestions of tools identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

CATEGORY	TOOLS AND CUES FOR PAIN ASSESSMENT
Cognitively intact adults	<p>These pain assessment tools have been validated for use in adults with pressure injuries (AWMA, 2012; NPUAP, EPUAP & PPPIA, 2014, Solowiej, Mason & Upton, 2010).</p> <ul style="list-style-type: none"> ■ Visual Analogue Scale ■ Numerical Pain Rating Scale ■ Verbal Pain Rating Scale ■ Wong-Baker FACES Pain Rating Scale ■ McGill Pain Questionnaire
Cognitively impaired (including communicatively impaired but cognitively intact adults e.g., ALS, stroke)	<p>Depending on the severity of the cognitive impairment, the expert panel recommends several self-reported pain assessment tools that have been used in this population, including:</p> <ul style="list-style-type: none"> ■ Iowa Pain Thermometer ■ Verbal Pain Rating Scale <p>The following additional observational pain assessment tools may be considered:</p> <ul style="list-style-type: none"> ■ Assessment of Discomfort in Dementia (ADD) protocol ■ Abbey Pain Scale ■ Pain Assessment Checklist for Seniors with Limited Ability to Communicate Proxy Pain Questionnaire ■ Pain Assessment in Advanced Dementia (AWMA, 2012) <p>The following non-verbal cues may be used to assess pain (NPUAP, EPUAP & PPPIA, 2014; Solowiej, Mason & Upton, 2011, 2015):</p> <ul style="list-style-type: none"> ■ Changes in activity patterns ■ Decreased appetite ■ Guarding ■ Grimacing ■ Withdrawal ■ Crying ■ Moaning ■ Delirium ■ Restlessness ■ Rubbing ■ Increased heart and breathing rate ■ Faster eye-blink rate ■ Muscle tension ■ Squirming and sweating hands ■ Dry mouth ■ Pale skin and cold sweat ■ Avoidance behaviour

Appendix O: Seating Assessment

The following is one method of how to perform a seating assessment for people with pressure injuries. This is not an exhaustive list but rather an example of a seating assessment identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

The term “pressure ulcer” used in this appendix, refers to “pressure injury.”

Seating Assessment

A seating and mobility assessment requires a specialized expertise. As a result, all clients at risk of developing pressure ulcers, or who have pressure ulcers and sit in a wheelchair or other chairs should be referred to an occupational or physical therapist with an expertise in seating and mobility. These individuals are often familiar with various funding sources both governmental and non-governmental which may be able to assist the client with the purchase of any needed equipment. A seating assessment should occur every two to three years, whenever the client has status changes, or where there is a risk of pressure ulcer development.

There are other activities that members of the health-care team can do to maximize the reduction in pressure, friction and shear when sitting. These include:

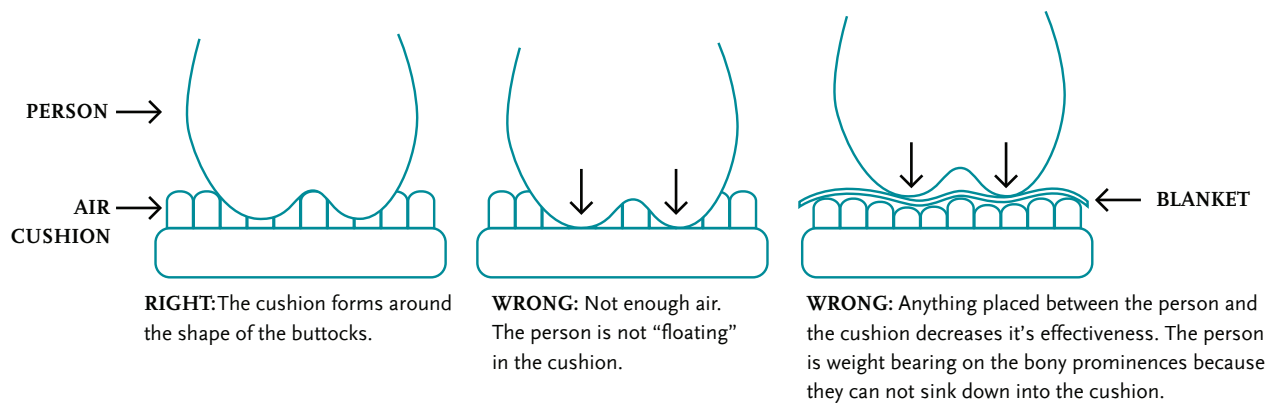
- **If the client uses a wheelchair, ensure that the wheelchair and seat cushion have been prescribed for that client and it is the latest prescription.** Clients may have been given a wheelchair that was prescribed for another relative, or purchased without a therapist’s involvement. In these situations, the fit of the chair may not be ideal. In other cases, the client may have a newer piece of equipment that they are not using. Encouraging the use of the most recently prescribed equipment may help to minimize friction and shearing forces.
- **Check that there are no foreign objects in the wheelchair.**
- **Encourage clients to engage in weight shifting behavior.** Depending on the abilities of the client this may include shifting from side to side, leaning forward or using the tilt feature on their chair.
- **Assist clients to reposition themselves in the wheelchair at least every 2 hours.**
- **Always use a specialty wheelchair cushion, which has been prescribed by an occupational or physical therapist. Ensure this cushion is correctly placed in the wheelchair.** Many cushions have contours on the top of the cushion. The contour in the middle on one side of the cushion is called a pommel. The pommel should be positioned on the top at the front of the wheelchair, as it is designed to help align the legs. Provide education for the client and/or family on cushion use.

