THE DEVELOPMENT OF A SELF-DIRECTED E-LEARNING RESOURCE ON BURN CARE NURSING

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Abstract

Background: A burn injury is defined as a traumatic injury resulting in partial or complete destruction of the skin and underlying tissue. Burn patients often present with complex care needs and are at risk for numerous complications. Registered Nurses (RNs) are expected to manage burn patients' complex needs; however, without established formal training, it is difficult to ensure the delivery of consistent care. **Purpose:** The purpose of this practicum project was to develop a learning resource for RNs working on the burn unit to support them in caring for patients with burn injuries. **Methods:** The four methods consisted of: 1) an integrated literature review, 2) an environmental scan to determine the existing resources for burn care nursing, 3) consultations with the Burn Committee members and staff RNs through semi-structured interviews, and 4) development of a self-directed e-learning resource. **Results:** The literature review findings supported that RNs experience difficulties managing burn patients' care, and desire additional education and training pertaining to burn care nursing. The environmental scan did not reveal any findings directly applicable to the development of this e-learning resource. The consultations supported the need for education on burn care and methods of content delivery and key topics were identified for the learning resource. Based on the findings of the integrated literature review, environmental scan, and consultations, a five-module self-directed e-learning resource was developed on the assessment, monitoring, and treatments required by patients with burn injuries. **Conclusion:** The e-learning resource was developed to address the learning needs of the RNs on the burn unit and will be provided to the clinical educator to distribute to newly orientating RNs. It will also be available to other staff RNs of the burn unit interested in learning more about burn care nursing.

Keywords: *burn injury*, *burn patient*, *burn care nursing*, *wound care*

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A burn is defined as a traumatic injury that results in partial or complete destruction of the skin and underlying tissue due to intensive heat (World Health Organization [WHO], 2018). The care of burn patients is complex and requires a multidisciplinary approach. Registered Nurses (RNs) hold a pivotal role in the care of burn patients. RNs are expected to monitor patients' physiologic status, biopsychosocial needs, maintain infection prevention measures, complete complex wound care, ensure adequate pain management, and facilitate rehabilitation (Bettencourt et al., 2020). In addition, RNs must collaborate with members of the interdisciplinary team, including Registered Dieticians, Physiotherapists, and Occupational Therapists during the care of the burn patient. There are multiple sequelae of burn injuries, including bacterial infection, sepsis, hypovolemia, hypothermia, respiratory distress, scarring, contractures, anxiety, depression, and post-traumatic stress disorder (Mayo Clinic, n.d.).

Given the complexity of the care required by patients with burn injuries specialized training is warranted to ensure competent nursing care is provided. At present, there is no formalized burn care training or education available for RNs at the burn unit in a tertiary care centre in one province in Eastern Canada. Without established formal training and educational preparation for burn care nursing, it is difficult to ensure the delivery of consistent and competent care (Carrougher et al., 2019). Through preliminary discussions with the RNs and members of the Burn Committee from the burn unit of this tertiary care centre, it was determined that additional training is essential. Thus, the purpose of this practicum project was to develop an educational resource to support burn care nursing for the RNs working on the burn unit of focus. This report will further discuss the purpose of the practicum project and the efforts that have been made to support the development of a self-directed e-learning resource for burn care nursing, including key results from the integrated literature review, environmental scan, and

consultations. Furthermore, reflections will be provided on the advanced nursing practice competencies that were demonstrated throughout the completion of the practicum project. Lastly, plans for the implementation and evaluation of the e-learning resource will be discussed.

Objectives

The purpose of this practicum project was to develop an evidence-based learning resource for the RNs related to the care of patients with burn injuries.

The key objectives of the practicum project were as follows:

1. Identify the current evidence and best practices for burn care in the acute care setting;
2. Identify the learning needs of Registered Nurses in the acute care setting caring for patients with burn injuries;
3. Develop a learning resource based on current evidence and best practices to guide Registered Nurses in the care of patients admitted to the hospital with burn injuries; and
4. Demonstrate advanced nursing practice competencies.

Overview of Methods

Three key methods were utilized during the development of this practicum project: an integrated literature review to identify appropriate, current, and evidence-informed content, an environmental scan of burn units across Atlantic Canada and targeted websites to determine current efforts to support burn care nursing, and consultations via semi-structured interviews with key informants from the burn unit of focus. These three methods each provided valuable information to inform the development of the self-directed e-learning resource and will be summarized below. The literature review, environmental scan, and consultation reports can be found in entirety in Appendices I, II, and III, respectively. The self-directed e-learning resource can be found in Appendix IV.

Summary of the Literature Review

An integrated review of the literature was completed using The Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus, PubMed, Cochrane Library, and Google Scholar databases. The reference lists of research articles found were also searched for applicable articles. Assistance was recruited from a librarian at the Health Sciences Centre, Memorial University, for the literature search plan. MeSH terms and CINAHL subject headings were utilized to enhance the search results. The search terms used included various combinations of "burn injury," "burn trauma," "burn patient," "burns," "burn care nursing" and "nurse," "nursing," "nursing care," "wound care," "learning needs," "continuing education," "competence," "preparedness," "education," "pain management," "biopsychosocial factors," "psychological well-being," and "anxiety." Since the techniques and products used during burn care nursing evolve based on evidence-based practice, the inclusion criteria consisted of articles published between 2011 to 2021. The search was limited to peer-reviewed research articles that were available in English. Furthermore, the search was limited to studies conducted on adults in the acute care setting since the educational resource will be developed for RNs working with this patient population.

A total of twenty-eight studies were chosen to inform the literature review. Thirteen studies employed quantitative designs, nine utilized qualitative designs, two used mixed-methods designs, and four were literature reviews. Seven of these were intervention studies that highlighted potential methods of delivering burn care nursing education. The Public Health Agency of Canada (PHAC) (2014) Critical Appraisal Toolkit and the Critical Appraisal Skills Programme (CASP) (2017) were used to critique and appraise quantitative and qualitative research studies, respectively.

Prevalence

The literature review revealed that while the incidence of burn injuries has been declining globally (Smolle et al., 2016), burns remain the fourth most common cause of injury with approximately eleven million people receiving care for burn injuries annually (WHO, 2018). In 2010, 45,000 burn injuries occurred in Canada (Parachute and Injury Prevention Centre, 2015). Individuals living in low- and middle-income countries are at a higher risk for burn injuries than those residing in high-income countries. However, within all countries the risk of burn injury is correlated with socioeconomic status, with those of lower socioeconomic status being at a greater risk for burn injury (WHO, 2018; Smolle et al., 2016). While females have slightly higher mortality rates from burn injuries, the overall rate of burn injuries from the various mechanisms are higher among men (WHO, 2018; Smolle et al., 2016).

Impact on Patients

Throughout the literature the impact a burn injury can have on the patient was emphasized. It was discovered that burn patients commonly experience inadequate pain management and insufficient information regarding the pain and discomfort associated with their evolving scarring (Dai et al., 2018; Yuxiang et al., 2012; Simons et al., 2016). Additionally, burn patients desired better discharge education and information on possible outcomes, problems, and solutions to reduce their uncertainties (Simons et al., 2016; Christiaens et al., 2015). The need for support and the recognition of burn patients' psychosocial needs was also identified. This was particularly important among patients with disfiguring scars and functional limitations who reported feeling fearful of being stigmatized, judged, and isolated, which emphasized the need for psychosocial support to those living with burn injuries. Commonly, these patients expressed a need for more information on coping mechanisms and the availability of adequate social

supports following discharge (Jones et al., 2017; Christiaens et al., 2015; Simons et al., 2016). It was deemed important for RNs to ensure open communication and that patients felt supported and encouraged. Even still, RNs should recognize the importance of family members in care and the support they can offer their loved one (Abrams et al., 2016; Dai et al., 2018).

Impact on Families

The impact of a loved one's burn injuries on family members was highlighted throughout the literature. Family members commonly experience strong emotional reactions including shock, grief, depression, anxiety, and guilt. These emotions may be persistent and associated with post-traumatic stress disorder (Sundara, 2011). Bond et al. (2017) discovered that 77.42% of spouses and 56.00% of close relatives experienced at least one PTSD-related anxiety or depression symptom upon admission of their loved one. Upon discharge, 45.00% of spouses and 6.25% of close relatives experienced at least one PTSD-related anxiety or depression symptom. The discharge period was identified as particularly anxiety provoking as family members prepare to take responsibility for the care of their loved one. In addition to requiring support with their activities of daily living, patients with burn injuries often require psychosocial support (Sundara, 2011). However, burn patients' family members may also be in a state of crisis and require assistance so that they can effectively support their loved one (Bond et al., 2017).

Impact on RNs

Two studies identified in the literature revealed the impact burn patients and their care needs can have on RNs. Primarily, the lack of education surrounding burn care nursing was associated with nursing job dissatisfaction and increased nursing staff turnover (Mann-Salinas et al., 2014; Robbins et al., 2017). Burn units were recognized as clinically demanding and high stress environments and introducing nursing staff to this clinically demanding environment

without ensuring proper training was found to compromise nurse retention. Secondly, it was recognized that the burn care environment is physically and emotionally demanding for nursing staff (Mann-Salinas et al., 2014). However, structured education was found to reduce nurse turnover (Mann-Salinas et al., 2014; Robbins et al., 2017).

Impact on the Healthcare System

The literature review findings revealed that burn injuries have a significant economic impact on the healthcare system in terms of high-cost services, length of hospital stays, and the staffing ratios required to meet care needs. The average cost of stay for a burn patient varies by burn severity but averages $84,678 (Banfield et al., 2015). Over 2000 hospitalizations occurred for burn injuries in Canada in 2010, costing up to $366 million, which has increased from $299 million in 2004 (Parachute and Injury Prevention Centre, 2015). The average length of hospital stay varies by burn severity and equates to 1 to 1.2 days per 1% total body surface area burned (Bessey et al., 2014; American Burn Association, 2016). An additional consideration is the care and monitoring required by burn patients, which necessitates a substantial amount of clinical time and typically exceeds that required for the care of other patient populations. As a result, appropriate staffing is a necessity and the patient-to-nurse ratio for patients with burn injuries reflects this (Bettencourt et al., 2020).

Contributing Factors

The care and management of burn patients is complex and requires specialized knowledge. Thus, it was questioned whether RNs obtain knowledge of burn care throughout their nursing school curriculum, and if practicing RNs are comfortable with burn care nursing, or if additional education and training is necessary.

Practicing RNs' Lack of Knowledge

Throughout the literature it was emphasized that RNs often experience feelings of powerlessness in caring for patients with burn injuries (Kornhaber & Wilson, 2011). At times nurses feel incompetent and doubt their ability to perform burn care procedures and struggle to manage burn patients' pain. Furthermore, nurses may feel apprehensive as to whether burn patients are adequately prepared for discharge and if they have instilled adequate coping strategies, particularly to cope with any disfigurement (Kornhaber & Wilson, 2011). Nurses have expressed a desire for further training to help patients look at their injuries, to manage patients' emotional reactions, and to improve their communication techniques (Shepherd & Begum, 2014).

Nursing Students' Lack of Preparedness from their Nursing School Curriculum

It was discovered through the literature review that nursing students are likely inadequately prepared to care for burn patients through their nursing school education. Meschial and Felix de Oliveira (2014) discovered that only 22.4% of participants had an adequate knowledge of burn care, indicating that nursing students are inadequately prepared with the knowledge necessary to care for patients with burn injuries. Similarly, Hosseini and Momennasab (2020) discovered that senior nursing students experienced fear and stress regarding the care of burn patients and felt the care requirements were outside of their comfort level and previous experiences. However, exposure to and education on burn care nursing was found to improve knowledge levels and comfort caring for patients with burn injuries. A positive association was found between having previously cared for burn patients during clinical experiences (OR = 3.1, p=0.01444) or having observed the care of burn patients throughout nursing school (OR = 3.6, p=0.006533) and having adequate knowledge of burn care (Meschial

and Felix de Oliveira, 2014). Similarly, a mentorship program helped students build confidence, prioritize care, improve assessment skills, become advocates for their patients and families, and eased the transition into practice (Bay et al., 2018), while an internship course was highly beneficial to increasing skills and knowledge-level for burn care, which caused fear and stress to diminish (Hosseini and Momennasab, 2020).

Educational Interventions

Preceptorship programs, literature (handbooks and journal clubs), education sessions, and simulations were highlighted throughout the literature as potential educational interventions to support burn care nursing.

Preceptorship Programs

The literature review findings included support for preceptorship programs and efforts to improve the precepting experience. Robbins et al. (2017) found that following the eight to 12-week transitioning phase with support from a preceptor, 76% of transitioning nurses achieved passing scores on the basic knowledge assessment test and 93% of transitioning nurses passed the wound care test. Additionally, there was a statistically significant increase in competency scores of the new nurses' knowledge, skills, and abilities for burn care from 5 (+/- 2) before and 9 (+/- 1) post ($P<0.0001$). Thompson et al. (2018) discovered from their focus group analysis that preceptors and preceptees desired standardization of the preceptorship program to overcome inconsistent teaching methods and more appropriate matching of preceptors and preceptees to prevent disaccord between the paired duos.

Literature (Handbooks and Journal Clubs)

Olszewski et al. (2016) found that knowledge levels on burn care nursing improved following implementation of a burn care handbook (pre: 55.9% [SD: 11.0]; post: 69.6% [SD:

8.7], p<0.001). Similarly, Fowler et al. (2013) found that survey respondents believed the journal club enhanced medical knowledge (90%) and patient care (73%). Fowler et al. (2013) also found that the burn unit journal club enhanced research competency (70%), critical thinking (63%), and evidence-based practice (63%) related to the care of burn patients.

Education Sessions

Taverner and Prince (2016) evaluated the effectiveness of an education session on neuropathic pain assessment. It was discovered from a retrospective chart review completed six months following the education session that 88% of patients received twice-daily neuropathic pain assessments, 42% of which exhibited neuropathic pain. Prior to the education session, neuropathic pain assessments were not being completed regularly on the unit. This is particularly important since neuropathic pain that is undetected and untreated can lead to PTSD, insomnia, and suicidal ideations, and can interfere with the rehabilitation phase of burn injury (Taverner and Prince, 2016). Educational efforts that provide training on appropriate assessments for various types of pain experienced by burn patients, including neuropathic pain, can improve pain assessment techniques and the subsequent pain management provided.

Simulations

Conflicting evidence was revealed regarding the effectiveness of simulations for burn care education. Onarici and Karadag (2021) did not find a statistically significant difference from their randomized clinical trial between the intervention and control groups for pre-test (p=0.586) and one-week post-test (p=0.102) scores. However, there was a statistically significant increase in the intervention group's test scores compared to the control group's two-weeks post intervention (p=0.006). Comparably, Reeves et al. (2018) found from their non-randomized controlled trial that amongst the simulation group, mean written test scores (%) were 87.54% and

mean practicum exam scores (1-5) were 4.186. When compared to the non-simulation group who received a mean of 85.03% on the written test and 4.24 on the practicum exam, there was a statistically significant difference in written test scores, with the simulation group demonstrating higher scores ($p<0.01$). However, there were no statistically significant differences between practical exam scores.

Conclusion

It was discovered that there was limited, moderate evidence available regarding burn care nursing throughout the literature. However, the evidence identified revealed educational topics surrounding burn care nursing that should be covered in an educational resource. These topics included: burn pathophysiology, burn assessment (physical, pain, and biopsychosocial needs), burn wound care, and burn patient discharge planning. In addition, the literature review helped identify potential beneficial methods of delivering burn care education. Inconsistent evidence was discovered regarding simulation interventions. Simulations were deemed potentially unfeasible due to the high-cost technology necessary, and the significant educator time required to develop scenarios (Onarici & Karadag, 2021; Reeves et al., 2018). However, the literature suggested that interactive learning methods, including: case studies, role-playing, and reflective exercises may be beneficial to underpin the practicum project (Robbins et al., 2017).

During the process of searching the literature, it was difficult to identify studies regarding educational interventions for burn care nursing. To assist in the search process, assistance was recruited from a librarian. The librarian aided with the literature search plan, and this helped identify two additional intervention articles on burn care nursing. Throughout this interaction, education was provided on techniques and tips to assist with the literature search process. The integrated literature review report can be found in Appendix I.

Summary of the Environmental Scan

Throughout the first semester of the practicum project an environmental scan was completed of the burn centres throughout Atlantic Canada and from four targeted websites. In conducting the environmental scan email responses were received from the Burn Care Clinical Lead of Hospital A and the Burn Resource RN of Hospital B. The Burn Care Clinical Lead and the Nurse Practitioner (NP) for the Plastics Program at the tertiary care centre of focus provided direction towards two of the targeted websites, the British Columbia Patient Safety and Quality Council (2021) burn care e-learning module and the American Burn Association's (2018) provider manual, while the remaining two websites, the NL Skin and Wound Care Manual (2008) and the University of Washington's (2021) educational videos were discovered independently. The educational topics covered, and the method of content delivery used by the targeted websites were noted. Throughout this process informative conversations were conducted with the Burn Care Clinical Lead via telephone and the Burn Resource RN via email. The Burn Care Clinical Lead provided information on education topics covered at her facility and the means of delivering this education and the Burn Resource RN shared a 37-page orientation manual. From the environmental scan the topics identified for education included: burn pathophysiology, burn assessment (physical, pain, and biopsychosocial), burn wound care, interdisciplinary education, infection prevention and control measures, information specific to inhalation injuries and circumferential burns, the burn patient admission process, and discharge planning.

Connecting with individuals from the burn centres across Atlantic Canada provided some insight into the advances and educational efforts that have been put forward towards burn care nursing at these centres. In particular, the conversations with the Burn Care Clinical Lead at

Hospital A provided insight into the updated formulas for fluid resuscitation they have adopted from the American Burn Association and the use of a new wound care product called Integra. While the orientation manual provided by Hospital B is extremely detailed and the topics are highly relevant to burn care nursing, it is believed that a more interactive method would better support learning and knowledge integration. Furthermore, neither of these educational methods had been fully implemented or evaluated. The environmental scan report can be found in Appendix II.

Summary of the Consultations

An additional key aspect of identifying the needs, content, and strategies for the development of an educational resource was consulting with key informants from the burn unit of focus. Therefore, telephone interviews were completed with the NP of the Plastics Program, two of the Patient Care Coordinators, the Clinical Educator, and two novice and seven senior RNs from the burn unit.

The respective interviews helped to identify the perceived learning needs of the RNs working on the burn unit, potential solutions to improve the orientation process, efforts made by the Burn Committee to support burn care nursing education, and methods of educational delivery that would meet the learning styles of the RNs on the burn unit. The topics identified for inclusion in an educational resource included: burn pathophysiology; burn assessment (physical, pain, and biopsychosocial needs); burn treatment (wound care, hydrotherapy, surgical interventions); management of adverse events; interdisciplinary considerations; discharge planning; and burn care documentation. A variety of learning strategies were identified as potentially beneficial to select as the mode of delivery for the educational resource. The RNs identified a manual, interactive modules, videos, and pictures as their preferred methods of

content delivery, while the Burn Committee members identified co-signed shifts, simulations, education days, and interactive modules as potentially the most beneficial.

The consultations revealed that interview subjects can often go off course when answering questions and prompts to redirect the conversation were highly important and valuable to the process. Additionally, it was noted that perspectives can vary greatly by the role held by the individual interviewed. For example, one of the Burn Committee members highlighted that RNs learn burn care by doing burn care; however, the RNs repeatedly emphasized the desire for formal training prior to being exposed to burn care nursing. In addition, some of RNs were focused on the wound care aspect of burn care nursing while those RNs with more experience and one of the Burn Committee members highlighted how burn care encompasses much more than solely wound care. These views emphasize the importance of obtaining a variety of perspectives through the interview process. The consultation report can be found in Appendix III.

Summary of the Resource

The findings of the integrated literature review, environmental scan, and consultations were subsequently used to inform the development the self-directed e-learning resource for the RNs working on the burn unit. The educational topics and the method of content delivery was chosen based on information obtained through these measures. Self-directed learning modules, that included pictures, videos, and interactive exercises were believed to best support the learning styles of RNs on the burn unit. The need for structured education had not only been repeatedly emphasized throughout the literature and from contacts with other burn units during the environmental scan, but also during the consultations with the administrative staff and RNs on the burn unit of focus. A self-directed nature was chosen for the convenience of the RNs. This

allowed the education to be provided in a manner that would accommodate scheduling and timing, and so that an increased census and patient acuity would not impact the RNs' abilities or opportunities to complete the education. Additionally, since the resource will be accessible at any time, it will also allow the RNs to complete the education at an individual pace, allowing them to focus longer on topics they find more difficult to comprehend. The interactive nature of the e-learning resource, which incorporated images, videos, and an assortment of activities encompassed multiple learning styles. These interactive learning methods support comprehension, knowledge integration, and the application of knowledge attained (Phillips, 2016; Scheckel, 2016). In this circumstance, it will result in the RNs being able to apply the evidence-based knowledge into burn care nursing practice.

The e-learning resource consists of five interactive learning modules on the assessment, monitoring, and treatments required for patients with burn injuries. The modules contain figures, videos, tables, and colour coded text boxes to supplement the learning experience. Blue text boxes offer nursing considerations, grey text boxes with red bordering provide critical considerations, green text boxes provide reminders and tips, and yellow text boxes direct the reader towards additional learning opportunities through links to videos or policies. Interactive exercises are also incorporated throughout the modules to further engage the RNs and to assess the learners' retention of the material presented. These exercises include case studies, true or false, fill-in-the-black, select-all-that-apply, and matching questions. The RNs are directed towards Appendix A of the e-learning resource for the answer keys to the interactive exercises and Appendix B for the definitions of bolded and italicized key words. Each of the modules will be further described below and the complete e-learning resource can be found in Appendix IV.

The first module provides a review of the basic anatomy and physiology of the integument system and the pathophysiology of burn injuries. The module describes the three layers of the skin, the functions of the skin, provides a definition of a burn injury, and reviews the local and systemic responses that occur following a burn injury. The module also encompasses the various mechanisms of injury, including: thermal, electrical, and chemical injuries. Figures and video links were provided to further explain these concepts. The foundational knowledge provided in this module was intended to help learners with their comprehension of the clinical management required following burn injuries. This information helps the learner understand the signs and symptoms a burn patient may exhibit, the risks of complications associated with the injury, and the rationale for clinical interventions.

The second module aims to provide an understanding of the assessment and management of a burn patients' biopsychosocial needs, including: social supports, spiritual and cultural needs, coping mechanisms, and mental health concerns. These are critical care considerations since the physical recovery required following a burn injury is paralleled by the emotional challenges burn patients endure (Christiaens et al., 2015). Furthermore, these aspects of care were emphasized throughout the literature as areas of unmet care needs for patients with burn injuries and care needs RNs reported they struggled to adequately manage.