Source: Reprinted from “Appendix M: Seating Assessment,” by Registered Nurses’ Association of Ontario, *Risk Assessment and Prevention of Pressure Ulcers Guideline Supplement*, 2011, pp. 44–45. Copyright 2011 by Linda Norton. Reprinted with permission.

- Check to ensure that the wheelchair is properly maintained and is not worn or bottoming out.** As foam cushions near the end of their life span, they may not return to their original shape when the client's weight is removed; alternatively they may collapse under the client and not distribute the pressure under the client. Some gel cushions may leak. Bottoming out or leaking are indicators that the client requires a new pressure management cushion. Air cushions should be checked to ensure they are properly inflated weekly. The only way to check the inflation of an air cushion is to put your hand between the client and cushion when the client is sitting normally on the chair (Note: wear gloves during this procedure. A low friction sleeve or sheet over the glove will make this process easier). There should be approximately one inch of air between the client's lowest bony prominence, and the bottom of the cushion (see diagram below).

Inflation of Air Cushions

Concept: The person should be "floating" in the cushion not sitting "on top of" the cushion.



RIGHT: The cushion forms around the shape of the buttocks.

WRONG: Not enough air. The person is not "floating" in the cushion.

WRONG: Anything placed between the person and the cushion decreases its effectiveness. The person is weight bearing on the bony prominences because they can not sink down into the cushion.

OTHER TIPS:

- The best way to check the inflation is to put your hand between the person's bony prominence (ischial tuberosity) and the cushion and "feel" how much air is in the cushion.
- When the person gets out of the cushion it may look as though there is not enough air.
- Remember to check the cushion regularly to ensure that it has the correct amount of air.

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Appendix P: Assessment of Goals of Care

The following is not an exhaustive list of methods on assessing a person's goals of care. This mnemonic has been suggested as an example identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback. It is an example of how to identify the goals of symptom management in people for whom wound healing is not a clinical expectation and where maintaining the person's comfort is key.

SPECIAL:

S – stabilize the wound. Collaborate with the person or the person's circle of care to prevent complications and/or further deterioration of the wound.

P – prevent new wounds. Collaborate with the person or the person's circle of care to assess and manage the person's risks for additional pressure injuries. Preventing additional pressure injuries will help avoid further physical discomfort.

E – eliminate odour. Collaborate with the person or the person's circle of care to reduce or eliminate unpleasant odours from a person's pressure injury to improve his/her quality of life.

C – control pain. Frequent turning and repositioning may not be possible due to the associated pain. In such cases, it is important to respect the person's preferences and goals of care with regard to a tailored repositioning schedule. Moreover, collaborate with the person or the person's circle of care to consider other non-pharmacological and pharmacological pain management strategies to help keep the person comfortable.

I – infection prevention. Collaborate with the person or the person's circle of care to prevent infections. Preventing infections helps avoid further physical discomfort and complications.

A – advanced absorbent wound dressing. Collaborate with the person or the person's circle of care to use dressings that help control wound drainage and odour.

L – lessen dressing changes as palliative care occurs. Collaborate with the person or the person's circle of care to reduce the frequency of dressing changes. Frequent dressing changes can be painful and beyond what the person can tolerate. (Perry et al., 2014)

Appendix Q: Support Surface Selection Tool

The following is one method of how to select the appropriate support surface for people with pressure injuries. This is not an exhaustive list but rather an example of a tool for support surface selection identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

The term “pressure ulcer” used in this appendix, refers to “pressure injury.”

Support Surface Selection Tool

Adapted from: Norton, L., Coutts, P., Sibbald, R. G. (2011). Beds: Practical Pressure Management for Surfaces/Mattresses. *Advances in Skin & Wound Care*, 24(7), 324-332.

With an evidence-based practice background (scientific evidence, expert knowledge and patient preference), clinicians still require a user-friendly guide to translate this information into practice to potentially improve patient care outcomes. The Support Surface Selection Tool was first developed in 2008 to respond to this need. This tool stratified the types of support surfaces (active support surfaces and reactive support surfaces) based on the risk of the client developing pressure ulcers or the number of ulcers the client has and their mobility status. Feedback from clinicians indicated that while the tool was helpful, further assistance was required to select the additional features. As a result, two decision trees were created to help with the selection of specific features of active and reactive support surfaces.

As illustrated in Figure 1, a validated risk assessment tool should be utilized to determine the type of support surface required for an individual client (i.e. the columns across the top of the chart in Figure 1). If the client currently has pressure ulcers, choose the description in the first row which best fits the client’s clinical status. Note that the heels are excluded from this clinical description as heels are best managed independently from the bed surface (RNAO, 2007; NPUAP & EPUAP, 2009).

Next determine the client’s usual degree of mobility in bed by selecting the appropriate row listed down the side of the chart. Where the column of “risk” intersects with the row of “mobility”, a specific type of support surface is recommended; either a reactive support surface or an active support surface. If a reactive support surface is recommended, go to the reactive support surface decision tree (Figure 2). If an active support surface is recommended, go to the active support surface decision tree (Figure 3). Follow the decision tree to identify other specific features that may benefit the specific client. Recognize that this algorithm is not designed to replace clinical judgment, but is designed to assist the clinician to choose features for their client based on a comprehensive assessment of each individual client. Specific examples of support surfaces can be added in to the last box of the decision tree based on the surfaces available in your setting.

Figure 1

© Norton, Coutts, Sibbald		Validated Risk Assessment Score or Pressure Ulcer Description			
Ability to change position in bed (i.e. bed mobility)		At risk Or Redness present which fades quickly when pressure removed	Moderate risk Or Pressure ulcer (excluding the heels) where the client can be positioned off the ulcer	High Risk Or Pressure ulcer (excluding the heels) and redness over another area	Very High Risk Or Multiple pressure ulcers (excluding the heels) or the client can not be positioned off of an ulcerated area
	Total assist to change position in bed	Reactive Support Surface (non powered) (e.g. air/gel/foam overlay)	Reactive Support Surface (e.g. air/gel/foam overlay)	Active Support Surface Multi-Zoned Surface (e.g. alternating pressure mattress, rotational surface) or a powered reactive support surface (e.g. low air loss)	Active Support Surface Multi-Zoned Surface (e.g. alternating pressure mattress, rotational surface)
	Moderate assistance with bed mobility required.	Reactive Support Surface (non powered e.g. air/gel/foam overlay or high density foam mattress)	Reactive Support Surface (e.g. foam overlay with air section insert in the area of the wound)	Reactive Support Surface (non powered e.g. foam overlay with air section insert in the area of the wound)	Active Support Surface Multi-Zoned Surface (e.g. alternating pressure mattress, rotational surface)
	Client independent with or without a device with bed positioning (light assist may be required)	Reactive Support Surface (eg High density foam mattress)	Reactive Support Surface (e.g. foam overlay with air section insert)	Reactive Support Surface (non powered) (e.g. air/gel/foam overlay)	Active Support Surface (if the controls can be placed within the client's reach)

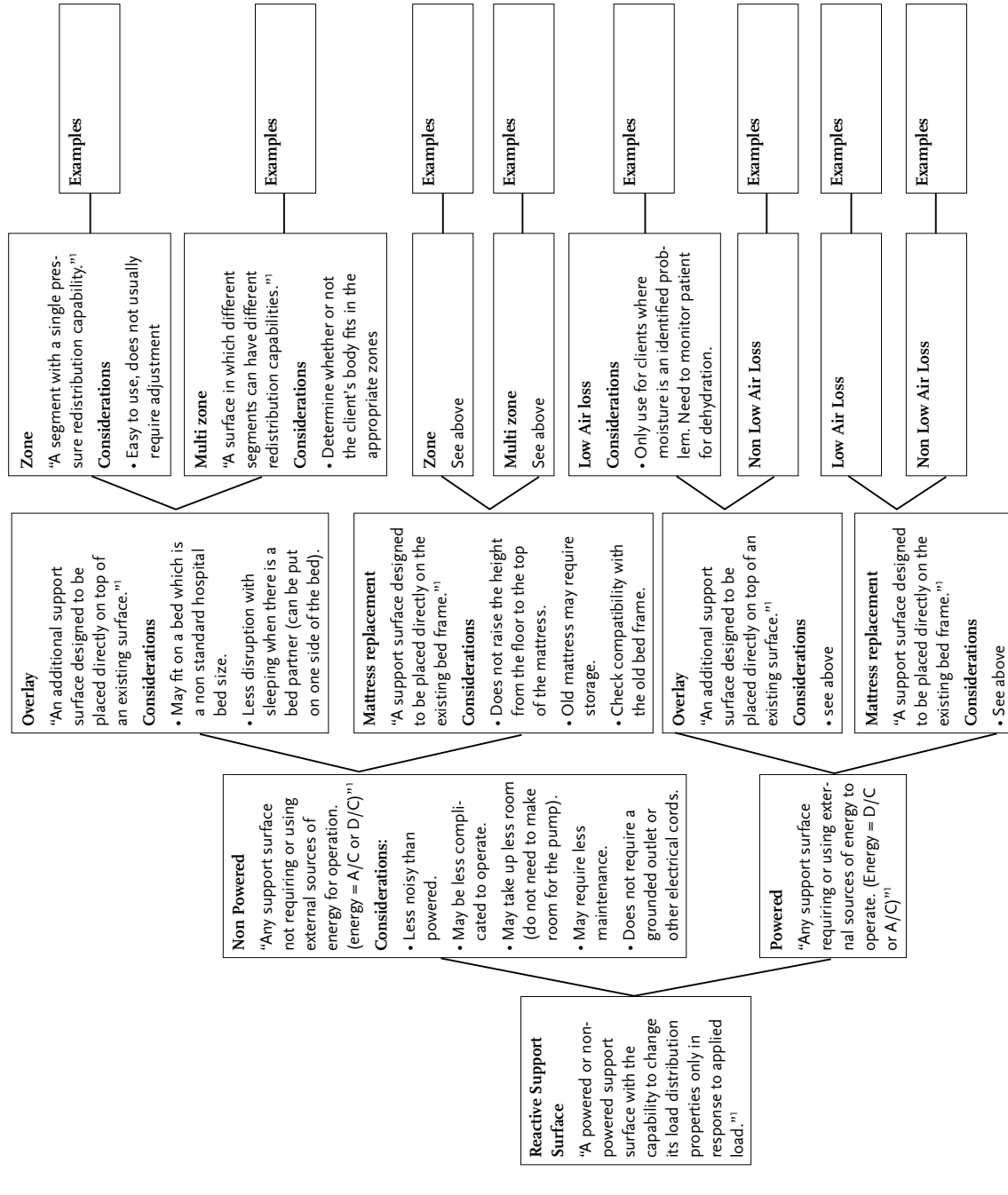
Users guide:

1. With a validated risk assessment tool, determine the patient level of risk OR grade the patients with ulcers based on the clinical descriptors
2. Assess the level of mobility in bed and follow the column and row intersection to determine the appropriate reactive or active support system
3. For more information on reactive surfaces see figure 2 and for more information on active surfaces see figure 3

Source: Reprinted from “Beds: Practical Pressure Management for Surfaces/Mattresses,” by L. Norton, P. Coutts, and R. G. Sibbald, 2011, *Advances in Skin & Wound Care*, 24(7), pp. 324–332. Copyright 2011 by Wolters Kluwer Health, Inc. Reprinted with permission.

Figure 2 Reactive Support Surface

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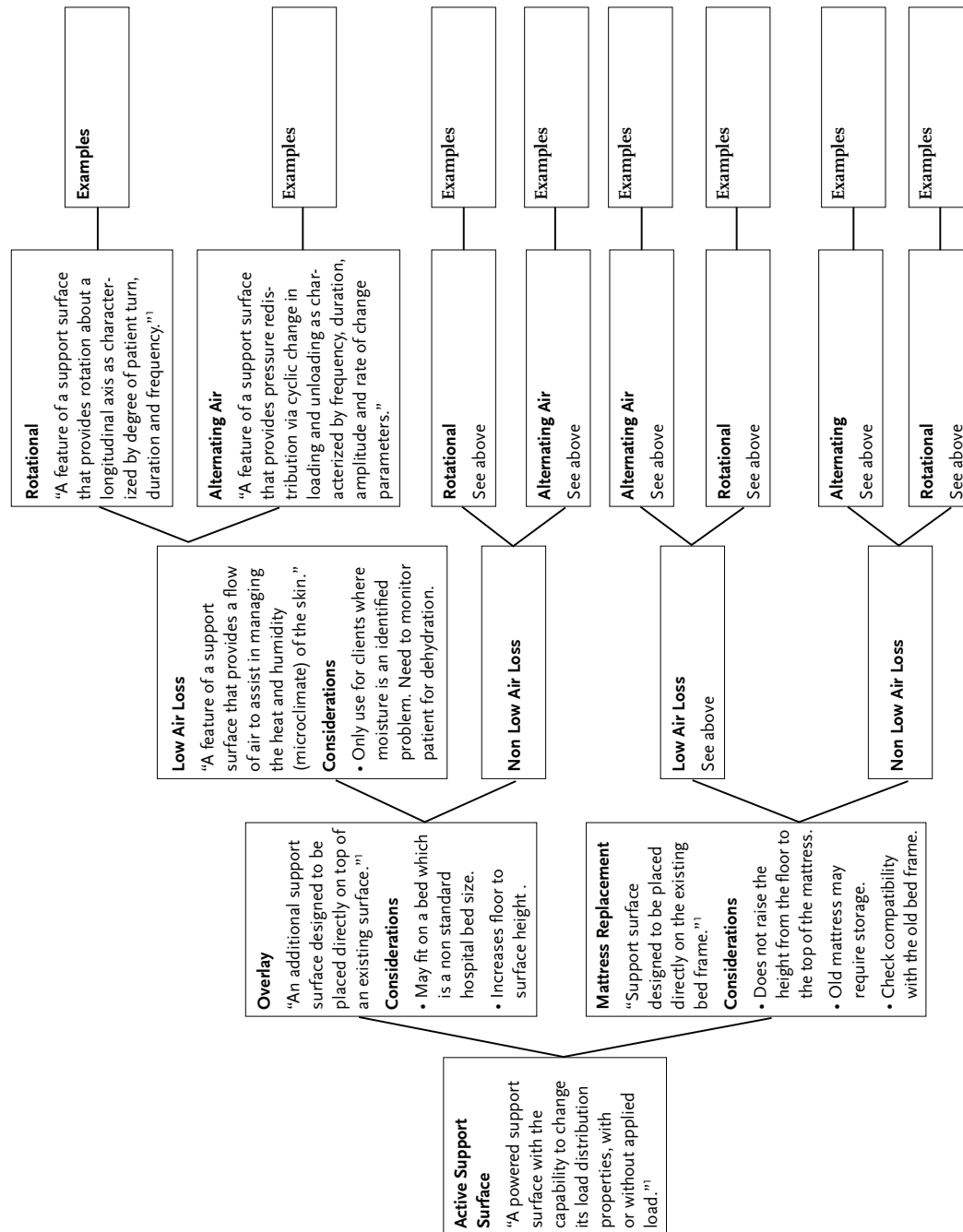


¹ National Pressure Ulcer Advisory Panel, Support Surface Standards Initiative: Terms and Definitions version 01/29/2007 http://www.npuap.org/NPUAP_S3I_TD.pdf. Accessed 03/21/ 2007.

Source: Reprinted from "Beds: Practical Pressure Management for Surfaces/Mattresses," by L. Norton, P. Coutts, and R. G. Sibbald, 2011, *Advances in Skin & Wound Care*, 24(7), pp. 324–332. Copyright 2011 by Wolters Kluwer Health, Inc. Reprinted with permission.