The third module of the e-learning resource encompasses the assessment and monitoring considerations of patients with burn injuries. This module begins with the assessment of burn wound injuries, methods of calculating the total body surface area of burn injuries, and the classification of burn injuries by depth. This information provides insight into the severity of the injury, which influences the assessments, monitoring, level of care, and treatments required. The next portion of the module consists of the head-to-toe assessment of a patient with burn injuries,

including considerations and possible complications, such as inhalation injuries, sepsis, and compartment syndrome. The assessment findings can help inform the plan of care and the importance of this was emphasized throughout the module. Documentation considerations were incorporated throughout this module to ensure RNs, especially those newly orientating to burn care, were aware of essential aspects to be included.

The fourth module focuses on treatments commonly required by burn patients, including: burn wound care (blister management, debridement, and hydrotherapy), common wound care products utilized, and surgical procedures (escharotomies and skin grafting). Infection prevention and control considerations were also incorporated into this module. Images were included so that the learner could visualize the common wound products used and the appearance of surgical sites, including burn wounds with eschar, debrided burn wounds, skin grafts, and donor sites. Post-operative care and monitoring and documentation considerations were also reviewed throughout this module. These treatments are required to achieve the goals of wound closure, prevent the deterioration of wounds, reduce the amount of necrotic tissue, prevent scarring, and promote life and limb preservation (Jeschke et al., 2018). The consultations revealed that many of the staff RNs were aware of common burn care treatments, procedures, and products but were uncertain of their purpose or the specific assessment and care requirements they necessitated. The consultants felt an understanding of this information is essential to optimize the care provided and ensure abnormal findings are promptly reported and addressed.

The fifth and final module concentrates on the interdisciplinary team and discharge planning and preparation. Burn patients have complex care needs and require a multidisciplinary approach to care. Providing education on the various roles and responsibilities of key members of the interdisciplinary team can help the RNs recognize consultations that may be warranted and

which members to direct questions towards. The discharge period was identified throughout the literature review and consultations as an anxiety provoking time for both burn patients, their family members, and the RNs who have concerns with ensuring the burn patient is adequately prepared for the transition home. The information provided in this module aims to support the discharge process by encompassing considerations including: hygiene routines at home, managing challenges (pain, pruritus, scarring, temperature sensitivities, and emotional adjustments), maintaining sun safety, wearing pressure garments, ensuring proper nutrition, maintaining activities of daily living, and providing outpatient referrals. This was intended to increase RNs' confidence and to ensure burn patients are adequately prepared for discharge to prevent rehospitalization or setbacks to the recovery process.

The theoretical framework chosen to guide the process of developing this self-directed e-learning resource was Knowles' Adult Learning Theory. This theory asserts that adults are most interested in learning which is relevant and impactful to their lives and that adult learning is problem centered (Knowles et al., 2015). In congruence with the principles of andragogy, the e-learning resource will meet the RNs' motivations to learn by proposedly resulting in increased confidence, self-esteem, and satisfaction with the care they are providing to patients with burn injuries (Knowles et al., 1998).

Discussion of Advanced Nursing Practice (ANP) Competencies

The Canadian Nurses Association (CNA) (2019) has developed core competencies for advanced practice nursing that serve to guide nurses to practice safely and ethically in their roles and in the settings the nurses provide care. Throughout the practicum courses I have demonstrated four of these competencies: educational competencies, research competencies, use of research methods, and leadership competencies.

Educational Competencies

The CNA (2019) has indicated that the advanced practice nurse (APN) is committed to supporting the professional growth and learning of all health-care providers. This includes identifying the learning needs of nurses and other members of the health care team. During the first practicum course, I demonstrated this competency by conducting the literature review, environmental scan, and consultations to identify the learning needs of the RNs in planning for the development of an educational resource for burn care nursing. This was further demonstrated throughout the second practicum course through the development of the burn care self-directed e-learning resource for RNs caring for patients with burn injuries in the acute care setting.

Research Competencies

The CNA (2019) has indicated that APNs should be able to identify, appraise, and apply research. During the first practicum project course, I completed an integrated literature review to identify the current evidence and best practices for burn care nursing. Throughout the process of completing this literature review I appraised both qualitative and quantitative studies using the CASP (2017) and the PHAC (2014) Critical Appraisal Toolkit, respectively. The evidence identified from the integrated literature review supported the content and delivery of the educational resource developed in the second practicum course.

Use of Research Methods

The CNA (2019) has indicated that APNs collect data and implement research-based initiatives to improve patient care. During the first practicum course, these research skills were demonstrated through the environmental scan and the consultations conducted with key informants. The results obtained from these measures were analyzed to identify the learning needs of the RNs on the burn unit and the most appropriate method to deliver an educational

resource to meet these needs. During the second practicum course, these results were utilized to develop the self-directed e-learning resource for burn care nursing.

Leadership Competencies

The CNA (2019) explains that APNs identify problems and initiate change to address challenges at the clinical level. Through my experience as a RN on the burn unit and as a member of the Burn Committee I have recognized and been a part of conversations that emphasized the need for additional education surrounding burn care nursing. This education has been recognized as imperative to ensure RNs are instilled with the knowledge necessary to feel confident in their care and to ensure burn patients are receiving optimal care. My personal experiences and the conversations were the motivating factors to initiate change and develop an educational resource for burn care nursing through the practicum project.

Next Steps

The burn care self-directed e-learning resource is in the process of entering the implementation stage and has yet to be evaluated. However, cohesive plans have been made for the implementation and evaluation of the e-learning resource. The e-learning resource will be provided to the clinical educator of the burn unit who will circulate it amongst the RNs. The goal is to have RNs who are newly hired to the burn unit complete the self-directed e-learning resource during their orientation. However, the resource will also be available to experienced staff RNs caring for burn patients should they desire to learn more about burn patients and the assessment, monitoring, and care required.

Once the self-directed e-learning resource has been implemented, it will be evaluated through two methods. The RNs will be evaluated pre- and post-completion of the e-learning resource to identify the effectiveness of the resource in educating RNs on the care of patients

with burn injuries. Furthermore, the RNs will be asked to complete a satisfaction survey to determine if they believe this e-learning resource was helpful in improving their knowledge and practices related to burn care nursing. The survey will also include a section for suggestions to improve the e-learning resource. Based on the results and feedback obtained, the resource will be able to be revised and refined as necessary. Further evaluation methods may include monitoring incidence reports related to burn care complications, such as nosocomial infections for inpatients on the burn unit and completing chart audits to determine the frequency and appropriateness of the care measures provided. For example, a chart audit to determine if appropriate wound care dressings are being applied.

Conclusion

Formal training and educational preparation for burn care nursing can help ensure the delivery of consistent and competent care to patients with burn injuries (Carrougher et al., 2019). This also helps ensure RNs are confident and comfortable with the care they are providing, which can increase job satisfaction (Robbins et al., 2017). The purpose of this practicum project was to develop a learning resource for nurses related to the care of patients with burn injuries. Throughout the first practicum course significant efforts were put forward in conducting the integrated literature review, the environmental scan, and the consultations with key informants. These efforts helped justify the need for an educational resource for burn care nursing and helped identify the learning needs and educational topics surrounding burn care nursing to be addressed. From the work completed during first practicum course, the self-directed e-learning resource was able to be developed throughout the second practicum course. Several advanced practice nursing competencies were demonstrated throughout the process of completing the practicum project. The self-directed e-learning resource for RNs on the assessment, monitoring, and treatment of

patients with burn injuries is now entering the implementation phase and plans have been outlined for its evaluation. It is desired that this resource will provide the longed-for educational support for burn care nursing within this facility.

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Appendices

Appendix I: Literature Review Report

The Development of a Self-directed E-Learning Resource on the Assessment, Monitoring, and Treatment of Patients with Burn Injuries: A Review of the Literature

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A burn is defined as a traumatic injury that results in partial or complete destruction of the skin and underlying tissue due to intensive heat (World Health Organization, 2018). As the total body surface area of the burn injury increases, morbidity and mortality rates typically increase (Warby & Maani, 2020). Burns present the risk for complications, such as bacterial infection, sepsis, hypovolemia, hypothermia, respiratory distress, scarring, and contractures (Mayo Clinic, n.d.). Registered Nurses (RNs) hold a pivotal role in the care of burn patients. RNs are expected to monitor patients' physiologic status, biopsychosocial needs, maintain infection prevention measures, complete complex wound care, ensure adequate pain management, and facilitate rehabilitation (Bettencourt et al., 2020). Burn care is complex and requires a multidisciplinary approach. RNs must collaborate with members of the interdisciplinary team, including Registered Dieticians, Physiotherapists and Occupational Therapists during the care of the patient. It is expected that RNs will deliver competent care. However, without established formal training and educational preparation for burn care nursing, it is difficult to ensure the delivery of consistent and competent care (Carrougher et al., 2019). Thus, interventions and strategies are needed to better prepare RNs caring for patients with burn injuries.

The purpose of this integrative literature review is to provide support for the development of an educational resource, to identify appropriate, current, and evidence-informed content, and to aid in the organization and delivery of the content in a logical manner. The literature review will determine the incidence, prevalence, and impact of burn injuries for patients, families, the healthcare system, and RNs. The review will investigate factors contributing to this problem, including knowledge gaps among RNs. Furthermore, the review will identify potential interventions and strategies to address this problem.

This literature review will show that there is moderate evidence that burn patients have

care needs which are inadequately met, and nursing school curriculum is likely insufficient to adequately prepare RNs to care for patients with burn injuries. The literature review will reveal that an educational resource including interactive learning methods, such as case studies, role-playing, and reflective exercises can better prepare RNs to care for patients with burn injuries. An educational resource for burn care nursing is believed to improve patient morbidity and mortality rates and nursing satisfaction by increasing their levels of confidence and competence.

Search Methods

A thorough review of the literature requires a consideration of the search strategies that will be employed. Key questions guiding the review include "What are the issues and learning needs when caring for patients with burn injuries?" and "What strategies and resources can be utilized to support nursing care to burn patients?" Assistance was recruited from a librarian for the literature search plan. The databases searched include The Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus, PubMed, Cochrane Library, and Google Scholar. The reference lists of research articles found were also searched for applicable articles.

MeSH terms and CINAHL subject headings were utilized to enhance the search results. The search terms used included various combinations of "burn injury," "burn trauma," "burn patient," "burns," "burn care nursing" and "nurse," "nursing," "nursing care," "wound care," "learning needs," "continuing education," "competence," "preparedness," "education," "pain management," "biopsychosocial factors," "psychological well-being," and "anxiety".

Since the techniques and products used during burn care nursing evolve based on evidence-based practice, the inclusion criteria consisted of articles published between 2011 to 2021. The search was limited to peer-reviewed research articles that are available in English.

Furthermore, the search was limited to studies conducted on adults in the acute care setting since the educational resource will be developed for RNs working with this patient population.

The various combinations of the key words yielded over four hundred results. These were scanned for possible relevance and the abstracts of potentially relevant articles were downloaded for further review. Thirty-nine full articles were read based on the relevance of the abstracts. Eight additional studies were identified from the reference lists of the relevant studies. A total of twenty-eight studies were chosen to inform the literature review. Thirteen studies employed quantitative designs, nine utilized qualitative designs, two used mixed-methods designs, and four were literature reviews. The Public Health Agency of Canada (2014) Critical Appraisal Toolkit and the Critical Appraisal Skills Programme (CASP) (2017) were used to critique and appraise quantitative and qualitative research studies, respectively. The findings will be presented below as an integrated review of the literature to identify the current evidence on the best practices for the nursing care of patients with burn injuries. Seven key intervention studies will be further summarized in literature summary tables that can be found in Appendix A. The authors names will be highlighted bold to indicate which studies are included in the literature summary tables.

Background

To gain an appreciation of the significance of the problem, it is important to understand the incidence and prevalence of burn injuries and the impact burn injuries have on patients, their family members, RNs, and the health care system.

Incidence and Prevalence

Reports from the World Health Organization (WHO) (2018), the American Burn Association (ABA) (2016), the Parachute and Injury Prevention Centre (2015), and the Canadian Skin Patient Alliance (2020), in addition to a well-conducted systematic review (Smolle et al.,

2016) were used to identify the incidence and prevalence of burn injuries. The WHO (2018) and the ABA (2016) compiled reports based on registry statistics and the report by the Parachute and Injury Prevention Centre (2015) was developed in collaboration with the PHAC. The Canadian Skin Patient Alliance (2020) completed their report from peer-reviewed literature. Smolle et al., (2016) employed a strong design of medium quality, owing to the heterogeneity of the included studies and the lack of information on the number of appraisers.

While the incidence of burn injuries has been declining globally (Smolle et al., 2016), burns remain the fourth most common cause of injury with approximately eleven million people receiving care for burn injuries annually (WHO, 2018). In 2010, 45,000 burn injuries occurred in Canada, with 657 of these occurring in Newfoundland and Labrador (NL) alone (Parachute and Injury Prevention Centre, 2015). In the United States (US), approximately 486,000 individuals require medical attention for burn injuries annually (ABA, 2016).

Individuals living in low- and middle-income countries are at a higher risk for burn injuries than those residing in high-income countries. However, within all countries the risk of burn injury is correlated with socioeconomic status, with those of lower socioeconomic status being at a greater risk for burn injury (WHO, 2018; Smolle et al., 2016). The mortality rate from burn injuries has been decreasing globally (Smolle et al., 2016; WHO, 2018; ABA, 2016). This is largely owed to the advances made in burn care, which means patients with severe burn injuries, such as those greater than 80% total body surface area, have a greater chance of survival in developed countries (Abrams et al., 2016; Christiaens et al., 2015).

While females have slightly higher mortality rates from burn injuries, the overall rate of burn injuries from the various mechanisms are higher among men (WHO, 2018; Smolle et al., 2016). The incidence of burn injuries appears to vary by age with adults aged 40 to 49 being

most likely to be hospitalized, followed closely by children (Canadian Skin Patient Alliance, 2020). Burn injuries most commonly occur at home or in the workplace (ABA, 2016; WHO, 2018) with most burns being caused by contact with hot substances, such as water, steam, or chemicals or by fire/flame (Canadian Skin Patient Alliance, 2020; ABA, 2016).

Impact on Patients

To ensure the delivery of quality care, it is important to consider the experience from burn patients' perspectives. Seven articles were reviewed, six employing qualitative designs (Abrams et al., 2016; Backstrom et al. 2019; Christiaens et al., 2015; Jones et al., 2017; Simons et al., 2016; Yuxiang et al.,2012) and one utilizing a mixed-methods design (Dai et al., 2018), to investigate the experience and perspectives of burn patients.

Phenomenological studies were conducted by Abrams et al. (2016) in the US, Yuxiang et al. (2012) in China, and Jones et al. (2017) in the UK. Simons et al. (2016) conducted a qualitative cross-sectional study in Australia, while Backstrom et al. (2019) and Christiaens et al. (2015) conducted qualitative descriptive studies in Sweden and Belgium, respectively. Finally, Dai et al. (2018) utilized a mixed-methods approach with a quantitative cross-sectional design and a qualitative descriptive aspect in the US. Abrams et al. (2016) (n = 8), Yuxiang et al. (2012) (n = 8), Jones et al. (2017), Simons et al. (2016) (n = 30), and Dai et al. (2018) (n = 610) recruited burn injury survivors, whereas Backstrom et al. (2019) (n = 14) recruited nurses, and Christiaens et al. (n = 29) recruited a combination of burn patients (n = 29) and allied health professionals (n = 28). Abrams et al. (2016) and Jones et al. (2017) explored the implications of burns injuries on the survivors' health, Yuxiang et al. (2012) explored burn patients' experience with pain related to burn injuries during hospitalization, and Simons et al. (2016) sought to gain an understanding of burn scars on health-related quality of life. Christiaens et al. (2015) and Dai

et al. (2018) both sought to understand the care needs of patients with burn injuries and Backstrom et al. (2019) identified how nurses offer support to family members of patients with burn injuries. Abrams et al. (2016), Yuxiang et al. (2012), Jones et al. (2017), Simons et al. (2016), and Backstrom et al. (2019) utilized semi-structured interviews for data collection, while Christiaens et al. (2015) utilized a combination of face-to-face interviews (n = 40) and focus group discussions (n = 17), and Dai et al. (2018) utilized surveys for data collection.

Each of the studies were deemed to be of medium trustworthiness except for Dai et al. (2018) whose quantitative design was weak and overall trustworthiness of the qualitative data was deemed to be low. This offers an indication of the value and applicability of the data (Streubert & Carpenter, 2011). This is mainly owed to the use of purposive sampling, which involves selecting participants based on their first-hand experience with a phenomenon of interest, which may have led to inherent bias as the individuals who chose to participate may have had more impactful experiences (Streubert & Carpenter, 2011). Dai et al. (2018), in their mixed-methods study, had a low response rate (21%), were limited to one setting, did not ensure data saturation was achieved, and did not complete member checking. This impacts the credibility, dependability, and transferability of the study findings (Streubert & Carpenter, 2011). Interestingly, Abrams et al. (2016) reported that their primary researcher was a burn survivor. This presents a risk of credibility bias, which is an inaccurate or unfair presentation of information that can occur when a researcher is influenced by their personal experiences and views. The primary researcher being a burn survivor may cause them to be biased in the interpretation of interview responses and the data selected for presentation. Nonetheless, Abrams et al. (2016) utilized a third-party experienced in qualitative research to review the primary investigator's field log, reflective journal, transcripts, categories, and themes to verify credibility.

Inadequate pain management was a common theme identified through the research. Pain assessment is a critical aspect of pain management, yet patients reported their pain was not assessed regularly, nor did they feel they were taken seriously regarding their interpretation of their pain intensity (Dai et al., 2018; Yuxiang et al., 2012). Additionally, participants commonly reported a perceived lack of information. For example, some patients felt discharge education was not adequate to prepare them for the pain and discomfort associated with their evolving scarring (Simons et al., 2016). Contrarily, other burn patients commended the nurses for teaching them non-pharmacological measures to manage their pain. However, burn patients still desired more specific medical information regarding pain management interventions (Yuxiang et al., 2012). Additionally, burn patients felt they were not informed enough and wanted more information on possible outcomes, problems, and solutions to reduce their uncertainties. Patients stated that information was often given during interventions, such as dressing changes but felt they would retain the information better if it was given separately (Christiaens et al., 2015).

The need for support and the recognition of psychosocial needs was another common theme identified in six studies (Abrams et al., 2016; Christiaens et al., 2015; Jones et al., 2017; Simons et al., 2016; Dai et al., 2018; Yuxiang et al., 2012). This was particularly important among patients with disfiguring scars and functional limitations who reported feeling fearful of being stigmatized, judged, and isolated, which emphasized the need for psychosocial support to those living with burn injuries (Jones et al., 2017; Simons et al., 2016). Commonly, these patients expressed a need for more information on coping mechanisms and the availability of adequate social supports following discharge (Jones et al., 2017; Christiaens et al., 2015; Simons et al., 2016). This emotional turmoil was discovered to make it difficult for the patients to have social contacts outside of their immediate families. Thus, family member inclusion in care was

deemed important (Abrams et al., 2016). However, Backstrom et al. (2019) discovered that RNs may not always recognize the importance of family members in care. While some nurses actively sought to include and support family members, others felt family involvement was not a natural part of patient care and fell to the role of other disciplines, such as social work. Patients who had open communication with their nurses and felt supported and encouraged reported higher patient satisfaction scores on discharge (Dai et al., 2018) and had a higher perceived level of self-confidence that influenced them to become members of support groups where they shared their stories and offered support to other burn patients (Abrams et al., 2016).

There is consistent, moderate evidence indicating that burn patients have unmet care needs. RNs could benefit from education to ensure they understand the importance of pain assessment, pain management, the assessment of psychosocial needs, including social supports and the inclusion of family in care, and adequate preparedness for discharge home.

Impact on Families

Two studies were reviewed that investigated the issues and concerns of the families of adults with burn injuries. Sundara (2011) conducted a systematic review and Bond et al. (2017) conducted a cross-sectional study. Sundara (2011) reviewed 31 international articles that were quantitative, qualitative, and mixed-methods to identify the issues and concerns of the family members of adult burn survivors. Bond et al. (2017) recruited 36 family members of adult burn patients from a burn centre in Montreal, Canada to assess the prevalence of anxiety, depression, and post-traumatic stress disorder (PTSD) related symptoms among family members at the time of admission and discharge from the hospital. The participants completed the Hospital Anxiety and Depression Scale, and the Modified PTSD symptom scale on admission and at discharge.Sundara (2011) utilized a strong design, while Bond et al. (2017) employed a weak

design deemed to be of medium quality. Bond et al. (2017) recruited from a single setting limiting the generalizability of the findings, only 27% of eligible participants were included in the analysis, and 42% were loss to follow-up. Additionally, the researchers questioned whether the small sample size lowered the statistical power and the ability to discover associations between patient or close relative variables and the psychological distress reported. Sundara (2011) stated several studies did not identify methods used for data analysis, the relationship of the family members to the burn patient was not consistently identified, and the inclusion of international studies poses potential cultural differences in the findings.

The emotional reactions experienced by burn patients' family members were identified in both studies. Family members commonly experience strong emotional reactions including shock, grief, depression, anxiety, and guilt. These emotions may be persistent and associated with PTSD (Sundara, 2011). Similarly, Bond et al. (2017) discovered that 77.42% of spouses and 56.00% of close relatives experienced at least one PTSD-related anxiety or depression symptom upon admission of their loved one. Upon discharge, 45.00% of spouses and 6.25% of close relatives experienced at least one PTSD-related anxiety or depression symptom. Anxiety ($p<0.0001$), depression ($p<0.0001$), and PTSD-related symptoms ($p<0.0001$) were significantly higher at admission than discharge (Bond et al., 2017).

Family members' concerns surrounding discharge was an additional common theme. The discharge period can be particularly anxiety-provoking as family members prepare to take responsibility for the care of their loved one. In addition to requiring support with their activities of daily living, patients with burn injuries often require psychosocial support (Sundara, 2011). However, burn patients' family members may also be in a state of crisis and require assistance themselves so that they can effectively support their loved one (Bond et al., 2017). Additional

concerns of spouses and family members include sexuality and intimacy, sources of social support, the need for information on their loved one's prognosis and expectations as they recover (Sundara, 2011). The levels of anxiety may inhibit family members' ability to concentrate and retain information. As a result, written material may be more beneficial and answers may need to be repeated and reinforced by members of the burn care team (Bond et al., 2017; Sundara, 2011).

These studies present consistent, moderate evidence to support the need for nursing staff to assess the psychological distress of family members, ensure families are well-informed to help lessen feelings of uncertainty, and prepare them for the transition home following discharge.

Impact on RNs

Two studies were reviewed that discussed the impact of structured education on nursing staff retention at a US Army Institute of Surgical Research Burn Centre. These studies were prompted based on a survey administered to the nursing staff of the burn centre following a significant turnover of 33.6% of nursing staff, which revealed that the lack of structured education programs was a significant factor contributing to nurse job dissatisfaction and increased turnover (Mann-Salinas et al., 2014; **Robbins et al., 2017**). Mann-Salinas et al. (2014) conducted a systematic review regarding the development of an evidence-based precepting program for experienced nurses transitioning to burn specialty practice. Forty-three studies, a combination of qualitative and quantitative research, were reviewed. **Robbins et al. (2017)** conducted an uncontrolled before-after study to investigate the use of preceptorship programs to assist in the transition of RNs providing burn care at the US Army Institute of Surgical Research Burn Centre. Thirty new nurses participated in an 8- to 12-week precepting program and completed a competency assessment tool, a benchmark for basic knowledge assessment, and a

burn wound care test. This is further discussed in the educational intervention section below and in the literature summary table found in Appendix A.

Mann-Salinas et al. (2014) employed a strong design of high-quality owing to the comprehensive search process, use of multiple appraisers, and clear description of the results. **Robbins et al., 2017** utilized a weak design of medium quality owing to the participants being recruited from a single setting, which limits the diversity of the sample and subsequently the generalizability of the findings (Polit & Beck, 2012). Furthermore, there is questionable feasibility of implementation of the preceptor program as two of the programs were cancelled due to increased census and low staffing (**Robbins et al., 2017).**

Mann-Salinas et al. (2014) systematic review identified support for the development of an evidence-based precepting program for burn care nursing at the US Army Institute of Surgical Research Burn Centre. Burn units were recognized as clinically demanding and high stress environments and introducing nursing staff to this clinically demanding environment without ensuring proper training was found to compromise nurse retention (Mann-Salinas et al., 2014). Secondly, it was recognized that the burn care environment is physically and emotionally demanding for nursing staff (Mann-Salinas et al., 2014). However, structured education was found to reduce nurse turnover (Mann-Salinas et al., 2014; **Robbins et al., 2017**). **Robbins et al. (2017)** discovered that the turnover rate decreased from 33.6% to 16.5%, a 50% decrease ($p < 0.1$), following the development of a precepting program. This decrease in turnover rate is owed to the increase in general nursing staff confidence and job satisfaction found from precepting programs (**Robbins et al., 2017**).

Impact on the Healthcare System

Reports from the WHO (2018), the ABA (2016), the Parachute and Injury Prevention

Centre (2015), the Canadian Skin Patient Alliance (2020), and the Canadian Institute for Health Information (CIHI) (2011) were reviewed to describe the impact burn injuries have on the healthcare system. The WHO (2018), the ABA (2016), and the CIHI (2011) compiled reports based on registry statistics. The information from the ABA (2016) was obtained through the National Burn Repository, which is not publicly accessible. The report from the Parachute and Injury Prevention Centre (2015) was developed in collaboration with the Conference Board of Canada and the PHAC and quantifies the cost of injury to Canadian children, families, the health care system, and Canadian society. The Canadian Skin Patient Alliance (2020) completed their report from peer-reviewed literature that was reviewed by an expert of their medical advisory board. Additionally, information was obtained from a cohort study conducted by Banfield et al. (2015) in Canada, a narrative review conducted by Ray et al. (2017) of 152 internationally based qualitative and quantitative articles, a retrospective cross-sectional study by Bettencourt et al. (2020) in the US, and a retrospective cohort study conducted by Eidelson et al. (2018) in the US.

While Banfield et al. (2015) obtained data from 1,139 patient medical records to conduct a cost-analysis of patients hospitalized with burn injuries in the provincial burn centre of Ontario, Canada, Bettencourt et al. (2020) and Eidelson et al. (2018) utilized hospital databases to obtain data regarding the association between nurse staffing and burn patient mortality and patterns of nationwide burn patient readmission rates, respectively. Bettencourt et al. (2020) database sample included 14,064 patients and 29,584 nurses from 653 hospitals in the US and Eidelson et al. (2018) included data from 22 US states. Similarly, Ray et al. (2017) provided a comprehensive review of burn patient care needs and burn injury outcomes.

Banfield et al. (2015) employed a moderate design of medium quality, while Bettencourt et al. (2020) and Eidelson et al. (2018) both utilized weak designs deemed to be of medium

quality. While Banfield et al. (2015) recruited from a single burn centre, Bettencourt et al. (2020) and Eidelson et al. (2018) obtained data from databases that included information from multiple centers, increasing the generalizability of the findings. However, all three reported missing data, which is a common concern when researchers collect data from a database as accuracy cannot be controlled (PHAC, 2014). Finally, Ray et al. (2017) did not provide descriptions or critical appraisals of the individual studies.

The care of burn patients poses a significant economic impact on the healthcare system due to high-cost services, length of hospital stays, and staffing ratios required to meet care needs. The average cost of stay for a burn patient varies by burn severity but averages $84,678 (Banfield et al., 2015). Over 2000 hospitalizations occurred for burn injuries in Canada in 2010 with 39 occurring in NL alone. These hospitalizations across Canada cost up to $366 million in the year 2010, which has increased from $299 million in 2004 (Parachute and Injury Prevention Centre, 2015). In the US approximately 40,000 individuals require extended hospitalization for burn injuries annually (ABA, 2016).

The average length of hospital stay varies by burn severity and equates to 1 to 1.2 days per 1% total body surface area burned (Bessey et al., 2014; ABA, 2016). Given that criteria for admission to a burn unit includes, but is not limited to, a total body surface area of burns greater than 10% (Skin and Wound Care Specialists of the Regional Health Authorities, 2008), burn patients typically occupy hospital beds for longer than the average patient population, which is seven days according to the CIHI (2021). In Canada, the average length of hospital stay for a patient with burn injuries is 14 days, which increases to an average of 27 days for patients with severe burn injuries (Canadian Skin Patient Alliance, 2020).

Furthermore, the high-cost services required for burn injuries presents an economic impact

on the healthcare system. For example, full-thickness burns require surgical intervention to heal (Warby & Maani, 2020). Multiple surgical procedures may be required over the course of weeks to month. These procedures can include surgical debridement, escharotomy, allografting, autografting, release of contractures, or even amputations (Ray et al., 2017). The procedures are estimated to cost $23,874 per patient in Canada (Banfield et al., 2015). An additional consideration is the care and monitoring required following these surgical procedures. The care of patients with burn injuries requires a substantial amount of clinical time and typically exceeds that required for the care of other patient populations. As a result, appropriate staffing is a necessity and the patient-to-nurse ratio for patients with burn injuries reflects this (Bettencourt et al., 2020). Bettencourt et al. (2020) discovered that each additional burn patient added to a nurse's workload was associated with 30% higher odds of mortality ($p < 0.05$, 95% CI: 1.02-1.94). On the contrary, improvements in the work environment were associated with 28% lower odds of mortality ($p < 0.05$, 95% CI: 0.07-0.99).

Furthermore, burn injuries present the risk for readmission. Infection (28.4%), pain control (19.2%), and issues with wound healing (15.3%) are among the most common reasons for readmission (Eidelson et al., 2018). Eidelson et al. (2018) noted that 7,000 or 7.4% of burn patients were re-admitted within thirty days. The risk factors for 30-day readmission included burns of the lower limbs (odds ratio [OR] 1.29, 95% CI, 1.21-1.37, $p < 0.01$), third degree burns (OR 1.31, 95% CI, 1.22-1.41, $p < 0.01$), comorbidities (OR 1.48, 95% CI, 1.37-1.60, $p < 0.01$) and undergoing an operation (OR 1.48, 95% CI, 1.34-1.63, $p < 0.01$).

Evidently, burn injuries pose a significant impact on the healthcare system, particularly given their length of stay and risk for readmission. Owing to the complexity of burn patients,

patient-to-nurse ratios must be lower for this patient population to ensure the safety and quality of care delivered.

Contributing Factors

Practicing RNs' Lack of Knowledge

Two articles were reviewed that investigated RNs' perceptions of various aspects of caring for burn patients (Kornhaber & Wilson, 2011; Shepherd & Begum, 2014). Kornhaber and Wilson (2011) conducted a phenomenological study in a tertiary teaching hospital in Australia to examine the feelings of powerlessness by nurses who care for patients with severe burn injuries. Shepherd and Begum (2014) completed a mixed-methods study through the administration of a questionnaire with both quantitative and qualitative components at a single burn centre in the UK. The quantitative component consisted of Likert-scaled items that explored how staff helped patients look at their injuries, while the qualitative component consisted of five open-ended questions that explored greater detail on issues surrounding helping patients look at their injuries (Shepherd & Begum, 2014). Kornhaber and Wilson (2011) completed in-depth semi-structured interviews with seven RNs, while Shepherd and Begum (2014) recruited burn care staff (n = 33), including nurses (n = 25) to complete a survey designed by the researchers to explore the degrees of confidence and beliefs associated with helping burn patients look at their injuries.

Kornhaber and Wilson's (2011) study was deemed to be of medium trustworthiness and Shepherd and Begum (2014) utilized a weak design of medium quality. Both Kornhaber and Wilson (2011) and Shepherd and Begum (2014) recruited participants from a single setting, limiting the diversity of the sample. Additionally, Kornhaber and Wilson (2011) did not employ member checking, which improves the credibility of the findings by having participants verify that the findings are true to their experiences (Streubert & Carpenter, 2011). Finally, the self-

report nature of the assessment tool used by Shepherd and Begum (2014) may have posed a risk of bias whereby participants respond in socially desirable ways by underreporting inappropriate behaviours and overreporting appropriate behaviours (Donaldson & Grant-Vallone, 2002).

Powerlessness is a common theme identified by nurses caring for patients with burn injuries (Kornhaber & Wilson, 2011). At times nurses feel incompetent and doubt their ability to perform burn care procedures and struggle to manage burn patients' pain. Furthermore, nurses may feel apprehensive as to whether burn patients are adequately prepared for discharge and if they have instilled adequate coping strategies, particularly to cope with any disfigurement (Kornhaber & Wilson, 2011). Similarly, Shepherd and Begum (2014) found that while 85% of nurses recognize the importance of having burn patients look at their injuries, 63% worried about the patients' reactions and 48% worried about having an appropriate response. Nurses have expressed a desire for further training to help patients look at their injuries, to manage patients' emotional reactions, and improve communication techniques (Shepherd & Begum, 2014).

Evidently, there is a level of discomfort associated with the care of burn patients. At times, nurses are apprehensive, lack confidence in the care they are providing, and desire additional support and training. Further education is required to support nurses caring for patients with burn injuries.

Nursing Students' Limited Preparedness from Nursing School Curriculum

The care and management of burn patients is complex and requires specialized knowledge. Thus, it is questioned whether RNs obtain knowledge of burn care throughout nursing school curriculum or if additional education and training is necessary. Three studies were reviewed that investigated senior nursing students' preparedness to care for burn patients (Meschial and Felix de Oliveira, 2014; Hosseini and Momennasab, 2020; Oliveira-Kumakura et

al., 2018) and one study described the transition of novice nurses to burn care (Bay et al., 2018). Meschial and Felix de Oliveira (2014) conducted a cross-sectional study in four higher education institutions in Brazil. Hosseini and Momennasab (2020) conducted a descriptive phenomenological in one nursing school in Iran, and Oliveira-Kumakura et al. (2018) and Bay et al. (2018) conducted case reports in one nursing school in Brazil and the US, respectively.

Meschial and Felix de Oliveira (2014) (n = 107), Hosseini and Momennasab (2020) (n = 8), Oliveira-Kumakura et al. (2018) (n = 9) and Bay et al. (2018) (n = 80) all recruited senior nursing students. However, Bay et al. (2018) participants were transitioning into practice as novice nurses. While the nursing students in Hosseini and Momennasab's (2020) study participated in an internship course that involved one week in the burn unit and another week in the burn emergency unit, Oliveira-Kumakura et al. (2018) had the nursing students participate in a four-week course (3-hour session occurring once weekly) that was designed to develop clinical reasoning and decision making in the assessment and care of patients with burn injuries. Similarly, Bay et al. (2018) reviewed the implementation of a mentorship program to prepare novice nurses for a smooth transition into the trauma-burn and neuroscience critical care settings. Each of the 80 students were assigned to one or two RN mentors for their 12-hour shifts over a 15-week semester. In comparison, Meschial and Felix de Oliveira (2014) completed a questionnaire developed by the researchers that included 27 questions measuring the senior nursing students' knowledge of care to burn patients. Hosseini and Momennasab (2020) had the students participate in 45- to 60-minute semi-structured interviews to describe their feelings and thoughts of the internship and their experience of learning to care for burn patients, while Oliveira-Kumakura et al. (2018) had their students participate in case studies, simulations, and in-person debriefing sessions that aimed to determine knowledge acquired and satisfaction with

participating in the session. Similarly, Bay et al. (2018) had faculty complete in-person education and evaluation and faculty maintained a 24-hour responsibility for their assigned student.

Meschial and Felix de Oliveira (2014) employed a weak design deemed to be of medium quality, while Hosseini and Momennasab's (2020) descriptive phenomenological study was determined to be of medium trustworthiness and Oliveira-Kumakura et al. (2018) and Bay et al. (2018) conducted case reports, which are weak designs deemed to be of medium credibility. Meschial and Felix de Oliveira (2014) and Bay et al. (2018) recruited participants from multiple settings while Oliveira-Kumakura et al. (2018) and Hosseini and Momennasab (2020) recruited from a single setting. The use of multiple settings increases the diversity of the sample, contributing to generalizability and transferability of the findings, respectively (Polit & Beck, 2012; Streubert & Carpenter, 2011). Hosseini and Momennasab (2020) did not utilize member checking, a method whereby participants verify the results to reflect their experience was not completed, which questions the credibility of the findings (Streubert & Carpenter, 2011). Furthermore, Meschial and Felix de Oliveira (2014) had a moderate response rate of 79%. Since Oliveira-Kumakura et al. (2018) reported the use of a variety of teaching strategies, it is difficult to determine if one had a greater benefit. Oliveira-Kumakura et al. (2018) and Bay et al. (2018) case reports would benefit from rigorous study designs, including long-term follow-up to determine the effectiveness of the teaching strategies.

The findings from these studies have indicated the lack of preparedness of nursing students and novice nurses to care for patients with burn injuries. Meschial and Felix de Oliveira (2014) discovered that only 22.4% of participants had an adequate knowledge of burn care indicating that nursing students are inadequately prepared with the knowledge necessary to care for patients with burn injuries. Similarly, Hosseini and Momennasab (2020) discovered that

senior nursing students experienced fear and stress regarding the care of burn patients and felt the care requirements were outside of their comfort level and previous experiences. The students expressed the need for theoretical and practical learning about burns.

However, exposure to and education on burn care nursing was found to improve knowledge levels and comfort caring for patients with burn injuries. Meschial and Felix de Oliveira (2014) found that there was a positive association between having previously provided nursing care to burn patients during clinical experiences (OR = 3.1, p=0.01444) or having observed the care of burn patients throughout nursing school (OR = 3.6, p=0.006533) and having adequate knowledge of burn care. Similarly, Hosseini and Momennasab (2020) expressed that students found the internship course highly beneficial to increasing their skills and knowledge-level for burn care, which caused their fear and stress to diminish. This is congruent with Bay et al. (2018) findings which indicated the mentorship program helped students build confidence, prioritize care, improve assessment skills, become advocates for their patients and families, and eased the transition into practice. Congruently, Oliveira-Kumakura et al. (2018) discovered that the utilization of a variety of teaching strategies, such as the lectures, case studies, and simulations helped develop clinical reasoning and improved assessment skills of acute burns.

Evidently, there is consistent weak evidence to support the belief that information surrounding burn care nursing is lacking in nursing school curriculum and additional education is essential to prepare nursing students and novice nurses to care for patients with burn injuries. The evidence suggests that students with previous exposure to burn care and the opportunity for structured learning surrounding burn patient care, are more adequately prepared with the knowledge and confidence to care for patients with burn injuries than those who have not.

Educational Interventions

In order for Registered Nurses to provide safe and competent care in specialized areas such as the burn unit, they must be successfully orientated and trained. Seven research articles were reviewed that investigated educational measures to support Registered Nurses caring for burn patients (**Fowler et al., 2013**; **Onarici & Karadag, 2021**; **Olszewski et al., 2016**; **Reeves et al., 2018**; **Robbins et al., 2017**; **Tavener & Prince, 2016**; **Thompson et al., 2018**). Further descriptions of these articles are discussed below, and key details are found in Appendix A.

Preceptorship Programs

Robbins et al. (2017) and **Thompson et al. (2018)** investigated the use of preceptorship programs to assist in the transition of RNs providing burn care. The former employed an uncontrolled before-after design and the latter utilized a qualitative design. Following an evaluation which indicated that nursing staff desired more didactic instruction, hands-on learning, and precepting, **Robbins et al. (2017)** designed a preceptorship program. Similarly, **Thompson et al. (2018)** investigated ways to improve the precepting experiences in a burn centre in North Carolina, US. **Robbins et al. (2017)** recruited nurses (n = 63) from the US Army Institute of Surgical Research Burn Center. Senior nursing staff (n = 33) completed a 3-day course to prepare them to become preceptors and new nurses (n = 30) participated in the 8- to 12-week preceptorship program. **Thompson et al. (2018)** conducted focus group sessions with preceptors (n = 16) and preceptees (n = 17) to identify perceived gaps in the precepting program and potential solutions. **Robbins et al. (2017)** precepting program involved co-signed shifts, simulations, role-playing, case studies, readings, and discussions to instill critical thinking and knowledge. A competency assessment tool was used to evaluate the new nurses' knowledge, skills, and abilities in the burn unit pre- and post-preceptorship program. The new nurses also

completed a burn wound care test pre- and post-preceptorship program. The basic knowledge assessment test (BKAT) was conducted prior to initiation of the preceptorship program to identify baseline knowledge and areas that would benefit from focused education during the preceptorship experience on the burn unit (**Robbins et al., 2017**).

Robbins et al. (2017) employed a weak design of medium quality and **Thompson et al. (2018)** utilized a qualitative design of low trustworthiness. **Robbins et al. (2017)** and **Thompson et al. (2018)** recruited participants from a single setting, which limits the diversity of the sample and subsequently the generalizability and transferability of the findings, respectively (Polit & Beck, 2012; Streubert & Carpenter, 2011). There is questionable feasibility of implementation of **Robbins et al. (2017)** preceptor program as two of the programs were cancelled due to increased census and low staffing. **Thompson et al. (2018)** did not provide sufficient detail of the data analysis process or employ the use of member checking.

Robbins et al. (2017) found that following the eight to twelve week transitioning phase with support from a preceptor, 76% of transitioning nurses achieved passing scores on the BKAT and 93% of transitioning nurses passed the wound care test. Additionally, there was a statistically significant increase in competency scores of the new nurses' knowledge, skills, and abilities for burn care from 5 (+/- 2) before and 9 (+/- 1) post ($P<0.0001$). **Thompson et al. (2018)** discovered from their focus group analysis that preceptors and preceptees desired standardization of the preceptorship program to overcome inconsistent teaching methods and more appropriate matching of preceptors and preceptees to prevent disaccord between the paired duos. Additionally, it was believed that increased efforts were needed to engage and welcome preceptees and preceptor support was needed to better prepare preceptors, prevent burn out, and help them feel valued and appreciated.

Literature (Handbooks and Journal Clubs)

Two studies were reviewed that evaluated the use of a handbook developed to enhance nursing staff burn care competency (**Olzewski et al., 2015**) and a multidisciplinary burn literature journal club to promote education, research competency, clinical knowledge, and evidence-based practice of burn care (**Fowler et al., 2013**). **Olszewski et al. (2016)** conducted an uncontrolled before-after study and **Fowler et al. (2013)** utilized a cross-sectional design. **Olszewski et al. (2016)** recruited nurses (n = 59) from the Firefighters Burn Institute Regional Burn Centre in California, US. **Fowler et al. (2013)** administered surveys to 114 burn unit journal club members at a single burn centre in Ohio, US. **Olszewski et al. (2016)** provided a 51-page burn nursing handbook that was disseminated as required reading for the burn unit nursing staff. A knowledge assessment survey was completed pre-test by 46 of the 59 nurses and the post-test was completed by 36 of these nurses, due to the voluntary nature of the survey. **Fowler et al. (2013)** hosted a monthly journal club for two years that was open to a variety of hospital personnel, including nurses who made up 20% of the members. Each month an appointed speaker would choose and present a current article related to burn care. **Fowler et al. (2013)** received survey responses from 30 of the 114 members.

Olszewski et al. (2016) employed a weak design of medium quality and **Fowler et al. (2013)** utilized a weak design of low quality. **Olszewski et al. (2016)** and **Fowler et al. (2013)** recruited their participants from a single setting, which limits the diversity of the sample and subsequently the generalizability of the findings (Polit & Beck, 2012). Additionally, due to the voluntary nature of the survey tools completed by **Olszewski et al. (2016)** and **Fowler et al. (2013)** there is a risk of response bias as those who participated may have a greater interest in burn care. Additionally, it is not possible to determine if participants reviewed the handbook or

participated in all the burn unit journal club sessions in each of these respective studies. Furthermore, the study conducted by **Fowler et al. (2013)** lacked objective measures of knowledge improvement. Therefore, it is not possible to determine whether the handbook or the journal club were truly effective in improving knowledge on burn care nursing.

Olszewski et al. (2016) found that knowledge levels on burn care nursing improved following implementation of the burn care handbook (pre: 55.9% [SD: 11.0]; post: 69.6% [SD: 8.7], $p<0.001$). Similarly, **Fowler et al. (2013)** found that survey respondents believed the journal club enhanced medical knowledge (90%) and patient care (73%). **Fowler et al. (2013)** also found that the burn unit journal club enhanced research competency (70%), critical thinking (63%), and evidence-based practice (63%) related to the care of burn patients.

Education Session

A single study was retrieved that evaluated the use of educational sessions. **Taverner and Prince (2016)** completed a retrospective descriptive study to determine the proportion of patients who received twice-daily assessments of neuropathic pain following education to RNs on an assessment tool that was added to the patients' charts. RNs at the provincial burn center in British Columbia (BC), Canada received three-weeks of education from a Pain Clinical Nurse Specialist on screening for neuropathic pain using a validated assessment tool that was newly introduced to patients' charts. The nurses received support and guidance from the Pain Clinical Nurse Specialist during the initial week post-implementation **(Taverner & Prince, 2016)**.

Taverner and Prince (2016) utilized a weak design of medium quality. Participants were recruited from a single setting, which limits the diversity of the sample and subsequently the generalizability of the findings (Polit & Beck, 2012). Furthermore, it was not possible to

determine whether all the nurses providing care had participated in the education sessions as the authors did not report this information.

Six months following the education sessions and the implementation of the new tool, **Taverner and Prince (2016)** completed retrospective chart reviews of 76 burn patient charts over a one-year period. Nurse-led assessment for neuropathic pain was not a part of routine care prior to the education sessions. Since pain assessment was limited to pain intensity by the numerical rating scale, adequate and accurate assessments for neuropathic pain were not being completed. From the chart review it was discovered that 88% of patients received twice-daily neuropathic pain assessments, 42% of which exhibited neuropathic pain. These results indicate that a significant proportion of burn patients are at risk for neuropathic pain. However, the successful treatment relies on an accurate assessment of the pain. This is particularly important since neuropathic pain that is undetected and untreated can lead to PTSD, insomnia, and suicidal ideations, and can interfere with the rehabilitation phase of burn injury (**Taverner and Prince, 2016**). It is expected that RNs complete routine pain assessments, including the type of pain, so it can be properly managed. Educational efforts that provide training on appropriate assessments for various types of pain experienced by burn patients, including neuropathic pain, can improve pain assessment techniques and the subsequent pain management provided.