Figure 3 Active Support Surface

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¹ National Pressure Ulcer Advisory Panel, Support Surface Standards Initiative: Terms and Definitions version 01/29/2007 http://www.npuap.org/NPUAP_S3I_TD.pdf. Accessed 03/21/ 2007.

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Appendix R: Cleansing Solutions

This is not an exhaustive list of cleansing solutions for chronic wounds (including pressure injuries), but rather suggestions of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

Agent	Effects
Sodium hypochlorite solution	High pH causes irritation to skin. Dakins Solution and Eusol (buffered preparation) can select out Gram-negative micro-organisms.
Hydrogen peroxide	De-sloughing agent while effervescing. Can harm healthy granulation tissue and may form air emboli if packed in deep sinuses.
Mercuric chloride, crystal violet, Proflavine	Bacteriostatic agents active against Gram-positive species only. May be mutagens and can have systemic toxicity.
Cetrimide (quaternary ammonium)	Good detergent, active against Gram-positive and -negative organisms, but high toxicity to tissue.
Chlorhexidine	Active against Gram-positive and -negative organisms, with small effect on tissue.
Acetic acid (0.5% to 5%)	Low pH, effective against <i>Pseudomonas</i> species, may select out <i>S. aureus</i> .
Povidone iodine	Broad spectrum of activity, although decreased in the presence of pus or exudate. Toxic with prolonged use or over large areas.

Source: Reprinted from “Best Practice Recommendations for Preparing the Wound Bed: Update 2006,” by R. G. Sibbald, H. Orsted, P. M. Coutts and D. H. Keast, 2006, *Wound Care Canada*, 4(1), pp. 15–29. Copyright 2006 by Wolters Kluwer Health, Inc. Reprinted with permission.

Appendix S: Dressing Categories and Indications for Use

Modern Dressing Category	Comment	Average Wear Time
Hydrogels ^a	Contain 70%-90% moisture	1–3 d
Donate moisture	Donates moisture to the wound	
	Bioresorbable	
	Can be combined with silver, iodine (cadexomer) for antimicrobial action	
Films ^a	Protective layer	3–7 d
Moisture neutral	Does not donate or absorb a large amount of exudate	
Hydrocolloids ^a	Water-binding and water-repelling components	2–7 d
	Will absorb small to moderate amount of moisture	
Hydrofibers	Bind small to moderate amount of exudate	1–3 d
	Fluid lock, nonbioresorbable	
	Can be combined with silver for antimicrobial action	
Calcium alginates ^a	Absorb small to moderate amounts of exudate onto outer surface of dressing	1–3 d
	Fibers are bioresorbable, releasing calcium (hemostasis property) and resorbing sodium to form a hydrogel with exudate fluid	
	Can be combined with silver and honey for antibacterial action	
Foams	Absorb moderate amount of exudate	2–7 d
	Fluid balance with the dressing giving back some exudate that prevents wound surface from dehydrating	
	Can be a method of delivering an antibacterial agent (silver) or containing a nonrelease antibacterial agent for antibacterial action above the wound surface (PHMB, methylene blue/gentian violet)	
Superabsorbents	Absorb moderate amount of exudate	1–3 d
	Fluid lock technology equivalent to diapers	

^aAlso provides autolytic debridement properties.
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Source: Reprinted from “Optimizing the Moisture Management Tightrope with Wound Bed Preparation 2015,” by R. G. Sibbald, J. A. Elliott, E. A. Ayello, and R. Somayaji, 2015, *Advances in Skin & Wound Care*, 28(10), pp. 466-476. Copyright 2015 by Wolters Kluwer Health, Inc. Reprinted with permission.

Product Picker Dressing Selection Guide

This is not an exhaustive list of wound dressings, but rather suggestions of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

http://cawc.net/images/uploads/store/UPDATED_Product_Picker.pdf

Source: Reprinted from “Product Picker Dressing Selection Guide,” by Canadian Association of Wound Care, 2014 (http://cawc.net/images/uploads/store/UPDATED_Product_Picker.pdf). Copyright 2014 by the Canadian Association of Wound Care. Reprinted with permission.

Appendix T: List of Topical Antimicrobial and Antiseptic Agents

Topical Antimicrobial Agents:

This is not an exhaustive list of topical antimicrobial agents, but rather suggestions of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

Agent	<i>S. aureus</i>	MRSA	<i>Streptococcus</i>	<i>Pseudomonas</i>	Anaerobes	Comments	Summary
Cadexomer iodine	+	+	+	+	+	Also debrides. Low potential for resistance. Caution with thyroid disease.	Low risk and effective
Silver	+	+	+	+	+	Do not use with saline. Low potential for resistance.	
Silver sulfadiazine	+	+	+	+	+	Caution with sulphonamide sensitivity.	
Polymyxin B sulphate/ Bacitracin zinc	+	+	+	+	+	Bacitracin in the ointment is an allergen; the cream formulation contains the less-sensitizing gramicidin.	Use selectively
Mupirocin		+				Reserve for MRSA and other resistant Gram+ species	
Metronidazole					+	Reserve for anaerobes and odour control. Low or no resistance of anaerobes despite systemic use.	
Benzoyl peroxide	Weak	Weak	Weak	Weak	Weak	Large wounds. Can cause irritation and allergy	Use with caution
Gentamicin	+		+	+		Reserve for oral/IV use—topical use may encourage resistance.	
Fusidin ointment	+		+			Contains lanolin (except in the cream).	
Polymyxin B sulphate/ Bacitracin zinc neomycin	+	+	+	+	+	Neomycin component causes allergies, Bacitracin zinc neomycin and possibly cross-sensitizes to aminoglycosides.	Use with caution

Source: Reprinted from from “Best Practice Recommendations for Preparing the Wound Bed: Update 2006,” by R. G. Sibbald, H. Orsted, P. M. Coutts and D. H. Keast, 2006, *Wound Care Canada*, 4(1), pp. 15–29. Copyright 2006 by Wolters Kluwer Health, Inc. Reprinted with permission.