Simulations

Onarici and Karadag (2021) and **Reeves et al. (2018)** evaluated the use of simulations for burn care nursing. The former conducted a randomized clinical trial, and the latter conducted a non-randomized controlled trial. **Reeves et al. (2018)** simulation scenarios included electrical injuries, smoke inhalation injuries, scalding burns, and associated traumas, while **Onarici and Karadag (2021)** utilized real burn patient data to develop scenarios and care plans. **Onarici and**

Karadag (2021) recruited nursing students (n = 61) from a nursing school in Turkey. The intervention group included 31 nurses who completed a theoretical burn and nursing care course, a 10-minute simulation of a burn patient scenario, and a 20-minute in-person debriefing session. The 30 nursing students in the control group solely received the theoretical burn and nursing care course. Similarly, **Reeves et al. (2018)** recruited healthcare professionals (n = 71), including nurses (n = 46) from a level one trauma and burn centre in the US to evaluate the use of simulation scenarios in a centre that employs the American Burn Association's Advanced Burn Life Support (ABLS) curriculum in the US. The intervention group completed seven simulation scenarios that were 20-minutes each. The non-simulation group received regular training. **Onarici and Karadag (2021)** had the participants complete the Cognitive Level Assessment Test for Burn Patient Care before the intervention, one-week post, and two-weeks post intervention. **Reeves et al. (2018)** had the participants complete the ABLS written test and the participants' performance during the simulation served as a practical evaluation.

Onarici and Karadag (2021) and **Reeves et al. (2018)** both employed strong designs of medium quality. **Onarici and Karadag (2021)** recruited participants from a single setting, whereas **Reeves et al. (2018)** recruited participants from multiple settings. The use of multiple settings increases the diversity of the sample, contributing to generalizability of the findings (Polit & Beck, 2012). Additionally, there is questionable feasibility of implementation of **Onarici and Karadag (2021)** and **Reeves et al. (2018)** simulation interventions as they necessitate high-cost technology and significant educator time to develop scenarios.

Onarici and Karadag (2021) did not find a statistically significant difference between groups for pre-test ($p=0.586$) and one-week post-test ($p=0.102$) scores. However, there was a statistically significant increase in the intervention group's test scores compared to the control

group's two-weeks post intervention (p=0.006). Comparably, **Reeves et al. (2018)** found that amongst the simulation group, mean written test scores (%) were 87.54% and mean practicum exam scores (1-5) were 4.186. When compared to the non-simulation group who received a mean of 85.03% on the written test and 4.24 on the practicum exam, there was a statistically significant difference in written test scores, with the simulation group demonstrating higher scores ($p<0.01$). However, there were no statistically significant differences between practical exam scores. This calls to question the benefit of simulation interventions in improving practical skills. However, a larger study with long-term follow-up is warranted to make this determination.

Quality of the Evidence

It is apparent that there is moderate evidence from few studies to support a variety of educational methods to educate RNs providing care to patients with burn injuries. Literature, such as handbooks and journal clubs, preceptorship programs, education sessions, and simulations may prove beneficial to provide such education. **Onarici and Karadag (2021)** and **Reeves et al. (2018)** demonstrated inconsistent evidence from their studies to support the use of simulations. Additionally, it is unlikely that a simulation intervention would be feasible to develop through the practicum project as they necessitate high-cost technology and significant educator time to develop scenarios. However, from follow-up satisfaction surveys it was demonstrated that participants valued interactive learning methods, such as the case studies, role-playing, and reflective exercises (**Robbins et al., 2017**). Additionally, **Robbins et al. (2017)** participants obtained passing rates of 75% and 93% for the BKAT and wound care test, respectively following their intervention. Thus, an educational resource that can incorporate interactive learning methods, such as case studies, role-playing, and reflective exercises may potentially be beneficial and feasible to underpin the practicum project.

Theoretical Framework

Given that the educational resource that will be developed will serve RNs, all of whom are adults, providing care to patients with burn injuries, the theoretical framework chosen to guide this process is Knowles' Adult Learning Theory. This theory asserts that adults learn differently than children. Adults desire to be involved in the planning and evaluation of their learning, are most interested in learning which is relevant and impactful to their lives, and that adult learning is problem centered (Knowles et al., 2015). Guided by this theory, efforts will be made to identify learning needs, knowledge and skills gaps, and potential solutions. As a result, educational efforts can be developed that enable competencies, knowledge, skills, and abilities to be met in a way that is meaningful to the adult learner (Knowles et al., 2015). The six principles of andragogy are: 1) the learner's need to know, 2) self-concept of the learner, 3) prior experience of the learner, 4) readiness to learn, 5) orientation to learning, and 6) motivation to learn (Knowles et al., 2015). These principles will be discussed as they apply to the development of a learning resource for burn nurses.

Knowles et al. (1998) explained that the first principle surrounds adults having a desire to understand why they need to know something or what benefit the knowledge will have to them. For the RNs on the burn unit of focus, the knowledge obtained from the learning resource developed through the practicum project will benefit them directly in the increased competence and confidence in caring for patients with burn injuries. The second principle surrounds adult learners' responsibility for their own learning (Knowles et al., 1998). The maintenance of continuing education is an expectation of RNs and RNs often seek out learning opportunities independently. The developed learning resource will be available as needed for RNs who would like to use it. The third principle asserts that adult learners bring a range of life experiences that

are important to consider when learning (Knowles et al., 1998) and will be necessary to take into account in the development of the learning resource. Fourth, adult learners are assumed to possess a readiness to obtain knowledge that will be impactful to their lives (Knowles et al., 1998). The learning resource will contain information that will be impactful to the RNs' provision of burn patient care. Fifth, adult learners are believed to have a problem- or task-centered approach to their learning. Finally, adult learners are assumed to have internal motivations to learn, including the desire for increased job satisfaction and increased self-esteem (Knowles et al., 1998). It was discussed throughout the literature that the lack of structured educational resources was a factor that contributes to nursing job satisfaction and increased turnover among nurses in burn units (**Robbins et al., 2017**). Thus, the learning resource developed will address this motivation to learn and potentially contribute to improved job satisfaction and increased self-esteem.

Implications

This literature review was conducted to determine the incidence, prevalence, and impact of burn injuries for patients, families, RNs, and the healthcare system. The review also determined contributing factors and potential interventions and strategies to support RNs caring for patients with burn injuries. The knowledge obtained from the literature review has indicated that among the major concerns for burn patients are their pain and anxiety management, communication surrounding care, and discharge preparation (Abrams et al., 2016; Backstrom et al. 2019; Christiaens et al., 2015; Dai et al., 2018; Jones et al., 2017; Simons et al., 2016; Yuxiang et al., 2012). Ensuring burn patients' care needs are met is vital. Patients whose care needs are fulfilled are less likely to be readmitted or experience life-threatening complications, such as septicemia, and subsequently achieve better clinical outcomes (Dai et al., 2018). There is

limited evidence that suggests that evidence-informed educational programs may provide the training to help ensure there is a greater consistency in the care provided. This would help resolve the concerns of burn patients that they receive contradictory and inconsistent care and information, leaving them with anxieties and uncertainties (Christiaens et al., 2015).

In addition, it was noted in recently published literature that nursing students experience fear and stress due to their perceived inadequate preparation to care for burn patients (Meschial and Felix de Oliveira, 2014; Hosseini and Momennasab, 2020; Oliveira-Kumakura et al., 2018; Bay et al., 2018), and Registered Nurses question their abilities to perform burn care procedures, manage pain, prepare their patients for discharge, and instill adequate coping mechanisms (Kornhaber & Wilson, 2011; Shepherd & Begum, 2014). It is believed that the lack of structured educational opportunities is a contributing factor to nurses' job dissatisfaction that results in turnover (**Robbins et al., 2017**) and can impact patient outcomes, such as morbidity, mortality, and length of stay (Bettencourt et al., 2020). It is vital that nurses feel empowered and competent in the care they are providing, and this can be accomplished through appropriate educational measures. Ray et al. (2017) expressed the need for collaborative efforts to develop curricula, assist in education and training, and provide support to ensure the delivery of high-quality care in the palliative care setting and the same holds true for the inpatient burn care setting. Through critical appraisal of the studies reviewed using the PHAC (2014) toolkit and the CASP (2017) and utilization of the criteria for rating evidence found in Table 1 and Table 4 of the PHAC (2014) toolkit, there is limited moderate evidence that suggests that interactive learning methods, such as simulations, role playing, case studies, and reflective exercises may support the evidence-informed educational training for Registered Nurses providing care to burn patients

(**Fowler et al., 2013**; **Onarici & Karadag, 2021**; **Olszewski et al., 2016**; **Reeves et al., 2018**; **Robbins et al., 2017**; **Tavener & Prince, 2016**; **Thompson et al., 2018**).

The findings of the literature review will inform the development of interview guides that will be used during the consultations with key stakeholders and provide support for the development of an educational resource to support burn care nursing.

The purpose of the literature review was to provide support for the development of an educational resource for RNs caring for burn patients. Since information surrounding burn care nursing is lacking in nursing school curriculum (Meschial & Felix de Oliveira, 2014; Hosseini & Momennasab, 2020; Oliveira-Kumakura et al., 2018; Bay et al., 2018), RNs are insufficiently prepared to care for burn patients when entering the burn unit setting. Furthermore, transition programs to new specialties, especially burn care, are limited (**Robbins et al., 2017**). However, given the complexity of the care required for burn patients, additional education is imperative. This is especially important given the advances in burn care, which have resulted in greater survival rates for those with severe injuries and increased complications (Abrams et al., 2016; Christiaens et al., 2015). It has been expressed throughout the literature that there is a critical need for nursing-led, evidence-informed education (Bettencourt et al., 2020; **Robbins et al., 2017**; **Olszewski et al., 2016**). Many of the current educational programs are focused on the initial emergent phase, which begins with the onset of burn injury until the completion of fluid resuscitation, while education surrounding the care following fluid resuscitation is lacking (**Olszewski et al., 2016**). However, this education is also warranted and its need has been repeatedly expressed throughout the literature (**Robbins et al., 2017**; **Olszewski et al., 2016**; Carrougher et al., 2019; Mann-Salinas et al., 2014).

Conclusion

It is evident based on this literature review that additional education is vital to ensure patient care needs are met and RNs are empowered, confident, and competent in the care they are providing. Such educational efforts need to incorporate a comprehensive focus of burn nursing care, from assessment and pain management to discharge preparation. There is potential benefit to a variety of educational strategies; however, from the literature review it has been determined that an educational resource that can incorporate interactive learning methods, such as case studies, role-playing, and reflective exercises may be the best and most feasible intervention to underpin the practicum project. Consideration must be taken to ensure the educational modality chosen is effective for adult learners who are believed to be problem-centered and self-directed (Knowles et al., 2015). Based on the impacts of burn injuries on patients, families, and RNs, the educational resource should include a focus on assessment, pain management, biopsychosocial needs, family support, wound care, and discharge planning and preparation. RNs hold a vital role in the care of patients with burn injuries. The evidence-informed practicum project can support staff and ensure they are adequately trained and instilled with the knowledge and skills necessary to care for patients with burn injuries. The assurance that RNs are adequately educated will serve to improve their competence and confidence and improve patient safety, and subsequently morbidity and mortality rates.

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Appendix A
Literature Summary Tables

Key Question: What interventions/strategies provide education for Registered Nurses caring for patients with burn injuries?

Legend: CLATBPC – Cognitive Level Assessment Test for Burn Patient Care, V&R – Validity and reliability

Study/Design	Methods	Key Results	Comments
Authors: Onarici & Karadag (2021) Design: RCT Purpose: To determine the effectiveness of a simulation method on nursing students' burn patient care planning.	N: 61 nursing students enrolled in the Surgical Diseases nursing course. Country/setting: Turkey Intervention: 31 nursing students who received the theoretical Burn and Nursing Care course, a 10-minute simulation of a burn patient scenario and a 20-minute debriefing. Control: 30 nursing students who received the theoretical Burn and Nursing Care course. Data collection: - CLATBPC: conducted before intervention, 1-week post, and 2-weeks post. V&R reported. Outcomes: - Mean scores of burn patient care evaluation test. *No sophisticated statistics (no regression).	**CLATBPC median pretest scores (Quartiles):** Intervention: 52.00 (32.00-84.00) Control: 48.00 (20.00-80.00) (p = 0.586). **CLATBPC median 1-week post scores (Quartiles):** Intervention: 56.00 (32.00-72.00) Control: 52.00 (24.00-68.00) (p = 0.102). **CLATBPC median 2-week post scores (Quartiles):** Intervention group: 60.00 (24.00-76.00) Control group: 48.00 (24.00-72.00) *Statistically significantly higher scores in the intervention group compared to control group (p = 0.006).	Strength of Design: **Strong** Quality: **Medium** Issues: - Participants were from a single setting. - Participants were not blinded or separated. Could communicate with each other and share information. - Larger sample with long-term follow-up would be beneficial. - Feasibility of implementation (high-cost technology and significant educator time required to develop scenarios).

Legend: ABLS – Advanced Burn Life Support, NLN EPQ – National League of Nursing Education Practice Questionnaire, SSSCL – Student Satisfaction and Self-Confidence in Learning Scale, V&R – Validity and reliability

Study/Design	Methods	Key Results	Comments
Authors: Reeves et al. (2018) Design: Non-randomized controlled trial. Purpose: To determine the effect of high-fidelity patient simulation on burn care knowledge.	N: 71 healthcare professions (including 46 nurses) completing training in a simulation centre. Country/setting: United States **Simulation:** 71 participants who completed 7 simulation scenarios (20-minutes each). **Non-simulation:** 64 individuals who received regular training. Data collection: 1. ABLS test: completed following simulation and non-simulation training. 2. NLN EPQ: 16-item tool 3. SSSCL: 13-item tool *V&R of each reported. Outcomes: 1. Written test & practical exam scores 2. Measurement of educational concepts & didactic materials. 3. Student satisfaction and self-confidence in learning. * $p < 0.05$ considered significant. * Regression not used.	**Simulation:** Mean written test score (%): 87.54% Mean practical exam score (1-5): 4.186 **Non-simulation:** Mean written test score (%): 85.03% Mean practical exam score (1-5): 4.24 *The simulation group has statistically significant higher scores on the written test than the non-simulation group ($p<0.01$). *No statistically significan difference in practical exam scores between groups. **NLN EPQ (1-5):** Overall active learning rating: 4.5 +/- 0.7 **SSSCL (1-5):** Satisfaction with learning: 4.4 +/- 0.7 Satisfaction with self-confidence: 4.5 +/- 0.7	Strength of Design: **Strong** Quality: **Medium** Issues: - Convenience sampling. No randomization. - No pre-test to determine baseline knowledge levels. - Questionable feasibility of implementation (high cost-technology and significant time required to develop scenarios). - Risk of information bias as assessors and participants not blinded.

Legend: VNIP – Vermont Nurses in Partnership, BKAT – Benchmarks for basic Knowledge Assessment, V&R – Validity and reliability

Study/Design	Methods	Key Results	Comments
Authors: Robbins et al. (2017) Design: Uncontrolled before-after study Purpose: To investigate the implementation of an evidence-based transition to practice program for burn care nurses.	N: 63 nurses at the United States Army Institute of Surgical Research Burn Center. Country/setting: Texas, United States • 33 nursing staff completed a 3-day course provided by a VNIP trainer to prepare them to become preceptors. • 30 new nurses participated in the precepting program. • 8-12 weeks preceptorship conducted. • Observations, simulation, role-play, case studies, literature reviews, and discussions used by preceptors to instill critical thinking and knowledge. Data collection: • Competency Assessment Tool (assessed pre and post) • BKAT test (V&R confirmed) • 40 question burn wound care test Outcomes: • Transitioning nurses' knowledge and competencies of burn care. *Regression not used.	**Competency Assessment Tool:** • Initial competency score: 5 +/- 2 • Post competency score: 9 +/- 1 $p<0.0001$ **BKAT Test** • 22 (76%) of transitioning nursing achieved passing BKAT scores. **Burn Wound Care Test** • 24 (93%) passed the wound care test. **Miscellaneous** • Nurses who completed the program reported improved confidence in their ability to provide burn care. • While not statistically significant, employee turnover rate decreased from 33.6% prior to the program implementation to 16.5% the year following ($p<0.1$).	Strength of Design: **Weak** Quality: **Medium** Issues: - Limited to one center. - V&R of wound care and competency assessment tool not mentioned. - Questionable feasibility of implementation (increased census and low staffing caused two courses to be cancelled).

Legend: V&R – Validity and reliability, SD – Standard Deviation

Study/Design	Methods	Key Results	Comments
Authors: Olszewski et al. (2016). Design: Uncontrolled before-after study. Purpose: To evaluate burn nursing knowledge and the implementation of a handbook for burn care nursing.	N: 59 nurses working at the burn unit of the Firefighters Burn Institute Regional Burn Centre. Country/setting: California, United States Pre-test: Completed by 46 nurses working on the burn unit. Post-test: 36 of the same nurses who completed the pre-test and reviewed the 51-page Burn Nursing Handbook independently. Data collection: • Knowledge assessment survey: 24 questions, conducted pre- and ~1-year post-education. • V&R not reported. Outcomes: • Assessments measured burn care nurses' knowledge levels. *Regression not used.	**Knowledge Assessment Survey:** • The handbook improved education based on the overall post-test scores ($p<0.001$). Pre-test (SD): • 55.9% (11.0) Post-test (SD): • 69.6% (8.7) **Fluid Resuscitation Questions (Pre, Post):** 80.6%, 84.8% ($p=0.067$) *Insignificant decrease pre- to post-test. **TBSA Questions (Pre, Post):** 39.1%, 66.7% ($p<0.001$) *Statistically significant increase pre- to post-test. **Signs of wound infection (Pre, Post):** 67.4%, 61.1% ($p<0.072$) *Insignificant decrease pre- to post-test. **Respiratory care (Pre, Post):** 21.7%, 66.7% ($p<0.001$) 13%, 41.7% ($p<0.001$) *Statistically significant increases pre- to post-test for both questions.	Strength of Design: **Weak** Quality: **Medium** Issues: - Participants recruited from a single setting. - Only 78% response rate to pre-education survey and 78.3% response rate to post-education survey. - Risk of response bias as those who chose to participate may have a greater interest in burn care. - Unable to determine whether participants actually reviewed the handbook (although verbal confirmation given). - Post-survey not proctored (could have referenced handbook). - Missing data in years of experience.

Legend: TBSA – Total body surface area

Study/Design	Methods	Key Results	Comments
Authors: Taverner & Prince (2016) Design: Retrospective descriptive study. Purpose: Evaluate the proportion of burn patients who received twice-daily neuropathic pain assessments following the introduction of and education on a pain assessment tool to the patients' charts. To identify the prevalence of neuropathic pain in patients with acute burn injuries.	N: 76 charts of adult patients who had new burn injuries. Country/setting: Adult provincial burn centre in British Columbia, Canada. • Registered Nurses received 3-weeks of education from a Pain CNS on screening for neuropathic pain using a validated assessment tool. Support was provided by the Pain CNS during the first week of the tool's implementation. Data collection: • Retrospective chart review from December 2010 to December 2011 (6 months following the implementation of the neuropathic pain screening tool – a validated tool). Outcomes: • Proportion of patients receiving twice-daily pain assessment. • Presence of neuropathic pain. *p<0.05 considered significant.	• 88% of patients received twice daily neuropathic pain assessments. • 42% of patients exhibited neuropathic pain based on assessment criteria. **Age:** • Patient's 65 years and older were significantly less likely to report neuropathic pain signs (p<0.05). **Gender:** • Males (50%) were significantly more likely to report neuropathic pain than females (22%) (p<0.05). **TBSA:** • Patients with >11% TBSA burns were significantly more likely to experience neuropathic pain than those with <10% TBSA burns (p<0.05). **Burn type:** The cause or depth of burn injury had no statistically significant influence on the experience of neuropathic pain.	Strength of Design: **Weak** Quality: **Medium** Issues: - Single setting. - Retrospective design limits generalizability. - Unsure if all nurses providing care had participated in the session. - No consideration to whether patient already had a history of neuropathic pain.

Legend: V&R – Validity and reliability

Study/Design	Methods	Key Results	Comments
Authors: Fowler et al. (2013) Design: Quantitative descriptive study Purpose: To assess the effectiveness of a multidisciplinary journal club in promoting education, research competency, clinical knowledge, and evidence-based practice.	N: 30 members of the journal club who responded to a survey. Country/setting: Burn Centre in Ohio, United States • 24 monthly journal club meetings were attended by a variety of hospital personnel (researchers [26%], physicians [23%], Registered Nurses [20%], and other disciplines [30%]). • Each month the appointed speaker would choose a current article relevant to burn care to present and discuss. • After 2 years a confidential survey was distributed to evaluate the impact of the journal club. Data collection: • 7-question survey (V&R not reported) distributed to 114 journal club attendees. Outcomes: • Journal club competencies (medical knowledge, patient care, critical thinking, evidence-based practice).	• 100% of respondents judged the program to be valuable to personal educational needs. • 90% of respondents agreed the journal club enhanced medical knowledge. • 73% of respondents agreed the journal club improved patient care. • 70% of respondents agreed the journal club improved critical thinking. • 63% of respondents agreed the journal club improved evidence-based practice.	Strength of Design: **Weak** Quality: **Low** Issues: - Random sampling not used. - Only 26% response rate. This may have resulted in bias as those who responded may have perceived the journal club more positively than those who did not respond. - Measured perceived benefit of the journal club; however, no objective measure of knowledge improvement.

Study/Design	Methods	Key Results	Comments
Authors: Thompson et al. (2018) Design: Qualitative descriptive design. Purpose: To identify ways to improve the precepting experience in a burn intensive care unit.	N: 16 preceptors and 17 preceptees. Country/setting: Jaycee Burn Centre in North Carolina, United States Data collection: • 2 focus group sessions Outcomes: • Gaps identified in the precepting programs and solutions produced.	4 themes identified and solutions created: **1. Standards** • Inconsistent teaching among preceptors and at times inaccurate information taught by preceptors. • Solution: Standards created, including skills checklist and new preceptors require training. **2. Matchmaking** • Disaccord between some preceptors and preceptees. • Solution: An established personality assessment tool used to enhance preceptor/preceptee pairing process. **3. Engaging the New Hire Before Arrival** • It was believed that welcoming the preceptee to the unit would instill a sense of pride and enthusiasm. • Solution: Welcome video sent to the preceptee and informal meetings between preceptor and preceptee off-site before start date. **4. Preceptor Supper** • Preceptors were feeling overwhelmed, unprepared, and underappreciated. • Solution: Preceptor coffee time once a month to discuss issues, concerns, and positive aspects of the precepting experience.	Trustworthiness: **Low** **Credibility:** - No information on length of sessions. - No mention of data saturation. - Focus group setting may have limited free expression. - Unsure of relationship between focus group leader and participants. **Transferability:** - Single setting. **Dependability:** - Insufficient detail on theme development. **Conformability:** - No use of triangulation. - No mention of mutual agreement.

Appendix II: Environmental Scan Report

The Development of a Self-directed E-Learning Resource on the Assessment, Monitoring, and Treatment of Patients with Burn Injuries: Environmental Scan Report

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A burn injury is defined as a traumatic injury that results in partial or complete destruction of the skin and underlying tissue due to intensive heat. Burns are commonly classified as thermal, chemical, radiation, or electrical based on the mechanism of injury (World Health Organization, 2018). The care of burn patients is complex and can require intensive nursing monitoring and management to prevent such complications as bacterial infection, sepsis, hypovolemia, hypothermia, and respiratory distress (Mayo Clinic, n.d.). Registered Nurses (RNs) are expected to monitor the patients' physiologic status, biopsychosocial needs, maintain infection prevention measures, complete complex wound care, ensure adequate pain management, facilitate rehabilitation, and provide health education and health promotion (Bettencourt et al., 2020). Burn injuries are often associated with numerous concomitant injuries and burn patients progress through various phases of recovery, which further contributes to the complexity of the care required (Bayuo, 2021). Burn wound care can require hydrotherapy, mechanical debridement, and the use of a variety of wound care products, which changes as the burn injuries progress and requires specialized knowledge (Browning & Cindass, 2020). Studies have highlighted the need for education and training to empower nurses and instill the necessary knowledge to provide competent care to burn patients, particularly due to the complex recovery process and care needs associated with burn injuries (Backstrom et al., 2019).

At present there are no formal educational resources for RNs at the burn unit in a tertiary care centre in one province in Eastern Canada to avail of to improve their competency in caring for patients with burn injuries. Through preliminary discussions amongst the burn unit committee and nursing staff it was determined that formal education is necessary to improve RNs' competencies, comfort level caring for burn patients, and the quality of care delivered.

A literature review was conducted that investigated the incidence and prevalence of burns, and the impact of burn injuries on patients, family members, RNs, and the health care system. In addition, interventions and strategies to address the educational needs of RNs were reviewed and addressed. This literature review revealed that there is moderate evidence that burn patients and their family members have care needs which are inadequately met, and nursing school curriculum is likely insufficient to adequately prepare RNs to care for patients with burn injuries (Meschial and Felix de Oliveira, 2014; Hosseini and Momennasab, 2020; Oliveira-Kumakura et al., 2018; Bay et al., 2018). The literature review also revealed that educational resources including handbooks and manuals (Olszewski et al., 2016; Fowler et al., 2013), simulations (Onarici & Karadag, 2021; Reeves et al., 2018), role playing, and case studies (Robbins et al., 2017) demonstrate promise in preparing RNs to care for patients with burn injuries. Particularly, there is consistent moderate evidence that interactive learning methods, such as case studies, role playing, reflective exercises, and simulations are beneficial methods to educate RNs on the care of patients with burn injuries (Robbins et al., 2017; Onarici & Karadag, 2021; Reeves et. Al., 2018).

In order to develop an educational resource, it was first necessary to determine what resources are available at present and if they are beneficial for the burn unit of focus. Thus, an environmental scan was conducted to determine the educational resources available within Eastern Health and to RNs in the burn units across Atlantic Canada. The search was limited to these burn units as they were believed to be comparable in size and in patient demographics to the burn unit of focus. Furthermore, it was sought to identify the type of educational methods carried out at these facilities and the content included. This document summarizes the methods and results of the environmental scan as well as the implications for the practicum project.

Objectives of the Environmental Scan

The objectives of the environmental scan were as follows:

1. determine if the other burn units in Atlantic Canada provide formal education for Registered Nurses caring for patients with burn injuries;
2. identify the types of educational resources available for Registered Nurses in the burn units in Atlantic Canada and from targeted website searches (e.g., Self-directed learning module, PowerPoint presentations, seminars, etc.);
3. identify the information included in the educational resources for Registered Nurses in the burn units in Atlantic Canada (e.g., assessment/monitoring, wound care, infection prevention, etc.); and
4. determine if these educational resources would be applicable and useful for Registered Nurses working in the burn unit.

Search Methods

There were two sources of information for the environmental scan, the first being the burn units across Atlantic Canada and the second searches of targeted websites. The websites were recommended from the Nurse Practitioner (NP) for the Plastics Program at the burn unit of focus, the Burn Care Clinical Lead at Hospital A, and from the literature review.

Burn Units

An initial internet search was completed to determine the location of the burn units throughout Atlantic Canada. Through this search it was determined that there are three other burn units within Atlantic Canada. These will be referred to as Hospital A, Hospital B, and Hospital C in the interest of ensuring confidentiality. The hospital websites were searched to identify contact information of nurse managers or nurse educators who work at these burn units.

The search revealed phone numbers for the respective burn units. I called these phone numbers, verified they were the burn unit, and politely requested the email addresses of the manager for the unit. An email of inquiry was sent to these individuals and can be found in Appendix A. The email explained my practicum project and inquired about the educational resources available to RNs caring for burn patients at the respective facilities. It was also requested that the individuals share or discuss the educational resources available, which may assist in developing a learning resource for the burn unit of focus. The individuals were informed that the correspondence and any information shared would be confidential and only shared with my practicum project supervisor and the practicum lead. The individuals were also ensured that the information would not be utilized or adapted without obtaining written consent.

Professional Contacts

I received replies to my emails of inquiry from the Burn Care Clinical Lead at Hospital A and the Burn Resource RN at Hospital B. Despite a follow-up email one week later, I did not receive a response from Hospital C. Following email correspondence, I had a 45-minute telephone meeting with the Burn Care Clinical Lead at Hospital A where the type and duration of educational methods, content included, and future endeavours to advance burn care nursing were discussed. I created a guide to support the process of this semi-structured interview, which can be found in Appendix B. Following email correspondence, the Burn Resource RN from Hospital B emailed a copy of the educational resources that have been developed at their facility.

A data collection form was used to help ensure consistency was maintained in the data collection process (Appendix C). This form identifies whether education was available, the method of content delivery, and the topics covered. An overview of the findings from the data analysis process can be found in the data analysis form (Appendix D). This form identifies the

mode of delivery of the education, targeted audience, and information on the various categories identified throughout the analysis of each of the educational resources (e.g., assessment, wound care techniques, etc.).

Targeted Websites

To identify the resources available through Eastern Health, a search was completed on the hospital intranet. This search identified the NL Skin and Wound Care Manual (2008), which includes a five-page section on burns. During an informal conversation with the NP for the plastics program at the burn unit of focus, I was informed of a learning module for burn care available in British Columbia. This module was developed by the British Columbia Patient Safety and Quality Council (2021) and I was able to access it through their website. The Burn Care Clinical Lead at Hospital A directed me towards resources developed by the American Burn Association (ABA) and while reviewing articles for my literature review, I learned about educational videos available through the University of Washington (UW). I was able to retrieve the learning manuals and access the educational videos through the respective internet sites. All three of these sources focused on the initial emergent phase, with the latter also focusing on outpatient burn care. The emergent phase begins at the onset of burn injury and lasts until completion of fluid resuscitation, typically 24-hours (Schaefer & Lopez, 2020). The priorities of care during this phase include the primary and secondary assessments, maintaining an adequate airway, and beginning fluid resuscitation (Schaefer & Lopez, 2020). This information would be applicable to RNs in the emergency room but not RNs in the inpatient setting, such as the burn unit who require a more comprehensive focus on the care of burn patients from admission to discharge. While much of the information included in these sources is not applicable to the practicum project, there are some useful information on burn patient assessment and special

considerations for various types of burn injuries. Findings from the data collection and data analysis processes can be found in Appendix C and Appendix D, respectively.

Data Security, Confidentiality, & Ethical Considerations

In order to ensure confidentiality of the data, the information has been securely stored on a password protected computer and printed materials have been stored in a locked filing cabinet in my private residence, both of which are only accessible to myself. The information has only been shared with my practicum project supervisor and the practicum project lead. Following completion of the practicum project, this information will be properly disposed of. Electronic information will be permanently deleted from my computer and printed information will be disposed of by paper shredder. The rationale for exemption from Health Research Ethics Board approval can be reviewed in Appendix E.

Data Analysis

The data were analyzed using content analysis, a research tool that serves to identify and analyze concepts within qualitative data, including interviews and documents (Columbia University, 2019). To do so, the content is broken down into categories and summarized. I reviewed the data from the three sources three times each to identify relevant information that would inform the development of a learning resource for the burn unit of focus. I took notes as I reviewed the educational resources and broke the content into categories based on the type of information provided. These categories were then able to be summarized. For example, burn patient assessment was a common category identified while reviewing the educational resources. Burn patient assessment was then summarized based on the topics included (e.g., classification of burn injuries, total body surface area (TBSA), head-to-toe, etc.). Information on the various

categories have been recorded in the table in Appendix D and a detailed summary of this information is provided below.

Summary of Results

Type of Education

All six sources of information reviewed and discussed various modes of delivery for educating nurses on burn care. Passive learning strategies were utilized by Hospital A, Hospital B, the NL Skin and Wound Care Manual (2008), and the American Burn Association (2018). Hospital A offered eight in-person education sessions that were four hours each and one eight-hour education day where a variety of presentations were delivered. A group of specialized RNs received an additional education session for advanced burn care competencies. Additionally, the RNs received one shift co-signed with the Burn Care Clinical Lead. The RNs at Hospital B were provided with a detailed 37-page orientation manual to review independently and were given co-signed shifts with a senior RN. In addition, a case study is being developed to supplement the burn care education provided at Hospital B. As evidenced by their titles, the NL Skin and Wound Care Manual (2008) and the ABA's (2018) Advanced Burn Life Support (ABLS) provider manual are manuals that include five and 90-pages of reading material, respectively.

The self-directed nature of these educational resources is beneficial. This allows learners to review the content at their own pace and identify questions to direct towards a clinical educator or senior RN as they progress through the content. Self-directed and self-motivated learning is believed to help individuals apply information and acquire capabilities and competencies (Betihavas et al., 2016). However, the passive learning strategies utilized is a concern as an overemphasis on content delivery is believed to be an impediment to knowledge integration (Benner et al., 2010).

The UW (2021) and the BC Patient Safety and Quality Council (2021) employed more active learning strategies. The UW (2021) offers sixteen educational videos, two of which were inaccessible, varying in length from two- to ten-minutes and the BC Patient Safety and Quality Council (2021) offers a self-directed, interactive e-learning module that takes approximately thirty-minutes to complete. This module includes matching, multiple choice, true and false, and select that apply questions, as well as a case study.

The interactive nature of BC's (2021) e-learning module and the UW's (2021) videos is believed to be highly beneficial. Individuals are typically better able to apply knowledge and achieve learning outcomes through active learning styles (Phillips, 2016). Actively engaging learners with the content in meaningful ways moves past the superficial level of comprehension and improves knowledge integration (Scheckel, 2016; Carpenter & Pease, 2013). Videos, such as those provided by the UW (2021), are also an engaging form of learning and are said to encourage critical thinking and address learning objectives in the cognitive, affective, and psychomotor domains (Thompson, 2020). An additional benefit of videos is that the learner can pause, rewind, and replay the video to digest the content at their own pace (Hanson, 2016). Even still, it is important to consider the diversities of the learner when selecting instructional strategies and learning activities (Candela, 2020). Therefore, I believe the integration of interactive methods into the learning resource developed through the practicum project, such as case studies, role playing, videos, matching, and multiple choice, select all that apply, or fill-in-the blanks questions may be beneficial. In this manner the learning resource will incorporate a variety of strategies that encompass multiple learning styles.

Targeted Audience

The burn units of Hospital A and Hospital B developed educational resources and sessions

specifically for RNs caring for patients with burn injuries; whereas the targeted websites provide burn care information that is not specific to RNs. An educational resource that is specifically for RNs would be of utmost benefit to inform the practicum project. As will be evidenced in the following sections, there are many considerations in the care of a patient with burn injuries. Preparing RNs with knowledge on all aspects of care from assessment to discharge planning will be highly beneficial to practice and improve the quality of care delivered to the patients.

Burn Patient Assessment

Each of the six sources provided information on the assessment of patients with burn injuries. Common to all sources was the inclusion of information for the initial assessment of burn patients, including the pathophysiology of burns, the classification of burn injuries by depth, calculation of the TBSA of injury using the Rule of Nines (Wallace, 1951) and the Lund and Browder chart (Lund & Browder, 1944), and fluid resuscitation calculations. Furthermore, Hospital B, the ABA (2018), and the UW (2021) discussed primary and secondary surveys. These are the initial assessments of the patient. The primary survey includes airway and cervical spine protection, ensuring adequate breathing, ventilation, circulation, and cardiac status, identifying any disabilities, neurologic deficits, or gross deformities, and to expose and examine the patient. The secondary survey is conducted once the primary survey is complete and once fluid resuscitation has begun. It includes obtaining a history and weight, completing a head-to-toe examination, and determining burn severity, depth, and size. Hospital A and B expanded beyond the initial assessment to include considerations for the head-to-toe assessment of a patient admitted to the acute care setting with burn injuries.

Both the NL Skin and Wound Care Manual (2008) and Hospital B included some dated terminology, including referring to burn injuries by first, second, and third degree. Additionally,

Hospital B included information on the Parkland Formula (Baxter, 1974) for fluid resuscitation. In more recent years this formula has had questionable use due to the perceived risk of under-resuscitation with fluids in some burn patient populations (e.g. those with inhalation injuries, electrical burns, and full-thickness burns). This occurs when the patient has not received sufficient fluid and is at risk for hypovolemia and hypoperfusion (Mehta & Tudor, 2020). The Parkland formula also has questionable use due to the risk of over-resuscitation in severely burned patients. This occurs when an excess of fluid is given, leading to fluid overload, and presenting the risk of pulmonary edema, abdominal compartment syndrome, and ischemia (Mehta & Tudor, 2020). The ABA (2018) has an updated formula that is based upon the type of injury, patient's age, and TBSA burned with adjustments being made to fluid rates based on patient response.

Understanding the pathophysiology of burn injuries is important for the management and care of burn patients. Different types of burn injuries have different injury patterns and physiological responses, which require differing care and management (Kettiaratchy & Dziewulski, 2004). Thus, providing a comprehensive focus on the assessment of burn patients from the initial phase through to the head-to-toe assessment of inpatient burn patients would be highly beneficial to the learning resource being developed through the practicum project. However, it is necessary to ensure the information provided is up to date.

Biopsychosocial Needs

Hospital A, Hospital B, and the ABA (2018) included information on the biopsychosocial needs of burn patients, such as managing anxiety and post-traumatic stress disorder related symptoms and coordinating appropriate referrals and supports. The RNs from Hospital A received a presentation from a Burn Psychologist. The manual from Hospital B included

information on considering the need for a referral to psychiatry due to the traumatic nature of burn injuries and the emotions experienced by burn patients, as well as, ensuring patients have appropriate emotional support upon discharge. Education was also provided on the management of procedural anxiety. The ABA (2018) emphasized the importance of differentiating pain from anxiety, ensuring health care providers are sensitive to the variable emotions experienced by burn patients and their family, and ensuring their psychosocial needs are met.

As was evidenced throughout the literature review, consideration of the biopsychosocial needs is a vital aspect in the care of patients with burn injuries (Abrams et al., 2016; Christiaens et al., 2015; Jones et al., 2017; Simons et al., 2016). This importance has been reiterated throughout the educational resources from Hospital A, Hospital B, and the ABA (2018). Given the prevalence of anxiety, depression, and post-traumatic stress disorder among burn patients (Sadeghi-Bazargani et al., 2011), this would be an important topic to cover in the learning resource. Ensuring RNs are educated on the importance of assessing and managing burn patients' and their family members' biopsychosocial needs will be an integral part of the learning resource.

Pain Management

Education on pain management was provided by Hospital A, Hospital B, the NL Skin and Wound Care Manual (2008), the ABA (2018), and within BC's (2021) e-learning module. The NL Skin and Wound Care Manual (2008) discussed the level of pain associated with various depths of burn injury. The ABA (2018) discussed assessing whether pain is due to the burn injury or a concomitant trauma and the consideration that the absorption of intramuscular and subcutaneous pain medications may be impaired by changes in fluid volume and tissue blood flow. In BC's (2021) e-learning module the importance of procedural pre-medication was

emphasized. The RNs from Hospital A received a presentation from a member of the Acute Pain Services team and were educated on the use of ketamine. Similarly, the RNs from Hospital B received education on opiates, NSAIDs, Gabapentin, Lyrica, and Fentanyl. These RNs also received education on the various types of pain, including nociceptive, neuropathic, and procedural pain. Education on non-pharmacological methods of pain management was solely provided by Hospital A. RNs at this facility were provided with training on virtual reality that is offered to burn patients as a method of distraction during procedures.

Pain management is a critical aspect of the care of burn patients. As was evidenced through the literature review findings, burn patients often experience inadequate pain management and feel their pain is not assessed regularly (Dai et al., 2018; Yuxiang et al., 2012). Studies have indicated that greater levels of acute pain are associated with negative long-term psychological effects (Dalal et al., 2010). I do not feel any individual resource sufficiently covered the necessary education needed on pain management as some were limited to education on assessment and others were limited to various analgesics. However, in combining the information from the various resources reviewed in the environmental scan a more comprehension focus on pain management may be provided in the proposed educational resource. Firstly, pain assessment is a vital aspect of pain management; therefore, it is necessary to ensure RNs are sufficiently educated on the pain assessment of burn patients. Secondly, including education on the various types of pain experienced by burn patients, such as background, breakthrough, procedural, and neuropathic pain is important as each type of pain may be managed differently (Griggs et al., 2017). Specific information on the preparation, safe administration, and effects of pain medications that are frequently utilized during the care of burn patients would likely be valuable to the RNs at the burn unit of focus. RNs should also be

educated on the importance of assessing patients' responses to analgesics and consulting the NP or physicians when patients are not achieving adequate pain management so that appropriate medication adjustments or referrals can be made (e.g., referral to Acute Pain Services). Additional information, such as the level of pain associated with various depth of injuries, pain from concomitant trauma, and factors that can impair medication absorbance are important considerations. Finally, education on non-pharmacological pain management methods, such as distraction will also have benefit and be included in the proposed educational resource.

Wound Care

The NL Skin and Wound Care Manual (2008) and BC's (2021) e-learning module provided information on the basics of burn wound care, including the objectives and principles of wound care. The ABA (2018) mainly focused on the initial care of various burn injuries and the UW (2021) focused on outpatient burn wound care, neither of which are directly applicable to the practicum project. However, of great interest were the special considerations for burns to the face, ears, eyes, hands, feet, genitals, and perineum included by the ABA (2018) and in BC's (2021) e-learning module. Furthermore, Hospital A, Hospital B, and BC's e-learning module included information on the use of specific wound care products, debridement, and graft and donor site care. Education on these topics would be highly valuable to the practicum project. Specific to Hospital B was the information included on items available in the burn kits used by their unit.

Burn wound care is highly complex, requires specialized knowledge, and the products used changes as the burn injuries progress (Browning & Cindass, 2020). Having a basic understanding of the principles of wound care is important. However, knowledge of the assessment of burn injuries and identifying the various types of wound tissue is important as this

influences the selection of appropriate products and alerts RNs to notify the Physician or NP when a current product may no longer be appropriate. In congruence with the education provided by Hospital B, specific considerations for the burn unit of focus, such as how to use the burn tub and the portable whirlpool for hydrotherapy and what items should be available on the burn cart would be advantageous to the learning resource being developed and will be further addressed in the consultations.

Interprofessional Collaboration

The importance of the multidisciplinary approach to burn care was recognized in the NL Skin and Wound Care Manual (2008), and by Hospital A, and Hospital B. The UW (2021) included instructional videos on exercises, stretches, splinting, and compression garments, which are common physiotherapy and occupational therapy approaches. The RNs at Hospital A and Hospital B were provided with more detailed descriptions of the roles of various members of the interdisciplinary team, including the Registered Social Worker, Dietician, Physiotherapist, Occupational Therapist, and Psychiatry. The increased survival rates following burn injuries has been attributed in part to a multidisciplinary approach to care (Mason et al., 2017; Karam et al., 2014). A multidisciplinary approach helps improve clinical care and outcomes by allowing the integration of expertise and knowledge from multiple health care providers, which leads to the better coordination of services, treatment, and planning (Karam et al., 2014). Therefore, RNs should understand the roles and responsibilities of the various team members and how they can support the optimal care of patients with burn injuries.

The complexity of burn patients necessitates the need for a multidisciplinary approach to care. It is important for RNs to understand the roles of each discipline and how they are valuable to the overall care of the patient. When providing burn wound care, RNs must coordinate the

timing of care with the Registered Physiotherapist and Occupational Therapist as they often assess and work with the patient when the dressings are removed. RNs are also the team members in closest contact with the patient; thus, they should be aware of the valuable information they can provide to the Registered Dietician and Social Worker. A section on the multidisciplinary management of patients with burn injuries will be addressed by including information on the roles and responsibilities of the members of the multidisciplinary team and how RNs coordinate care with these various services.

Miscellaneous

The four targeted websites included information on referral criteria to a burn centre. This would not be applicable to RNs in the inpatient setting. However, the ABA (2018) included education on smoke inhalation injuries, circumferential burns, compartment syndrome, and escharotomy. Furthermore, Hospital B included information on preparing for the admission of a patient to their burn unit, discharge planning, and infection prevention.

Understanding the risks associated with circumferential burns is important as these injuries can result in serious complications such as distal ischemia, compartment syndrome, respiratory failure, tissue necrosis, or death (Zhang & Hughes, 2020). Knowledge of the signs and symptoms of compartment syndrome are central to its early detection and prompt treatment before the damage leads to irreversible necrosis (Boccara et al., 2017). Inhalation injuries present an increased risk of acute upper airway obstruction and pneumonia (Ray et al., 2017). Knowledge of this and the signs and symptoms to monitor for are an important aspect of care. Additionally, information specific to the admission and discharge of a burn patient to the burn unit of focus may increase RNs' comfort level and help ensure care needs are met. Information can be provided on ensuring the room is prepared for the burn patient being admitted (e.g.,

isolation cart set up, dedicated vitals cart for the patient, blanket warmer is stocked, burn cart is prepped, etc.) and to ensure the patient is prepared for discharge (e.g., community health referral sent, follow-up appointments arranged, adaptive equipment obtained, appropriate supports in place, etc.).