Topical Antiseptic Agents:

This is not an exhaustive list of topical antiseptic agents, but rather suggestions of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

Agent	Effects
Chlorhexidine or PHMB	Low toxicity
Povidone-iodine (Betadine)	Broad spectrum
Acetic acid—vinegar diluted 1:5 to 1:10	<i>Pseudomonas</i>
Saline/sterile water	Not antibacterial
Dyes—scarlet red, proflavine	Select out gram negative
Sodium hypochlorite—Dakin solution, EUSOL	Toxic = bleach
Hydrogen peroxide	Action = fizz
Quaternary ammoniaVcetrimide	Very high toxicity

Agents are color coded by safety profile and antiseptic action: green = low toxicity potential, yellow = no antibacterial effect, red = high toxicity potential.

Source: Reprinted from “Optimizing the Moisture Management Tightrope with Wound Bed Preparation 2015,” by R. Sibbald, J. A. Elliott, E. A. Ayello, and R. Somayaji, 2015, *Advances in Skin & Wound Care*, 28(10), pp. 466–476. Copyright 2015 by Wolters Kluwer Health, Inc. Reprinted with permission.

Appendix U: Key Factors in Deciding the Method of Debridement

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

Where 1 is most desirable and 5 is least desirable

Source: Reprinted from “Best Practice Recommendations for Preparing the Wound Bed: Update 2006,” by R. G. Sibbald, H. Orsted, P. M. Coutts, and D. H. Keast, 2006, *Wound Care Canada*, 4(1), pp. 15–29. Copyright 2006 by Wolters Kluwer Health, Inc. Reprinted with permission.

Appendix V: Self-Management Techniques

The five A's of behavioural change, is one example of how to facilitate effective collaboration between health-care professionals and persons and their primary caregiver(s) in self-management education. This is not intended to be an exhaustive list of self-management techniques but rather an example of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

The 5 A's are: (1) assess, (2) advise, (3) agree, (4) assist, and (5) arrange.

Assess – Assess a person's knowledge, beliefs, and behaviours.

Advise – Provide the person with specific information about health risks and the benefits of change.

Agree – Collaborate with the person to set goals based on his/her confidence and willingness to change behaviour.

Assist – Identify potential sources of support (i.e. social, environmental) and identify potential barriers, problem solving strategies and other techniques to support a change in behaviour.

Arrange – Determine a plan for follow-up (e.g. phone call, visit, various reminders). (Glasgow, Runnell, Bonomi, Davis, Beckham, & Wagner, 2002)



Appendix W: Education Resources

The following is not an exhaustive list of education resources for the development and implementation of a pressure injury curriculum but rather examples of information identified within the systematic review, AGREE II appraised guidelines, by the expert panel or external stakeholder feedback.

RESOURCE	LINK
Principles of Adult Learning (Canadian Literacy and Learning Network, 2016)	An on-line site that identifies the principles of adult learning and provides resources for teaching/learning: http://www.literacy.ca/professionals/professional-development-2/principles-of-adult-learning/
Wound Care Instrument: Standards for Wound Management Education and Training (Canadian Association of Wound Care & Canadian Association of Enterostomal Therapy, n.d.)	Resource that provides step-by-step guidance for the development of wound care education: http://cawc.net/en/index.php/resources/wound-care-instrument/
Pieper Pressure Ulcer Knowledge Test (PPUKT) (Agency for Healthcare Research and Quality, 2016)	<p>Scroll down list and refer to 2G: Pieper Pressure Ulcer Knowledge Test http://www.ahrq.gov/professionals/systems/hospital/pressureulcertoolkit/putool7a.html</p> <p>To date, the only widely published assessment tool that assesses knowledge is the Pieper Pressure Ulcer Knowledge Test (PPUKT). The PPUKT, which has been implemented since 1995 in the United States and international clinical settings, is a valid and reliable tool for assessing health-care professionals' knowledge regarding pressure injury prevention and management (Pieper and Mott, 1995).</p> <p>Seven articles captured in the systematic review for this Guideline used the PPUKT to assess registered nurses' and registered practical nurses' knowledge regarding pressure injury care. The nurses came from urban areas, rural areas, the intensive care unit, acute care, orthopedic and trauma units, private hospitals, and teaching hospitals in countries and regions including Iran, the Midwestern United States, Portugal, Brazil, and Uganda (Chianca, Rezende, Borges, Nogueira, & Caliri, 2010; Iranmanesh, Rafiei, & Foroogh, 2011; Iranmanesh, Tafti, Rafiei, Dehghan, & Razban, 2013; Mwebaza, Katende, Groves, & Nankumbi, 2014; Rafiei et al., 2014; Smith & Waugh, 2009; Zulkowski et al., 2007). Using the PPUKT, seven studies were able to:</p> <ol style="list-style-type: none"> 1. Identify a statistically significant change in pressure injury knowledge among nurses following an educational intervention (e.g., wound care certification) (Zulkowski et al., 2007); 2. Determine deficits in nurses' pressure injury knowledge with regard to the onset and development of pressure injuries, classification, evaluation, prevention, and the complications of mismanaged wounds (Iranmanesh et al., 2011; Mwebaza et al., 2014; Rafiei et al., 2014); and