Implications for the Practicum Project

The results of the environmental scan have indicated that the resources include valuable information on the care of burn injuries. This information can be used to inform the content of the learning resource developed through the practicum project. However, it is necessary to focus beyond the initial emergent phase of burn patient care. Thus, a comprehensive focus that includes information on specific aspects of nursing care is warranted for the learning resource being developed through the practicum project. This will include education on burn pathophysiology, patient admission, patient assessment, pain, pruritis, and anxiety management, infection prevention, family support, burn care preparation and provision, the role of the multidisciplinary team members, and discharge planning and preparation. Additionally, it is important to ensure the educational information provided is current and up to date. Dated terminology was noted in some of the resources and it appears that the NL Skin and Wound Care Manual (2008) has not been updated or revised in the last thirteen years. Additionally, the need for interactive learning methods can be taken into consideration during the development of the practicum project. Active learning is essential to support comprehension, knowledge integration, and future application of the knowledge attained (Phillips, 2016; Scheckel, 2016).

Furthermore, the findings from the environmental scan will be used to inform the development of the interview guides that will be used for the consultations of the RNs, the NP, Patient Care Coordinator, and the Clinical Educator of the burn unit. The identified learning

needs of the RNs in the burn units across Atlantic Canada and the topics covered throughout the six identified resources can prompt questions to identify the learning needs of the RNs working on the burn unit and how these learning needs can be addressed.

Conclusion

The environmental scan was effective in identifying the educational methods and resources available to RNs caring for patients with burn injuries within NL and across Atlantic Canada. Through conducting the environmental scan, the specific educational methods utilized by the burn units across Atlantic Canada and the targeted websites were determined and the content they included was identified. The interactive nature of BC's (2021) e-learning module was highlighted as supportive and beneficial to learning. The educational resource developed by the Burn Resource RN from the Hospital B was determined to be comprehensive and highly valuable to educating RNs caring for burn patients. While this resource will not be used directly, it can be used indirectly to inform the practicum project in terms of relevant topics to cover. Since active learning strategies have been highlighted as highly beneficial to knowledge integration and application it is suggested that an interactive learning module may be most beneficial to develop.

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Appendix A

Email of Inquiry

Hello (name of contact),

My name is Elizabeth Burry and I am a Registered Nurse at the Health Sciences Centre in St. John's, NL. **I am writing you to inquire about the educational resources available to Registered Nurses caring for burn patients at your facility.** I am currently completing my master's degree through Memorial University of NL Faculty of Nursing. For my final project I am aiming to develop a learning module for Registered Nurses caring for patients with burn injuries. This is something that has been deemed important but is currently unavailable at our burn unit. A part of this project includes conducting an environmental scan to determine if there are any educational resources for Registered Nurses working at the other burn units in Atlantic Canada.

If your unit provides additional education on the care of burn patients and you are able to attach a copy of this educational resource, that would be greatly appreciated. Otherwise, if you are able to provide details on the type of education (orientation session, co-signed/preceptor shifts, PowerPoint presentation, learning module, seminar/education session, etc.), the topics covered (assessment/monitoring, wound care techniques/products, etc.), if it is specific to Registered Nurses, and the duration/length of the resource, that would also be appreciated. Rest assured that this information will not be used without written permission and only shared with my practicum project supervisor.

I am grateful for any help you are able to offer. If you have any questions about my practicum project, I would be happy to answer them.

Kind regards,
Elizabeth BN RN
Registered Nurse, Medical/Surgical Intensive Care Unit
Health Sciences Centre, Eastern Health

Appendix B

Interview Guide

1. Describe how you determined there was a need for formal education for Registered Nurses providing care to patients with burn injuries.
2. Describe the types of educational resources/measures you developed and utilized.
3. Describe the topics covered as a part of these educational resources/methods.

Appendix C
Data Collection Results

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Education Available (Yes/No)	• Yes	• Yes	• Yes	• Yes	• Yes	• Yes
Specific to RNs (Yes/No)	• No	• Yes	• Yes	• No	• No	• No
Type of Resource	• Manual	• In-person education sessions • Co-sign shift	• Manual • Case study (being developed) • Co-sign shifts	• E-learning module	• Manual	• Videos

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Topics Covered	• Burn severity • Long-term management • Objectives of wound care • Minor burn wound care • Burn unit referral criteria	• Burn pathophysiology • Burn patient assessment • Pain management • Psychosocial needs • Wound care and grafting • Physiotherapy and Occupational therapy	• The interdisciplinary team • Anatomy and physiology of the skin • Types of burns • Assessment • Burn severity • Admission • Standing orders • Pain management • Isolation guidelines • Wound care • Discharge planning	• Pediatric burns • Practice standards • Three phases of burn management • Triaging • ER burn wound management • Burn severity • Mechanism of injury • Assessment • Burn unit referral criteria • Treatment of minor burns • Patient education • Resources	• Initial assessment and management • Airway management • Shock and fluid resuscitation • Burn wound management • Mechanisms of injury • Pediatric burns • Transfer to a burn centre • Burn disaster management	• Initial management • Triaging • Pathophysiology of burns • Assessment • OR procedures • Escharotomy • Debridement of outpatient burns • Stretches • Donor site care at home • Splinting • Ace wrapping and Tubigrip • Pediatric burns

Appendix D
Data Analysis Form

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Type of education	• Self-directed • Reading material	• 8 presentation style education sessions • One education day • Co-sign shift with Burn Care Clinical Lead • Specialized RNs received education for advanced competencies	• Self-directed • Orientation manual • Case study being developed • Co-sign shifts	• Self-directed • Interactive learning module • Matching, multiple choice, true and false, and select all that apply questions, and case studies.	• Advanced Burn Life Support provider manual • Focused on initial 24-hours post-injury	• Sixteen videos (unable to access two) • Focused on initial emergent phase and outpatient burn care
Duration /Length of Resource	• Approx 5 pages	• Each education session was 4-hours each.	• 37 pages	• 30 minutes	• 90 pages	• 2- to 10- minutes each
Target Audience	• For providers	• RNs	• RNs	• For providers	• For providers	• For providers

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Assessment	• Classification of burn injuries by depth	• Pathophysiology of burn injuries • Calculating TBSA • Fluid resuscitation • Head-to-toe assessments	• Types of burns • Classification of burn injuries by depth • Calculating TBSA • Fluid resuscitation formulas. • Primary and secondary assessments • Head-to-toe assessments	• Classification of burn injuries by depth • Calculating TBSA	• Primary and secondary survey • Classification of burn injuries by depth • Calculating TBSA • Fluid resuscitation formulas • Vital sign frequency (Q1H if >20% TBSA) • Monitoring perfusion and ventilation	• ABC's • Fluid resuscitation • Pathophysiology of burns • Calculating TBSA • Classification of burn injuries by depth • Types of burns
Bio-psychosocial needs	• Not discussed	• Psychosocial needs of burn patients • Presentation from a burn Psychologist	• Discusses procedural anxiety (use of Ativan and midazolam) • Need for Psych referral	• Not discussed	• Psychosocial needs of burn patients	• Not discussed

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Pain management (Pharmacological)	• Level of pain associated with the various depths of burn injuries.	• Pain management • Presentation from Acute Pain Services team • Information about Ketamine	• Nociceptive, neuropathic, and procedural pain • Opiates, NSAIDS, Gabapentin, Lyrica, Fentanyl	• Discusses the need for procedural premedicatio n (60 minutes before).	• Pain management discussed	• Not discussed
Pain management (non-pharmacological)	• Not discussed	• Virtual reality	• Not discussed	• Not discussed	• Not discussed	• Not discussed
Wound care products	• Not discussed	• Various products • Presentation from a representative with Acticoat products	• Burn kits (sterile bowls, towels, and gloves, debridement sets, & gauze) • Flamazine • Acticoat • Aquacel Ag • Bactigras	• Select all that apply for product options based on treatment goals • Foam dressings • Aquacel Ag	• Initial cleansing of burn wounds • Bacitracin • Silver sulfadiazine	• Out-patient burn wound care • Donor site care at home

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Wound care techniques	• Objectives of wound care • Care of minor burn wounds • Debridement • Special considerations for facial burns with rationale • Special considerations for tar burn wounds with rationale	• Negative Pressure Wound Therapy • Grafting • Donor site care	• Debridement • Graft care • Donor site care • Hydrotherapy	• Principles of burn wound care (select all that apply question) • Burn wound management • (D-debridement, I-infection, • M-moisture management, • E-edge or environment) • Special consideration for face, ears, hands, feet, perineum, and buttocks	• Initial care of: • Tar burns • Electrical burns • Chemical burns • Burns to the face, eyes, ears, hands, feet, genitals, and perineum.	• Out-patient debridement
Interprofessional Considerations	• Mentions the importance of a multi-disciplinary team approach but no discussion of specific roles.	• Presentations from Registered Occupational Therapist and Physiotherapist	• In-depth descriptions of the roles of social work, Psychiatry, Registered Dietician, Physiotherapist, Occupational Therapist.	• Not discussed	• Not discussed	• Physiotherapy stretches • Occupational therapy (splinting and compression)

	NL Skin and Wound Care Manual	Hospital A	Hospital B	BC Patient Safety and Quality Council	American Burn Association	University of Washington Medicine
Miscellaneous	• Discusses need to ensure family support • Criteria for referral to outpatient and inpatient burn care centres.	• N/A	• Admission of a burn patient to the unit. • Infection control guidelines • Personal protective equipment • Discharge Planning	• Patient education • Criteria for referral to burn centre	• Smoke inhalation injury • Criteria for referral to burn centre • Pediatric burn injuries • Escharotomy • Compartment syndrome	• Criteria for referral to burn centre

Appendix E: Health Research Ethics Authority (HREA) Screening Tool

Student Name: Elizabeth Burry

Title of Practicum Project: Development of a learning module for nurses related to the care of patients with burn injuries.

Date Checklist Completed: May 26, 2021

This project is exempt from Health Research Ethics Board approval because it matches item number 3 from the list below.

1. Research that relies exclusively on publicly available information when the information is legally accessible to the public and appropriately protected by law; or the information is publicly accessible and there is no reasonable expectation of privacy.
2. Research involving naturalistic observation in public places (where it does not involve any intervention staged by the researcher, or direct interaction with the individual or groups; individuals or groups targeted for observation have no reasonable expectation of privacy; and any dissemination of research results does not allow identification of specific individuals).
3. **Quality assurance and quality improvement studies, program evaluation activities, performance reviews, and testing within normal educational requirements if there is no research question involved (used exclusively for assessment, management or improvement purposes).**
4. Research based on review of published/publicly reported literature.
5. Research exclusively involving secondary use of anonymous information or anonymous human biological materials, so long as the process of data linkage or recording or dissemination of results does not generate identifiable information.
6. Research based solely on the researcher's personal reflections and self-observation (e.g. auto-ethnography).
7. Case reports.
8. Creative practice activities (where an artist makes or interprets a work or works of art).

For more information please visit the Health Research Ethics Authority (HREA) at https://rpresources.mun.ca/triage/is-your-project-exempt-from-review/

Appendix III: Consultation Report

The Development of a Self-directed E-Learning Resource on the Assessment, Monitoring, and Treatment of Patients with Burn Injuries: Consultation Report

Elizabeth Burry

Memorial University of Newfoundland and Labrador Faculty of Nursing

Consultations with key informants from a burn unit in a tertiary care centre in one province in Eastern Canada were essential in preparing to develop an educational resource to support burn care nursing. The consultations have allowed for the identification of the learning needs of the Registered Nurses (RNs) on the burn unit, the mode of delivery of an educational resource that is perceived to be most effective, and the educational topics that are warranted to be included in the resource. The consultations were carried out as one-on-one semi-structured interviews with a combination of novice and senior RNs, the Nurse Practitioner (NP) for the Plastics Program, the Patient Care Coordinators (PCCs), and the Clinical Educator for the burn unit. The NP, PCCs, and the Clinical Educator will be referred to as "Burn Committee members" in the interest of maintaining anonymity of their responses. It was important to include these members in the consultation process as they provided a variety of views on the issue of burn care education, with the PCCs and the Clinical Educator providing insight from an administrative perspective and the NP and the RNs providing insight from direct clinical care. The results from the consultations will inform the development of the educational resource for burn care nursing. In this report I will provide a background of the practicum project, a summary of the participants, the methods of data collection, management, and analysis, ethical considerations, and the implications of the results for the practicum project will be discussed.

Background

A burn injury is defined as a traumatic injury that results in partial or complete destruction of the skin and underlying tissue due to intensive heat. Burns are commonly classified as thermal, chemical, radiation, or electrical based on the mechanism of injury (World Health Organization, 2018). Burn care nursing is recognized as being complex and requiring a multidisciplinary approach. Burn patients undergo various phases of recovery and depending on

the mechanism of injury they can have concomitant injuries that further contributes to the complexity of the care required (Bayuo, 2021). RNs hold a vital role in the care of patients with burn injuries. They are expected to monitor the patients' physiological status, biopsychosocial needs, maintain infection prevention measures, complete complex wound care, ensure adequate pain management, and facilitate rehabilitation (Bettencourt et al., 2020).

At present, there are no formal educational resources for RNs to avail of at the burn unit in this tertiary care centre in Eastern Canada to support the deliverance of care to patients with burn injuries. However, during preliminary discussions amongst the Burn Committee members and RNs and through the integrated literature review that was conducted it was determined that formal education is necessary to improve RNs' competencies and the quality of care delivered. Without established training and educational preparation, it is difficult to ensure the delivery of consistent and competent care to burn patients (Carrougher et al., 2019). The proper training of RNs to provide burn care can positively impact patient outcomes, reduce medical complications, and reduce health care costs (Onarici & Karadag, 2021). Furthermore, educational resources can augment the competency of the RNs providing care (Reeves et al., 2018). The goal of this practicum project is to develop an educational resource to meet these needs.

To develop an educational resource, it is first necessary to determine the perceived learning needs of RNs working on the burn unit that was the focus of this project. Thus, consultations were completed with key informants to identify the learning needs of the RNs working on the burn unit, as well as the preferred mode of delivery of an educational resource to meet these learning needs. These key informants included both novice and senior RNs, the NP for the plastics program, the PCCs, and the Clinical Educator from the burn unit. The data

collection methods, measures to ensure confidentiality, measures to ensure data security, the data analysis process, and the implications of the results for the practicum project will be discussed.

Objectives for the Consultations

The objectives for the consultations were as follows:

1. identify the perceived learning needs of Registered Nurses working on the burn unit at a tertiary care centre in one province in Eastern Canada;
2. identify the mode of delivery for an educational resource that is perceived to be most beneficial for Registered Nurses working on the burn unit at a tertiary care centre in one province in Eastern Canada; and
3. identify the educational topics that are perceived to be necessary to cover within an educational resource.

Methods

Setting

The dedicated burn unit of focus is located in a tertiary care centre. The unit encompasses general surgery, plastic surgery, trauma, and burn care and is a 40-bed unit. There are five private rooms that are separated from the rest of the unit and serve as the burn unit. This portion of the unit also includes a room where the burn tub is located and burn care supplies are stored.

Sample

Consultations were completed with two novice RNs and seven senior RNs, the NP for the Plastics Program, two of the PCCs, and the Clinical Educator for the burn unit. There was interest in consulting the wound care specialist; however, unfortunately the wound care specialist is on leave at present. Selecting both senior and novice RNs provided a more generalized perspective of the learning needs for the provision of burn care. In addition, these staff members

can offer direct insight into practice issues, learning needs, and informed content for the educational resource. The nursing experience of the two novice RNs ranged from eight months to two years with both having solely worked on the burn unit. The nursing experience of the senior RNs ranged from four to seven years and their years of experience on the burn unit ranged from two and a half to six years. The training received ranged from no training to three co-signed shifts, with four senior RNs reporting having received two co-signed shifts. Co-signed shifts involve shadowing and receiving teaching from a more senior RN.

The NP practicing on the burn unit is involved in the care of burn patients and follows and monitors the burn patients closely. The NP's role provides insight into the aspects of burn care practice staff nurses are seeking support for and common issues requiring attention. Similarly, the PCCs and the Clinical Educator receive updates and questions from the RNs assigned to the burn patients and work to address educational needs. The PCCs can provide insight into the issues, concerns, and occurrences brought forward by the staff nurses and the Clinical Educator has insight on the educational measures that have best supported the RNs learning needs in the past. The NP, PCCs, and the Clinical Educator are members of the burn unit committee. This committee was developed to support burn care nursing by identifying the challenges associated with burn care nursing and potential solutions. For example, the committee has been working over the past few years on developing and standardizing burn care policies.

The NP, PCCs, and Clinical Educator were recruited through an email message that can be found in Appendix A. The RNs from the unit were recruited through a post that was delivered through the communication forum used on the burn unit. This message can be found in Appendix B. Information about the practicum project and the consultations were included emails sent to the NP, PCC, and Clinical Educator and in the post delivered to the communication forum used by

the RNs. Contact information was provided and an email or telephone response implied agreement to be consulted. A reminder was delivered two days following the original posting to the RNs of the burn unit. Email replies were received from the NP, the three PCCs, and the Clinical Educator expressing their interest in participating; however, despite a follow-up one of the PCCs did not respond to schedule an interview time. Seven senior RNs and two novice RNs agreed to participate in an interview. The final sample consisted of 13 individuals.

Data Collection

Data were collected through telephone interviews using semi-structured questionnaires with all 13 individuals. Face-to-face interviews were avoided in the interest of minimizing unnecessary contacts due to COVID-19 precautions. The interviews were semi-structured and utilized open-ended questions that were informed by the integrated literature review conducted on burn care and from information obtained through the environmental scan completed for this practicum project. Interview questionnaires were created for senior RNs (Appendix C), novice RNs (Appendix D), the NP (Appendix E), the PCCs (Appendix F), and the Clinical Educator (Appendix G) of the burn unit. The interviews ranged from 15- to 45-minutes in length. To ensure data quality, detailed notes were taken throughout the interviews.

Data Management and Analysis

The data were analyzed using content analysis, a research tool that serves to identify and analyze concepts within qualitative data, including interviews and documents (Columbia University, 2019). To do so, the content is broken down into categories and summarized. The notes taken from the interviews were reviewed a minimum of three times each and potential themes were discussed with the practicum project supervisor. Additional notes were taken and information was highlighted as the interview data were reviewed to identify relevant information

that would inform the development of a burn care learning resource.

Data Security, Confidentiality, and Ethical Considerations

Agreement to participate was implied from the email response agreeing to participate in an interview. This agreement was confirmed at the initial point of the interview. The consultants were assured that their participation was voluntary and there were no implications for their practice if they did not wish to participate. All consultants were informed they could stop the interview at any time; however, no interviewees opted to withdraw their participation.

The interviews were scheduled one-on-one to ensure confidentiality was maintained. Information was recorded during the interviews by making digital notes on Microsoft Word. To ensure confidentiality of the data, electronic information has been securely stored on a password protected computer and printed materials and notes from the telephone interviews have been stored in a locked filing cabinet in my private residence, both of which are only accessible to myself. The information has only been shared with my practicum project supervisor and the practicum project lead. Upon completion of the practicum project, the electronic information will be permanently deleted from my computer and printed files will be shredded. Furthermore, in the interest of maintaining confidentiality and to ensure anonymity of the responses the NP, PCCs, and Clinical Educator will be referred to as Burn Committee members throughout the results.

This project is for quality assurance and is intended solely for the purpose of improvement purposes. The rationale for exemption from the Health Research Ethics Board approval can be reviewed in Appendix H.

Summary of Results

Six broad themes emerged from the analysis of the interview responses. These themes are issues and concerning trends, gaps in practice, job stress and dissatisfaction, content, barriers to

burn care, and mode of delivery.

Issues and Concerning Trends

The lack of education and training was consistently identified as an issue by the novice and senior RNs, and the Burn Committee members. Additionally, two of the Burn Committee members recognized that the lack of staff due to a recent turnover is a concerning trend because the unit has been relying on senior RNs to educate novice RNs during co-signed shifts. One senior RN expressed that she has been refusing to care for patients with burn injuries because she does not feel she can provide safe care with the minimal training she has received. Another senior RN stated she felt her training was not intended for the sole focus of her learning but rather was provided because two people were needed to complete the dressing changes of the burn patients admitted at the time. For this reason, she did not feel she had received adequate education. Two senior RNs expressed the concern that there is a lack of consistency and standardization with training received through co-signed shifts with a senior RN.

Gap in Practice for Burn Care

It was the consensus of all the RNs that their nursing school curriculum was likely insufficient to prepare them for the care of patients with burn injuries. One novice RN and three senior RNs recalled solely learning about the Rule of Nines (Wallace, 1951) and the Lund and Browder chart (Lund & Browder, 1944), while another senior RN recalled also learning about calculations for fluid resuscitation. Similarly, it was the consensus amongst the novice and senior RNs, and three Burn Committee members that the hospital orientation does not provide education on or prepare the RNs for burn care nursing.

One Burn Committee member recognized that the lack of continued education opportunities surrounding burn care for the members of the interdisciplinary team is a concern.

Another member stated concerns have been expressed surrounding burn patients' well-being and the ability of the staff to provide adequate care without having received appropriate and formalized burn care education. This is congruent with the concerns that were expressed by four of the senior RNs who identified the lack of burn care education as a hindrance to quality care.

Job Stress, Dissatisfaction, and Turnover

All the RNs recognized that burn care can be stressful for the RNs and three senior RNs noted a recent turn over in staff but were unsure whether this was solely attributed to concerns surrounding burn care. The stress associated with burn care nursing was attributed to the lack of experience in completing burn care and the limited education provided. One novice RN and two senior RNs noted that this stress has increased due to a recent staffing shortage. This has resulted in the burn nurse also being assigned to three other patients or being given a 4-hour time frame to provide the care, complete their documentation, and take their break before they must resume the care of three to four other patients. None of the RNs felt they were overtly affected by this stress; however, one senior RN stated the staff have been supporting one another, getting together outside of work to destress, and taking walks. Another senior RN stated she tries to stay busy outside of work so that she does not think about work at home. This RN stated she also avoids overtime, despite it being offered daily, because she does not want to experience burn out.

Similarly, a Burn Committee member noted that at times the RNs are apprehensive about caring for burn patients and the care can lead to feelings of anxiety and stress. Another Burn Committee member stated they have noted a turnover in staff and recognize that this will become an issue with less staff available to orientate novice RNs to burn care during co-signed shifts.

Content

The novice and senior RNs, the NP, the PCCs, and the Clinical Educator were asked

questions about the learning needs surrounding burn care nursing. All interview participants identified content they felt should be included in an educational resource for burn care nursing. A complete list of the content can be found in Table 1 below.