RESOURCE	LINK
<p>Pieper Pressure Ulcer Knowledge Test (PPUKT) (Agency for Healthcare Research and Quality, 2016) (Continued)</p>	<p>3. Tentatively demonstrate a positive association between various demographic factors, such as being a self-directed reader (Smith & Waugh, 2009) and having more clinical practice in in-patient units, and enhanced pressure injury knowledge (Chianca et al., 2010; Saleh, Al-Hussami, & Anthony, 2013).</p> <p>These studies demonstrate that knowledge deficits with regard to pressure injury care exist in a number of nursing constituencies in several countries, both in the developed and in the developing world. However, more research is required to evaluate long-term knowledge retention and application in clinical practice (Iranmanesh et al., 2013), and to confirm whether education alone is sufficient to improve pressure injury client outcomes (Zulkowski et al., 2007). For example, a cross-sectional study by Saleh et al. (2013) concluded that the “implementation of pressure injury prevention and treatment appears to depend primarily on knowledge, but may benefit from a range of programmes and use of risk assessment tools and grading scores” (Saleh et al., 2013, p. 10).</p> <p>Pieper and Zulkowski (2014) recently updated the content of the PPUKT to include newer concepts in pressure injury management, such as pressure injury prevention/ risk, staging, and wound description. The authors also renamed the PPUKT the Pieper/Zulkowski Pressure Ulcer Knowledge Test (PZ-PUKT). However, before recommending its widespread use, the expert panel believes that further research is needed regarding the modifications to the tool, in order to determine the “cut scores” for adequate knowledge in each of the subscales. With additional validity testing, the expert panel believes that the PZ-PUKT can be a valuable knowledge evaluation tool for use with interprofessional teams.</p>

Appendix X: Additional Resources

The expert panel, with input from external reviewers and other key stakeholders, has compiled a list of websites and other resources that may be helpful when providing care to people with pressure injuries. This list is not exhaustive.

Links to websites that are external to the RNAO are provided for information purposes only. The RNAO is not responsible for the quality, accuracy, reliability, or currency of the information provided through these sources. Further, the RNAO has not determined the extent to which these resources have been evaluated. Questions related to these resources should be directed to the source.

RESOURCE	URL/REFERENCE
Professional Association	
Canadian Association of Wound Care (CAWC)	http://cawc.net/
National Pressure Ulcer Advisory Panel (NPUAP)	http://www.npuap.org/
The Canadian Association for Enterostomal Therapy (CAET)	https://caet.ca/
Ontario Wound Care Interest Group (OntWIG)	http://ontwig.ca/
European Pressure Ulcer Advisory Panel (EPUAP)	http://www.epuap.org/
Wound, Ostomy and Continence Nurses Society	http://www.wocn.org/
Regroupement Québécois en Soins de Plaies	www.rqsp.ca
International Wound Infection Institute	http://www.woundinfection-institute.com/
Quality Standards	
Accreditation Canada	https://www.accreditation.ca/
Agency for Healthcare Research and Quality	http://www.ahrq.gov/
Wound-Related Research Journals	
Wound Care Canada	http://www.woundcarecanada.ca/
Advances in Skin and Wound Care	http://journals.lww.com/aswcjournal/pages/default.aspx
Journal of Wound Care	http://info.journalofwoundcare.com/
Journal of the World Council of Enterostomal Therapists	http://www.wceten.org/
Journal of Wound, Ostomy and Continence Nursing	http://journals.lww.com/jwocnonline/Pages/default.aspx
Ostomy Wound Management	http://www.o-wm.com/

Appendix Y: Description of the Toolkit

Best practice guidelines can only be successfully implemented if planning, resources, organizational, and administrative supports are adequate and there is appropriate facilitation. To encourage successful implementation, an expert panel of nurses, researchers, and administrators has developed the *Toolkit: Implementation of Best Practice Guidelines (2nd ed.; 2012)*. The *Toolkit* is based on available evidence, theoretical perspectives, and consensus. We recommend the *Toolkit* for guiding the implementation of any clinical practice guideline in a health-care organization.

The *Toolkit* provides step-by-step directions for the individuals and groups involved in planning, coordinating, and facilitating implementation of the guideline. These steps reflect a process that is dynamic and iterative rather than linear. Therefore, at each phase, preparation for the next phases and reflection on the previous phase is essential. Specifically, the *Toolkit* addresses the following key steps, as illustrated in the “Knowledge-to-Action” framework (Straus et al., 2009):

1. Identify the problem: identify, review, and select knowledge (Best Practice Guideline);
2. Adapt knowledge to the local context:
 - Assess barriers and facilitators to knowledge use, and
 - Identify resources.
3. Select, tailor, and implement interventions.
4. Monitor knowledge use.
5. Evaluate outcomes.
6. Sustain knowledge use.