Table 1

Summary of Recommended Content

Content	Details
Burn pathophysiology	
Burn patient assessment	• Initial assessment • Identifying depth of injury
Hydrotherapy	• Whirlpool • Burn tub
Mechanical debridement	
Wound care products	• Supplying the burn cart
Burn surgical procedures	• Skin grafting • Donor sites • Escharotomy
Skin graft and donor site assessment	
Biopsychosocial needs	• Assessment • Referrals • Supports • Considerations for self-inflicted injuries • Substance misuse/abuse • Cultural considerations
Pain assessment and pain management	• Four types of pain • Medications
Interdisciplinary education	• Registered Dietician • Registered Social Worker • Registered Physiotherapist • Registered Occupational Therapist • Registered Pharmacist • Acute Pain Services • Department of Psychology • Mental Health Nurse
Discharge planning and preparation	• Referrals • Special considerations (e.g., sun exposure, clothing, nutrition)
Infection prevention and control	• Personal protective equipment • Isolation precautions • Sterility

Content	Details
Airway maintenance	• Assessment for inhalation injuries • Oxygen set up • Oral airway
Adverse events	• Circumferential burns • Compartment syndrome
Documentation	• Documentation examples

Burn Pathophysiology

Two novice RNs and two senior RNs stated they were not comfortable with their understanding of burn pathophysiology, while four senior RNs stated they were moderately comfortable. One senior RN attributed their comfort level to the education they had obtained from attending a burn care conference. Only one senior RN reported feeling comfortable with their understanding of burn pathophysiology but attributed this to a wound care course they had recently completely that covered burn pathophysiology. Regardless of the reported comfort level, all nine of the RNs stated they would benefit from a review of burn pathophysiology. In congruence, three of the Burn Committee members identified burn pathophysiology as a topic on which the RNs required additional education.

Burn Patient Assessment

Similarly, the novice RNs stated they were not comfortable with the assessment of a burn patients and attributed this to their lack of exposure and experience. Four senior RNs reported having a moderate comfort level, while the remaining three reported feeling comfortable. One senior RN stated she found the initial assessment of a new burn the most challenging and worried that she would not recognize the burn wounds she was assessing or be able to differentiate between full and partial thickness wounds. Three senior RNs stated they often question their assessments and request a second opinion from another RN. Regardless of the reported comfort level, all nine of the RNs stated they would benefit from a review of burn patient assessment.

Additionally, two Burn Committee members identified burn patient assessment as a learning need of the RNs.

Hydrotherapy

Hydrotherapy was consistently identified as an area of concern and where more education was needed. One of the novice RNs and the senior RN stated they had never seen hydrotherapy completed and would not know how to operate the burn tub or the whirlpool.

Mechanical Debridement

Four senior RNs and a Burn Committee member also expressed feeling as though they would benefit from additional education on mechanical debridement, including wound tissues that can be debrided and the extent to which it can be done.

Wound Care Products

Four of the senior RNs felt they could comfortably make a dressing product selection but would question whether there might be a more appropriate option. A Burn Committee member identified wound care products as an area requiring additional education. One senior RN stated she felt more comfortable when the RN before her had provided good documentation, in this manner she could more easily identify changes in the wound or adverse responses to the product that might warrant the need for an alternate product.

Burn Surgical Procedures

One novice RN and one senior RN stated they were not comfortable with the care of burn patients following surgical procedures due to their limited exposure. One novice RN and three senior RNs stated they were comfortable, and one senior RN stated they were moderately comfortable with the care of skin graft and donor sites but not burn patients who are post-op from an escharotomy. An escharotomy involves the incising of burn tissue to release the eschar

tissue and its constricting effects, which subsequently restores compromised distal circulation (Zhang & Hughes, 2021). Only two senior RNs expressed feeling comfortable with all three common surgical procedures for burn injuries.

Skin Graft and Donor Site Assessment

The comfort level associated with skin grafts and donor sites was consistently attributed to the frequent experience of caring for these patients. However, one senior RN stated while they were comfortable in caring for a skin graft that was healing well, they feel less comfortable if the skin graft is not taking well (e.g., peeling from the edges, hematoma formation, excessive bleeding, discoloured). Post-operative care and skin graft site care was identified as a learning need for RNs by two Burn Committee members.

Biopsychosocial Needs

Two novice RNs and three senior RNs expressed feeling moderately comfortable in managing burn patients' biopsychosocial needs, while the remaining four senior RNs reported feeling comfortable with this aspect of burn patient care. One novice RN expressed concerns that RNs will attempt to begin a conversation and develop a rapport by asking the patient what happened to them. However, given the potentially traumatic nature of the event, this can be difficult for the patient to relive. A senior RN stated that it is worrisome when the burn patient does not have family support but that in these cases the nursing staff often becomes the patient's family and their support.

Interestingly, one Burn Committee member emphasized that burn patient care is not solely based on wound care and there should not be such a task-oriented focus. This individual stated that RNs need education to support burn patients' biopsychosocial needs as a burn injury is a traumatic event, burn patients may have self-inflicted injuries, or burn patients may have

been under the influence of drugs or alcohol. Similarly, another Burn Committee member mentioned that RNs must consider and need education on the unique cultural needs of indigenous populations who are admitted with burn injuries.

Pain Assessment and Pain Management

The two novice RNs and six of the senior RNs reported feeling moderately comfortable in assessing and managing burn patients' pain, while one senior RN reported feeling comfortable. One novice RN stated she would use the numerical rating scale to assess burn patients' pain but felt like she needed more education on the types of pain experienced by burn patients. A senior RN stated she considers and assesses for the presence of neuropathic pain. Additionally, one senior RN expressed the need to consider of the depth of the burn injury and highlighted the importance of medicating the patient before burn care procedures. Another senior RN emphasized the importance of the use of regular adjunct medications, rather than solely medicating prior to procedures. The Burn Committee members recognized that RNs need additional education regarding burn patient pain management. One Burn Committee member noted that RNs, especially novice RNs, are less likely to give burn patients the amount of pain medication that they need to adequately control their pain.

Interdisciplinary Education

One novice RN and one senior RN expressed feeling moderately comfortable in coordinating care with the members of the interdisciplinary team, while the remaining RNs felt comfortable. One novice RN and one senior RN expressed that aside from a professional from the Department of Psychology, these members of the interdisciplinary team participate in bi-weekly bed rounds, which helps to coordinate care. One senior RN expressed concern that the Registered Dietician is not consulted promptly enough and that burn patients spend excessive

time fasting when they should be receiving a high protein, high calorie diet. Two senior RNs stated they were not confident in their understanding of the role of the Registered Occupational Therapist. One senior RN stated she has often wondered if the RNs consulted the Registered Occupational Therapist if they would be able to assist with dressing applications that would not inhibit the burn patient's range of motion. Similarly, two senior RNs stated they were unsure when a professional from the Department of Psychology should be consulted. Two senior RNs stated it would be beneficial to have a session where each discipline describes their roles in the care of a patient with burn injuries and how the RN can help. Similarly, another senior RN felt it would be beneficial to have a Registered Physiotherapist provide education and describe considerations for various burns injuries, such as a hand burn.

One senior RN felt it would be beneficial to receive education from a Registered Pharmacist or the Acute Pain Services team to learn more about burn patient pain management. Similarly, three RNs expressed the desire for more education about the use of fentanyl for procedural pain as they have not felt comfortable when they have had to administer it.

Discharge Planning and Preparation

The two novice RNs and five of the senior RNs reported feeling moderately comfortable with preparing a burn patient for discharge, while the remaining two senior RNs reported feeling comfortable. Two of the senior RNs stated that bed rounds are completed bi-weekly on the unit and this helps prepare for complex discharges, such as burn patients. In congruence, one senior RN expressed that since burn care is a tedious process, it provides a great opportunity to talk to the patient identify any foreseeable issues upon discharge. Interestingly, two RNs mentioned special teaching and considerations they felt should be included for burn patients upon discharge, including minimizing sun exposure, avoiding tight clothing, and ensuring appropriate nutrition

for wound healing. One senior RN stated she finds it more stressful when she is discharging a burn patient to a rural area. These areas are less likely to have the appropriate rehabilitation resources to meet the burn patients' mental health needs or provide physiotherapy services to prevent the development of contractures.

Infection Prevention and Control

Two novice RNs and three senior RNs reported feeling moderately comfortable with infection prevention and control measures for burn care, while four senior RNs reported feeling comfortable. One novice and four senior RNs emphasized the importance of wearing personal protective equipment and maintaining isolation precautions. Three senior RNs highlighted the importance of maintaining sterility during dressing changes. One senior RN discussed how it can be complicated to determine when the burn wounds have become infected rather than it being the natural progression of the wound, as well as when and why the physicians begin antibiotics.

Airway Maintenance

Two novice RNs and five senior RNs stated they were not comfortable with the monitoring and management of patients with inhalation injuries, while one RN felt comfortable, and another felt moderately comfortable. A novice RN and one senior RN highlighted the importance of assessing for singing of nasal hairs, soot, or dark sputum, and swelling of the airway. Two senior RNs emphasized the importance of having an oral airway and oxygen set up at the bedside. Two senior RNs expressed that it is stressful and worrisome to have a patient with an inhalation injury on the unit because it is not possible to monitor them as closely as is necessary, which compromises patient safety.

Adverse Events

One novice RN and five senior RNs stated they were not comfortable with the monitoring

of circumferential burns and for compartment syndrome, while one novice RN and one senior RN felt moderately comfortable, and one senior RN felt comfortable. One novice RN and two senior RNs stated they would be able to assess for compartment syndrome. One senior RN stated that she overheard another RN tell the PCC that the new burn who was admitted had a circumferential burn and would require more frequent monitoring for signs of compartment syndrome. The senior RN stated she remembered thinking how she would not have thought of this if she had been the one to admit the patient.

Documentation

Two novice RNs and two senior RNs stated they were not comfortable with completing burn care documentation, while four senior RNs stated they were comfortable and one senior RN stated they were moderately comfortable. Three senior RNs stated that the use of online charting has helped with burn care documentation as it breaks it down into separate section and prompts the person documenting for specific information. In comparison, one senior RN stated she did not find the online documentation very user-friendly and that it was not the easiest or most efficient way to describe the burn patient and their care. Another senior RN expressed that because the burn care documentation is not standardized and not all RNs are using appropriate terminology to describe the location or type of burn wound and tissue, it makes it difficult to follow the care that was previously provided.

Barriers to Burn Care

One senior RN stated that due to the time constraints that exist on a floor of such high acuity, there is not always time to provide the support the patient needs. In congruence, another senior RN stated that a large burn is a life altering occurrence for many patients and the education obtained from the therapeutic communications course in nursing school is likely

insufficient to prepare RNs for this unique patient situation.

Interestingly, one senior RN stated that wound care seems to be the biggest stressor surrounding burn patient care for novice RNs. She expressed that novice RNs are often so overwhelmed by the burn wound care that they are not likely considering the full picture of the patient, including whether their pain is properly managed, if they are obtaining enough nutrition, or if their mental health needs are being met. This senior RN felt that if novice RNs became more proficient in burn wound care, they may begin to consider these other important aspects of care. Another senior RN stated that novice RNs are unsure about typical or unusual findings surrounding burn patient care, which makes the novice RNs feel nervous and uncomfortable.

Mode of Delivery

The novice and senior RNs and the Burn Committee members identified a variety of learning strategies that would best support the RNs' learning needs and would likely be successful on the burn unit. These learning strategies can be found in Table 2 below along with a record of the number of RNs and Burn Committee members who indicated support for each mode of learning. An interactive module, manual, videos, and pictures received the most support from the RNs, while education days, co-signed shifts, simulations, and an interactive module received the most support from the Burn Committee members.

Table 2

Summary of Recommended Modes of Delivery

Mode of Delivery	Number of 9 RNs Identifying the Mode	Number of 3 Burn Committee Members Identifying the Mode
Manual	7	1
Interactive module	6	2

Mode of Delivery	Number of 9 RNs Identifying the Mode	Number of 3 Burn Committee Members Identifying the Mode
Videos • How to set up a sterile tray • How to use the burn tub • How to use the whirlpool	4	
Pictures • Types of burns • Wound tissue • Skin graft and donor sites (healthy versus unhealthy) • Commonly seen structures (tendons, bones, etc.)	4	
Co-signed shifts • Bedside teaching	3	3
Simulations • Task trainers	3	3
Posters	3	
Education days	2	3
Online module	2	1
Lunch and learn sessions	2	
In-class sessions	2	
Presentations	1	
Webinar	1	
Mentorship programs	1	
Podcasts	1	
Clinical lab practice		1
Mock burn patient		1

One senior RN emphasized that a heavy focus on content would not be as beneficial, rather active learning strategies would be best. Two senior RNs felt that while simulations would be beneficial, they may be impractical given the resources available at the tertiary care centre. However, one senior RN stated that if inadequate staffing is an issue to completing the clinical piece, then task trainers with simulated burns may be beneficial. One of the Burn Committee members stated that the mock code blue sessions have been received positively on the burn unit and another Burn Committee member felt that burn care policies should be reviewed. Therefore,

a mock burn patient for the RNs to practice in a clinical lab setting might be beneficial. Two senior RNs felt it would be beneficial to provide samples of documentation for RNs to review and learn from. A Burn Committee member highlighted the need for a clinical and a theory component to the education provided. Finally, another Burn Committee member emphasized that the RNs are tech-savvy and seem to learn best through visual learning strategies; they suggested an online or interactive learning module that engages learners would be beneficial.

Additional Consultations

Throughout the preparation of the learning resource, additional consultations were completed with members of the interdisciplinary team. These consultations were necessary to ensure appropriate content was included in the learning resource to describe the roles and responsibilities of the respective interdisciplinary team members. The individuals consulted include, the Registered Social Worker, Dietitian, Physiotherapist, and Occupational Therapist working on the burn unit of focus. These individuals were recruited for assistance through an email message that can be found in Appendix I. Telephone follow ups occurred with the Registered Social Worker and Physiotherapist who preferred this method of communication. These members of the interdisciplinary team provided information on their roles and provided direction towards resources available on the internet that would offer beneficial information.

Implications for the Practicum Project

The results of the consultations have indicated that the nursing school curriculum and the hospital orientation are considered insufficient to prepare RNs on the burn unit to care for patients with burn injuries. The information obtained from the consultations can be used to inform the content of the learning resource developed through the practicum project. The consultations revealed that RNs' learning needs encompass aspects of care from the initial

admission to the discharge of a patient with burn injuries. A list of the recommendations for content was provided in Table 1.

The Burn Committee members and the RNs have identified a variety of learning strategies through which the educational resource can be delivered. An interactive module or manual that includes case studies, videos, and pictures, or other active learning strategies, such as task trainers and co-signed shifts, have been particularly highlighted as beneficial. Regardless of the method chosen, it is essential to ensure the learning is interactive and engaging as active learning is essential to support comprehension, knowledge integration, and future application of the knowledge attained (Phillips, 2016; Scheckel, 2016).

Conclusion

The consultations successfully identified the learning needs of the RNs on the burn unit, potential methods to deliver the needed education, and topics to be included within the educational resource. The care of burn patients has been consistently identified and stress-provoking and the limited educational resources appears to further contribute to this stress. The need for additional education and training has been repeatedly expressed by the RNs, NP, PCCs and the Clinical Educator who participated in the interviews. From the information obtained from the NP, PCCs, and the Clinical Educator it is evident that the Burn Committee has worked diligently to make improvements to burn care nursing; however, a formal educational resource is still desired. Interactive educational resources, including a module or manual that includes case studies, videos, and pictures, or simulations, task trainers, and co-signed shifts, have been highlighted throughout the consultations as potentially beneficial methods of education delivery. Since active learning strategies have been highlighted as highly beneficial to knowledge integration and application it is suggested that an interactive learning module, that includes case

studies, videos, pictures, and reflective questions, may be most beneficial to develop.

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Appendix A
Email to the NP, PCC, and Clinical Educator

Hello (name of contact),

I am contacting you to request your participation in **completing a telephone interview** that would assist me in the completion of my master's practicum project. I am currently completing my master's degree through Memorial University of NL Faculty of Nursing. For my practicum project I am aiming to develop a learning resource for Registered Nurses caring for patients with burn injuries. As a Registered Nurse who previously worked on the burn unit and who is currently working in the Medical/Surgical ICU, I appreciate that burn care nursing is complex and requires a specialized knowledge. Through my personal experiences I recognize that Registered Nurses may benefit from additional education surrounding the care of patients with burn injuries. An educational resource will have the potential to improve patient care and provide Registered Nurses with the knowledge and confidence necessary when caring for this complex patient population.

To create an educational resource for Registered Nurses, I need to learn about the issues, concerns, and learning needs surrounding burn care nursing. I also need to determine the best method of delivery of an educational resource that will be readily available and accessible to the burn unit staff. A part of this project involves completing consultations from key informants to help inform the content of the learning resource. **I am requesting your participation in completing a telephone interview.** If a telephone interview is not possible, I can provide a written questionnaire, if preferred. This should only take approximately 15-20 minutes of your time.

Your participation is entirely voluntary and the information that you share will be kept confidential. You will not be identified in the final report for this practicum project. The data will be kept on my password protected personal computer and will be reviewed by my practicum project supervisor only. At the end of the practicum project, the data will be deleted permanently. Rest assured that if you are not interested there will be no negative implications or consequences on your work. Your assistance in supporting my project would be greatly appreciated.

If you are interested in participating, **please send me an email reply by July 8th, 2021 as I would like to complete the interview by July 16th, 2021.**

Kind regards,
Elizabeth Burry MN Student
BNRN, Medical/Surgical Intensive Care Unit
Health Sciences Centre, Eastern Health

Appendix B
Invitation to Participate Post for the Burn Unit Registered Nurses

Hello,

I am contacting you to request your participation in **completing an interview** that would assist me in the completion of my master's practicum project. I am currently completing my master's degree through Memorial University of NL Faculty of Nursing. For my practicum project I am aiming to develop a learning resource for Registered Nurses caring for patients with burn injuries. As a Registered Nurse who previously worked on the burn unit and who is currently working in the Medical/Surgical ICU, I appreciate that burn care nursing is complex and requires a specialized knowledge. Through my personal experiences I recognize that Registered Nurses may benefit from additional education surrounding the care of patients with burn injuries. An educational resource will have the potential to improve patient care and provide Registered Nurses with the knowledge and confidence caring for this complex patient population.

To create an educational resource for Registered Nurses, I need to learn about the issues, concerns, and learning needs surrounding burn care nursing and the best method of delivery of an educational resource that will be readily available and accessible to the burn unit staff. A part of this project involves completing consultations from key informants to help inform the content of the learning resource. **I am requesting your participation in completing a short interview** as part of the consultation process in developing this educational resource. If a telephone interview is not possible, I can provide a written questionnaire, if preferred. This should only take approximately 15-20 minutes of your time.

Your participation is entirely voluntary and the information that you share will be kept confidential. You will not be identified in the final report for this practicum project. The data will be kept on my password protected personal computer and will be reviewed by my practicum project supervisor only. At the end of the practicum project, the data will be deleted permanently. Rest assured that if you are not interested there will be no negative implications or consequences on your work. Your assistance in supporting my project would be greatly appreciated.

If you are interested in participating, please contact me by email at xxx or phone at xxx **by July 8th, 2021 as I would like to complete the interview by July 16th, 2021.** Thank you for your assistance in supporting my practicum project and the development of an educational resource for Registered Nurses caring for patients with burn injuries.

Kind regards,
Elizabeth Burry MN-Student
BNRN, Medical/Surgical Intensive Care Unit
Health Sciences Centre, Eastern Health

Appendix C
Semi-structured Interview Guide for Senior RNs from the Burn Unit

1. How many years of nursing experience do you have? How many years of experience do you have working on the burn unit?

2. Have you received any special training or education on burn care nursing? If yes, what have you received?

3. What are your learning needs in providing care to patients with burn injuries?
   a. It was noted from the other burn units across Atlantic Canada that RNs may require additional education on burn pathophysiology and burn patient assessment. How comfortable are you with your understanding of burn pathophysiology and the head-to-toe assessment of a burn patient? Do you feel that you would benefit from having a review of burn pathophysiology and assessment as has been recommended in the literature for nurses providing burn care?

   b. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on burn wound care, including assessing burn wounds, preparing patients for hydrotherapy, completing mechanical debridement, and selecting appropriate products. Can you please describe your comfort level with these aspects of burn patient care?

   c. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the care required following surgical procedures for burn injuries, including escharotomies and graft and donor site care. Can you please describe your comfort level with these aspects of burn patient care?

   d. The literature suggests that nurses may require more education addressing burn patients' biopsychosocial needs, including depression, anxiety, and post-traumatic stress disorder-related symptoms, coordinating appropriate referrals (e.g., psychology) and supports, and including family in care. Can you please describe your comfortable level in managing burn patients' biopsychosocial needs?

   e. The literature suggests some nurses require supplementary education on pain assessment and pain management for burn patients, particularly given the four types of pain experienced by burn patients. What are your learning needs surrounding burn patients' pain management?

   f. The literature suggest that nurses may require additional education surrounding burn patient discharge planning and preparation. Can you please describe your comfort level in preparing a burn patient for discharge?

   g. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on infection prevention/control. How comfortable are you with these aspects of burn care? Can you please describe this for me?

h. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the monitoring and management of patients with inhalation injuries. Can you please describe your comfort level with these aspects of burn patient care?

i. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the risks posed with circumferential burns and monitoring for signs of compartment syndrome. Can you please describe your comfort level with these aspects of burn patient care?

j. It was noted in the other burn units across Atlantic Canada and through the literature that RNs may require additional education on the roles and responsibilities of the various members of the interdisciplinary team, including Registered Physiotherapists, Occupational therapists, Dieticians, Social Work, and a professional from the Department of Psychology. Can you please describe your comfort level with coordinating care with the Registered Physiotherapists and Occupational therapists? Can you please describe your comfort level coordinating care with the Registered Dietician? Can you please describe your comfort level coordinating care with the Registered Social Worker? Can you please describe your comfort level coordinating care with a professional from the Department of Psychology?

k. It has been noted in the literature that the documentation required for burn patient care is detailed and comprehensive. How comfortable are you with completing burn care documentation? Can you please describe this for me?

4. The literature suggests that the lack of structured education surrounding burn care nursing can lead to stress, job dissatisfaction, and job turn-over. Have you observed this to be an issue on the unit with your colleagues or with yourself? If you answered yes for yourself, how have you coped and managed with this? (e.g., any forms of self-care activities?)

5. The literature suggests that the nursing school curriculum is possibly insufficient to prepare nurses to care for patients with burn injuries. What aspects of the care of patients with burn injuries are novice RNs typically asking for assistance with?

6. The literature suggests that hospital orientation may be inadequate to prepare nurses to care for patients with burn injuries. Do you feel your orientation was adequate to prepare you to care for patients with burn injuries? If no, how do you feel this can be addressed?

7. The literature has indicated that successful strategies for burn care education include simulations, manuals, and active learning strategies such as case studies and reflective questions. What learning strategies do you think could be successful on the burn unit? What would work best for your learning needs?

8. Is there anything else about providing care for burn patients, or developing an educational resource on burn care that you would like to discuss?