Implementing guidelines to effect successful practice changes and positive clinical impact is a complex undertaking. The *Toolkit* is one key resource for managing this process. The *Toolkit* can be downloaded at <http://RNAO.ca/bpg/resources/toolkit-implementation-best-practice-guidelines-second-edition>.

Endorsements



The Canadian Association
for Enterostomal Therapy
Association Canadienne
des Stomothérapeutes

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February 25, 2016

Doris Grinspun RN, MSN, PhD, LLD(hon), O.ONT.
Chief Executive Officer, Registered Nurse's Association of Ontario (RNAO)
158 Pearl Street, Toronto, ON, M5H 1L3

Dear Dr. Grinspun,

The Canadian Association of Enterostomal Therapy (CAET) acts in the public interest for Canadian Enterostomal Therapy (ET) Nurses to give national leadership in wound, ostomy and continence nursing promoting high standards for ET nursing practice, education, research and administration to achieve quality specialized nursing care. CAET is pleased to endorse RNAO's Clinical Best Practice Guideline – *Assessment and Management of Pressure Ulcers for the Interprofessional Team*. With its robust evidence-based focus on enhancing interprofessional and person-centred pressure ulcer care, this guideline will greatly strengthen the use of best practices associated with enhancing the partnership between health-care providers and the person (and their family) by supporting the optimization of pressure ulcer management, clinical outcomes and overall satisfaction with the delivery of health-system services.

This guideline is directly related to our mission to advocate for the highest quality of specialized (Enterostomal Therapy) nursing to individuals with challenges in wound, ostomy and continence. The recommendations address the evidence-based best practices associated with pressure ulcer care at the individual practitioner, organization, and health system level and will enable our organization to work with other health-care settings towards creating a common goal of nursing specialty excellence, collaborative partnership and compassion in wound care.

CAET is committed to having a health-care system that effectively addresses the care of pressure ulcers through the use of evidence-based practices, and we believe RNAO's guideline *Assessment and Management of Pressure Ulcers for the Interprofessional Team* will help us move the health system forward to achieve optimal quality in the delivery of interprofessional, person-centred pressure ulcer health care and services.

Best regards,

A handwritten signature in cursive script that reads "Catherine Harley".

Catherine Harley
Executive Director,
Canadian Association for Enterostomal Therapy
cc. CAET Board of Directors



March 15, 2016

Doris Grinspun RN, MSN, PhD, LLD(hon), O.ONT.
Chief Executive Officer
Registered Nurse' Association of Ontario (RNAO)
158 Pearl Street
Toronto, ON
M5H 1L3

Dear Dr. Grinspun,

The Canadian Association of Wound Care (CAWC) exists to advance skin health and wound management in Canada, through professional education, public advocacy, research and collaboration. CAWC is pleased to endorse RNAO's Clinical Best Practice Guideline – *Assessment and Management of Pressure Ulcers for the Interprofessional Team*. With its robust evidence-based focus on enhancing interprofessional and person-centred pressure ulcer care, this guideline will greatly strengthen the use of best practices associated with enhancing the partnership between health-care providers and the person (and their family) by supporting the optimization of pressure ulcer management, clinical outcomes and overall satisfaction with the delivery of health-system services.

This guideline is directly related to our mandate of inspiring improvement and advances in skin and wound care in Canada to inform our practice, research and policy initiatives. The recommendations address the evidence-based best practices associated with pressure ulcer care at the individual practitioner, organization, and health system level and will enable our organization to work with other health-care settings towards creating a common goal of excellence in wound care globally.

CAWC is committed to having a health-care system that effectively addresses the care of pressure ulcers through the use of evidence-based practices, and we believe RNAO's *Assessment and Management of Pressure Ulcers by the Interprofessional Team* guideline will help us move the health system forward to achieve optimal quality in the delivery of interprofessional and person-centred pressure ulcer health care and services.

Best regards,

Mariam Botros, DCh, DE, IIWCC
Executive Director
Canadian Association of Wound Care

A handwritten signature in black ink, appearing to read 'M. Botros'.



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April 1, 2016

Doris Grinspun
Chief Executive Officer
Registered Nurses' Association of Ontario (RNAO)
158 Pearl Street
Toronto ON M5H 1L3

Dear Dr. Grinspun:

Thank you for your request to endorse your important new document, *Best Practice Guideline on the Assessment and Management of Pressure Ulcers for the Interprofessional Team*. All of us here at the Canadian Patient Safety Institute (CPSI) share with the RNAO a dedication to evidence-informed approaches to investigation and leadership and to sharing innovative health practices, resources, and tools. On behalf of CPSI, I would like to endorse your guideline, and commend the hard work that created this important document.

It is particularly encouraging to me to hear that safety improvement work is reaching practitioners in acute care, primary care, long term care, and individuals concerned about improving healthcare in Canada. When people from across the healthcare spectrum come together, we really can improve patient and health outcomes.

Sincerely,

Chris Power
CEO, Canadian Patient Safety Institute

Safe care...accepting no less
Soins sécuritaires...n'acceptons rien de moins

www.patientsafetyinstitute.ca
www.securitedespatients.ca

ia BPG

INTERNATIONAL
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Clinical Best
Practice Guidelines

MAY 2016

Assessment and Management of Pressure Injuries for the Interprofessional Team

Third Edition

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