Appendix D
Semi-structured Interview Guide for Novice RNs from the Burn Unit

1. How many years of nursing experience do you have? How many years of experience do you have working on the burn unit?

2. Have you received any special training or education on burn care nursing? If yes, what have you received?

3. What are your learning needs in providing care to patients with burn injuries?
   a. It was noted from the other burn units across Atlantic Canada that RNs may require additional education on burn pathophysiology and burn patient assessment. How comfortable are you with your understanding of burn pathophysiology and the head-to-toe assessment of a burn patient? Do you feel that you would benefit from having a review of burn pathophysiology and assessment as has been recommended in the literature for nurses providing burn care?

   b. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on burn wound care, including assessing burn wounds, preparing patients for hydrotherapy, completing mechanical debridement, and selecting appropriate products. Can you please describe your comfort level with these aspects of burn patient care?

   c. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the care required following surgical procedures for burn injuries, including escharotomies and graft and donor site care. Can you please describe your comfort level with these aspects of burn patient care?

   d. The literature suggests that nurses may require more education addressing burn patients' biopsychosocial needs, including depression, anxiety, and post-traumatic stress disorder-related symptoms, coordinating appropriate referrals (e.g., psychology) and supports, and including family in care. Can you please describe your comfort level with managing burn patients' biopsychosocial needs?

   e. The literature suggests some nurses require supplementary education on pain assessment and pain management for burn patients, particularly given the four types of pain experienced by burn patients. What are your learning needs surrounding burn patients' pain management?

   f. The literature suggest that nurses may require additional education surrounding burn patient discharge planning and preparation. How comfortable are you in preparing a burn patient for discharge? Can you please describe this for me?

   g. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on infection prevention/control. Can you please describe your comfort level with these aspects of burn care?

h. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the monitoring and management of patients with inhalation injuries. Can you please describe your comfort level with these aspects of burn patient care?

i. It was noted in the other burn units across Atlantic Canada that RNs may require additional education on the risks posed with circumferential burns and monitoring for signs of compartment syndrome. Can you please describe your comfort level with these aspects of burn patient care?

j. It was noted in the other burn units across Atlantic Canada and through the literature that RNs may require additional education on the roles and responsibilities of the various members of the interdisciplinary team, including Registered Physiotherapists, Occupational therapists, Dieticians, Social Work, and a professional from the Department of Psychology. Can you please describe your comfort level with coordinating care with the Registered Physiotherapists and Occupational therapists? Can you please describe your comfort level coordinating care with the Registered Dietician? Can you please describe your comfort level coordinating care with the Registered Social Worker? Can you please describe your comfort level coordinating care with a professional from the Department of Psychology?

k. It has been noted in the literature that the documentation required for burn patient care is detailed and comprehensive. How comfortable are you with completing burn care documentation? Can you please describe this for me?

4. What are some common issues you seek support for from senior nurses or the Nurse Practitioner when caring for a patient with burn injuries?

5. The literature suggests that the nursing school curriculum is possibly insufficient to prepare nurses to care for patients with burn injuries. Throughout the literature it has been expressed that nursing students are not necessarily exposed to burn patients during their clinical experiences and burn care nursing is not specifically discussed or examined. How has your nursing school education prepared you for the care of patients with burn injuries?

6. The literature suggests that the lack of structured education surrounding burn care nursing can lead to stress, job dissatisfaction, and job turn-over. Have you observed this to be an issue on the unit with your colleagues or with yourself? If you answered yes for yourself, how have you coped and managed with this? (e.g., any forms of self-care activities?)

7. The literature suggests that hospital orientation may be inadequate to prepare nurses to care for patients with burn injuries. Do you feel your orientation was adequate to prepare you to care for patients with burn injuries? What areas do you feel were missed in the orientation that you have had to address with your practice?

8. The literature has indicated that successful strategies for burn care education include

simulations, manuals, and active learning strategies such as case studies and reflective questions. What learning strategies do you think could be successful on the burn unit? What would work best for your learning needs?

9. Is there anything else about providing care for burn patients, or developing an educational resource on burn care that you would like to discuss?

Appendix E
Semi-structured Interview Guide for the NP of the Plastics Program

1. What issues or concerning trends, for example, any gaps in nursing or multidisciplinary practice, have you noted in the nursing care of patients with burn injuries?

2. It has been noted throughout the literature and from the other burn units across Atlantic Canada that nurses may require more education on burn pathophysiology, burn patient assessment, pain management, addressing biopsychosocial needs, infection prevention/control, coordinating care with the multidisciplinary team, burn wound care, and discharge planning. What questions are you commonly asked by Registered Nurses caring for patients with burn injuries?

3. How do you feel the care of burn patients can be improved? How difficult is it to coordinate care with other disciplines and ensure early consultations? How can the nursing care of burn patients be improved?

4. The literature has indicated that successful strategies for burn care education include simulations, manuals, and active learning strategies such as case studies and reflective questions. What resources or recommendations do you feel would be helpful in better preparing Registered Nurses to care for patients with burn injuries?

5. What recommendations have been brought forward by the Burn Committee to improve burn care nursing?

6. How can the recommendations from the Burn Committee be implemented?

7. Is there anything else about the care of patients with burn injuries or developing an educational resource on burn care that you would like to discuss?

Appendix F
Semi-structured Interview Guide for the PCC of the Burn Unit

1. What issues or concerning trends have you noted surrounding the nursing or multidisciplinary care of patients with burn injuries in your leadership role?

2. It has been noted throughout the literature and from the other burn units across Atlantic Canada that nurses may require more education on burn pathophysiology, burn patient assessment, pain management, addressing biopsychosocial needs, infection prevention/control, coordinating care with the multidisciplinary team, burn wound care, and discharge planning. What are common concerns brought forward to you by the Registered Nurses caring for patients with burn injuries on the burn unit?

3. What (if any) are common occurrences brought forward surrounding the care of patients with burn injuries?

4. The literature suggests that the lack of structured education surrounding burn care nursing can lead to stress, job dissatisfaction, and job turn-over. Do you think this has any implications for the nurses or interprofessional team caring for burn patients on the unit?

5. The literature suggests that hospital orientation may be inadequate to prepare nurses to care for patients with burn injuries. Do you think the orientation process to prepare nurses for burn care could be improved on? If so, can you please describe how you believe this can be improved on?

6. What recommendations have been brought forward by the Burn Committee to improve burn care nursing?

7. How can the recommendations from the Burn Committee be implemented?

8. Is there anything else about the care of patients with burn injuries or developing an educational resource on burn care that you would like to discuss?

Appendix G
Semi-structured Interview Guide for the Clinical Educator of the Burn Unit

1. It has been noted throughout the literature and from the other burn units across Atlantic Canada that nurses may require more education on burn pathophysiology, burn patient assessment, pain management, addressing biopsychosocial needs, infection prevention/control, coordinating care with the multidisciplinary team, burn wound care, and discharge planning. What are the common concerns brought forward to you by the leadership staff of the burn unit and the Burn Committee?

2. What recommendations have been brought forward by the Burn Committee to improve burn care nursing?

3. How can the recommendations from the Burn Committee be implemented?

4. The literature has indicated that there is possibly a lack of education provided on burn care in the undergraduate nursing curriculum and during nursing orientation. Have you noted this to be problematic? If yes, how do you think this issue can be addressed?

5. The literature has indicated that successful strategies for burn care education include simulations, manuals, and active learning strategies such as case studies and reflective questions. What learning strategies within your role have you observed to be successful on the burn unit? What further recommendations do you have?

6. Is there anything else about the care of patients with burn injuries or developing an educational resource on burn care that you would like to discuss?

Appendix H: Health Research Ethics Authority (HREA) Screening Tool

Student Name: Elizabeth Burry

Title of Practicum Project: Development of a learning resource for nurses related to the care of patients with burn injuries.

Date Checklist Completed: June 6th, 2021

This project is exempt from Health Research Ethics Board approval because it matches item number 3 from the list below.

9. Research that relies exclusively on publicly available information when the information is legally accessible to the public and appropriately protected by law; or the information is publicly accessible and there is no reasonable expectation of privacy.
10. Research involving naturalistic observation in public places (where it does not involve any intervention staged by the researcher, or direct interaction with the individual or groups; individuals or groups targeted for observation have no reasonable expectation of privacy; and any dissemination of research results does not allow identification of specific individuals).
11. **Quality assurance and quality improvement studies, program evaluation activities, performance reviews, and testing within normal educational requirements if there is no research question involved (used exclusively for assessment, management or improvement purposes).**
12. Research based on review of published/publicly reported literature.
13. Research exclusively involving secondary use of anonymous information or anonymous human biological materials, so long as the process of data linkage or recording or dissemination of results does not generate identifiable information.
14. Research based solely on the researcher's personal reflections and self-observation (e.g. auto-ethnography).
15. Case reports.
16. Creative practice activities (where an artist makes or interprets a work or works of art).

For more information please visit the Health Research Ethics Authority (HREA) at https://rpresources.mun.ca/triage/is-your-project-exempt-from-review/

Appendix I
Email to the Registered Social Worker, Dietitian, Physiotherapist, and Occupational Therapist

Hello (name of contact),

I am contacting you to request your assistance in **providing information on the roles and responsibilities of the Registered (insert discipline here) in the care of a patient with burn injuries.** I am currently completing my master's degree through Memorial University of NL Faculty of Nursing. For my practicum project I am aiming to develop a learning resource for Registered Nurses caring for patients with burn injuries. As a Registered Nurse who previously worked on the burn unit and who is currently working in the Medical/Surgical ICU, I appreciate that burn care nursing is complex, requires a specialized knowledge, and a multidisciplinary approach. Through my personal experiences I recognize that Registered Nurses may benefit from additional education surrounding the care of patients with burn injuries, including the roles and responsibilities of the various interdisciplinary team members. An educational resource will have the potential to improve patient care and provide Registered Nurses with the knowledge and confidence necessary when caring for this complex patient population.

Your assistance in identifying valuable information to include would be greatly appreciated. Your participation is entirely voluntary, and you will not be identified in the final report for this practicum project. Rest assured that if you are not interested there will be no negative implications or consequences on your work. Your assistance in supporting my project would be greatly appreciated.

Kind regards,
Elizabeth Burry MN Student
BNRN, Medical/Surgical Intensive Care Unit
Health Sciences Centre, Eastern Health

Appendix IV: Burn Care Self-Directed Learning Resource

Self-directed E-Learning Resource for Nurses: The Assessment, Monitoring, and Treatment of a Patient with Burn Injuries

Elizabeth Burry

Memorial University of Newfoundland and Labrador Faculty of Nursing

Self-Directed E-Learning Resource for Nurses: The Assessment, Monitoring, and Treatment of a Patient with Burn Injuries

Stock Image from Microsoft Word

Developed by Elizabeth Burry BN, RN

December 2021

TABLE OF CONTENTS

WELCOME

Welcome to the Burn Care Self-Directed E-Learning Resource. This e-learning resource has been developed following consultations with key informants from a teaching hospital within an urban centre in Newfoundland. Educational topics for this resource were also identified through the completion of an integrated literature review and consultations with informants from other burn units across Atlantic Canada. Registered Nurses (RNs) from the burn unit are invited and encouraged to complete this e-learning resource during their orientation to the burn unit. However, the resource will also be available and accessible to the RNs at any time they wish to review it.

The resource consists of five learning modules. The first module provides a review of the basic anatomy and physiology of the integument system and the pathophysiology of burn injuries. The second module focuses on burn patients' biopsychosocial needs and providing pain assessment and management. The third module encompasses the assessment and monitoring of patients with burn injuries, while the fourth module covers the treatment and management of patients with burn injuries. Lastly, the fifth module concentrates on the roles and responsibilities of the interdisciplinary team and the discharge planning and preparation required for a patient with burn injuries. Each module contains images, optional video links, and interactive exercises to engage the learner in attaining the education and skills to care for patients with burn injuries.

Text boxes of various colours have been incorporated throughout the learning modules to help with the presentation of the information.

Blue text boxes provide nursing considerations.

Grey text boxes that have a red outline contain critical considerations.

Green text boxes include reminders and tips.

Yellow text boxes direct the reader towards additional learning opportunities.

The **answer keys** to the various interactive exercises are located in **Appendix A** at the end of this resource. Similarly, any **key terms** that are bolded and italicised can be found in the *Glossary* located in **Appendix B** at the end of this resource manual.

MODULE 1:

ANATOMY & PHYSIOLOGY OF THE INTEGUMENT SYSTEM AND THE PATHOPHYSIOLOGY OF BURN INJURIES

Stock Image from Microsoft Word

Module 1: Anatomy & Physiology of the Integument System and Pathophysiology of Burn Injuries

The purpose of this module is to provide a brief review of the anatomy and physiology of the integument system and the pathophysiology of burn injuries. This module contains evidence-based information and includes interactive exercises and optional videos to enhance the learning experience. The **answer key to the exercises can be found in Appendix A** of the e-learning resource manual. **Definitions of terms that are bolded and italicized can be found in the Glossary located in Appendix B** of the e-learning resource manual.

Stock photo from Microsoft Word

Learning Objectives

After completing this module, you will be able to:

1. Demonstrate an understanding of the anatomy and physiology of the integument system;
2. Define burn injury;
3. Discuss the pathophysiology of a burn injury, including local and systemic responses; and
4. Discuss the various mechanisms of burn injuries;

1.1 Anatomy and Physiology of the Integument System

Defining the Integument System

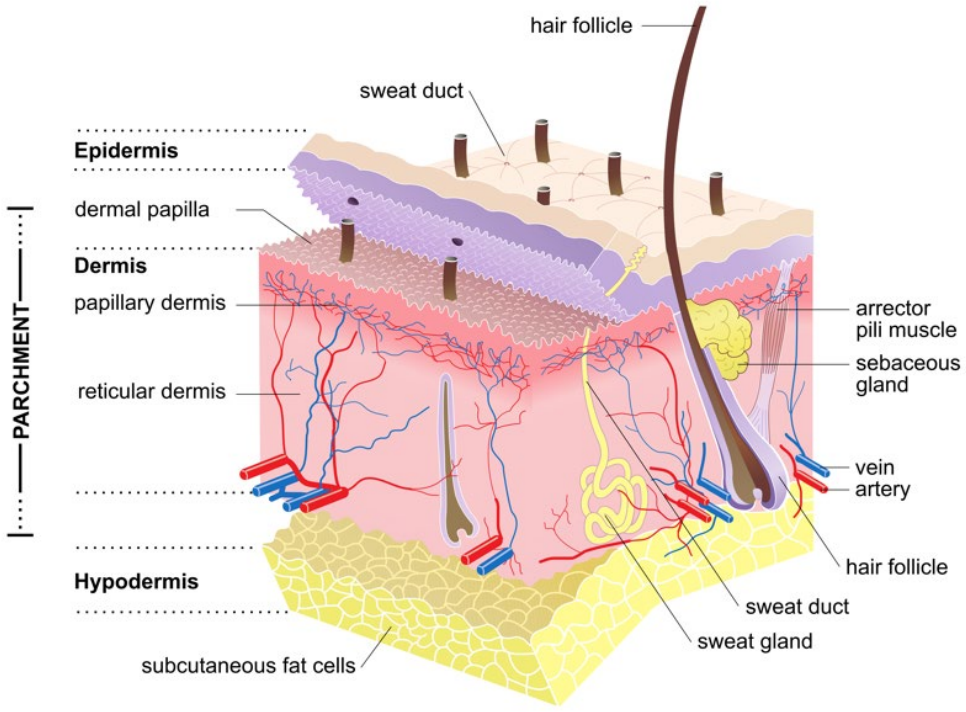
The skin is the largest organ of the body, which covers the entire external surface of the body. The skin is made up of three layers, the **epidermis**, **dermis**, and the **hypodermis**, each containing unique elements that provide different functions.[1]

Primarily, the skin provides protection by serving as a barrier against mechanical, chemical, and thermal trauma, invasion of microorganisms, and damage from ultraviolet (UV) light. Secondly, the skin helps regulate body temperature. The blood flow to the skin is regulated by the ***capillaries*** in the dermis that dilate and constrict in response to heat and cold. In addition, the skin participates in excretion of cellular waste products and regulates water loss via the sweat glands. Furthermore, the skin serves as a sensory organ. The sensory receptors in the skin help identify touch, heat, cold, and pain sensations. Finally, the skin is involved in the production of vitamin D. With assistance from UV light from the sun, skin cells convert cholesterol in the epidermis into vitamin D.[1,2]

Layers of the Skin

Figure 1.1

The Layers of the Skin



(Source) Structure of mammalian skin and the layers typically present in parchment by Doherty is licensed under by CC BY-SA 3.0

Figure 1.1 depicts the layers of the skin. **The epidermis is the top layer of the skin** and is made up of five sublayers, the stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, and stratum basale. The epidermis serves as a barrier to the environment, creates the skin tone, and regulates the water released from the body.[1]

The second layer is the dermis, which consists of two layers, the papillary layer, and the reticular layer. The dermis contains sweat glands, hair, hair follicles, muscles, sensory neurons, and blood vessels.[1]

The third layer, the hypodermis, is the deepest layer and is also known as the subcutaneous fascia. It connects the skin to the muscle and tissue below. The hypodermis is made up of fat and connective tissue and contains hair follicles and blood vessels.[1]

Click the image below to view a helpful video to review the anatomy and physiology of the integument system.

Additional Learning

Additional learning about the anatomy and physiology of the skin can be obtained by watching the following video.

Source: Hasudungan, A. (2019, October 1). *Introduction to skin anatomy and physiology* [Video]. YouTube. https://www.youtube.com/watch?v=xUW3E6eDbzU [3]

Exercise 1.1: Anatomy & Physiology of the Skin

The structures in the numbered column on the left and the functions in the lettered column on the right are currently incorrectly aligned. Match the structure to the appropriate function. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 1.1: Anatomy & Physiology of the Skin Answer Key**.

Structure	Function
1. Sweat glands	A. Help identify touch, heat, cold, and pain.
2. Dermis	B. Connects the skin to the muscle and tissue below.
3. Sensory receptors	C. Helps with the excretion of cellular waste products and the regulation of water loss.
4. Epidermis	D. Serves as a barrier to the environment.
5. Hypodermis	E. Houses sweat glands, hair, hair follicles, muscles, sensory neurons, and blood vessels.

1.2 Burn Pathophysiology

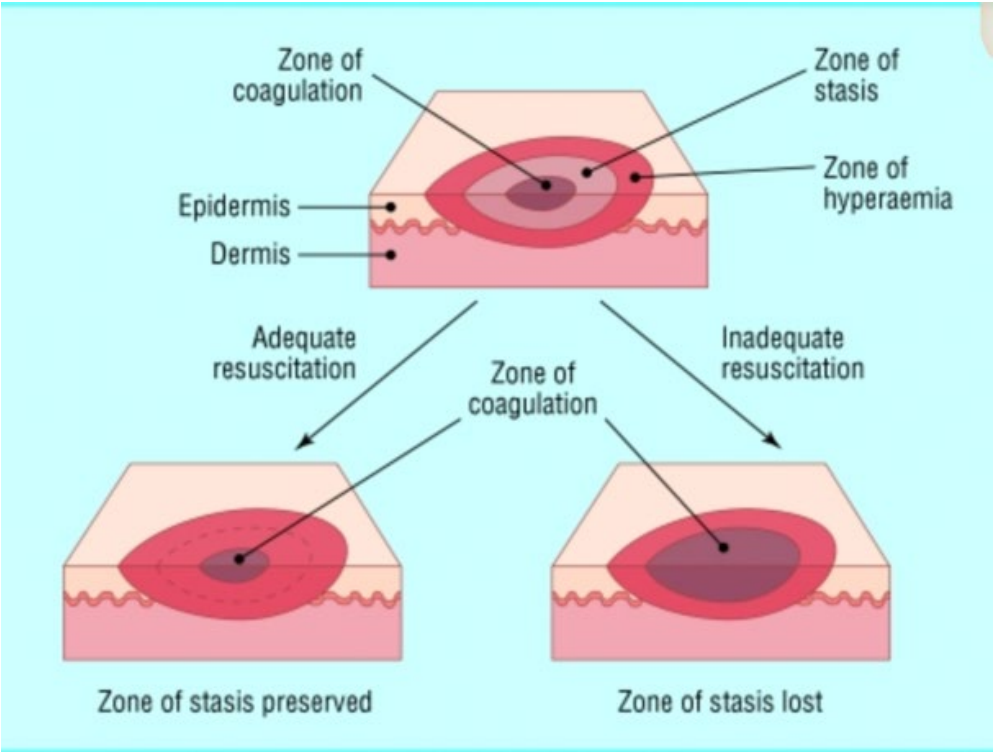
What is a burn injury?

A burn injury is defined as a traumatic injury resulting in partial or complete destruction of the skin and underlying tissue. This can be caused by intensive heat, chemicals, or electricity.[4,5]

When a burn injury occurs, **local and systemic changes occur**. The **local changes** in the skin are described as three damage zones, the **zone of coagulation**, the **zone of stasis**, and the **zone of hyperaemia**.[6] These zones are depicted in **Figure 1.2** below.

Figure 1.2

Jackson's Burn Zones



(Source) Jackson's Burn Zones and the Effects of Adequate and Inadequate Resuscitation (used with permission).[6]
Hettiaratchy, S., & Dziewulski, P. (2004). Pathophysiology and types of burns. *The British Medical Journal, 12*, 1427-1429. https://www.doi.org/10.1136/bmj.328.7453.1427

Local Changes

The **zone of hyperaemia** is the outermost zone, and it consists of viable cells. This zone is characterized by superficial partial thickness damage with good tissue perfusion. The tissue appears red and blanches with colour.[6]

The **zone of stasis** surrounds the zone of coagulation and is characterized by a mix of living and dead tissue. Depending on the management of the burn injury and the patient's comorbidities, the tissue in this zone is potentially salvageable. This zone is characterized by deep-partial thickness tissue damage with decreased tissue perfusion. The goal is to increase tissue perfusion to prevent any damage from becoming irreversible, which would cause the wound to deepen and widen. The tissue appears red initially but later turns white and may blanche with pressure.[6]

The **zone of coagulation** is in the centre of the wound and is the point of maximum damage as this area had the most contact with the burn source. Irreversible full-thickness tissue damage with no tissue perfusion occurs in this zone. The tissue will appear white or charred.[6]

Figure 1.3

Clinical Image of Burn Zones

(Source) Clinical image of burn zones. There is central necrosis, surrounded by the zones of stasis and of hyperaemia (used with permission).[6] Hettiaratchy, S., & Dziewulski, P. (2004). Pathophysiology and types of burns. *The British Medical Journal, 12*, 1427-1429. https://www.doi.org/10.1136/bmj.328.7453.1427

Systemic Changes

Severe burn injuries, typically greater than 20% total body surface area in adults, can also result in systemic changes. These systemic changes typically occur within the first 24 hours and affect the cardiovascular and respiratory system and can result in metabolic and immunologic changes. The systemic responses occur due to the release of cytokines and inflammatory mediators. ***Cytokines*** are small proteins that signal an immune response and inflammatory mediators are messengers that promote an inflammatory response in the body. Many of these changes will occur more prominently in deep burns as opposed to superficial burns.[6] The systemic responses to a burn injury include **cardiovascular**, **respiratory**, **metabolic**, and **immunologic changes**. The physical assessments pertaining to these changes will follow in **Module 2**.

Cardiovascular changes:

Increased ***vascular permeability*** results in fluid leaking out of the vessels causing interstitial edema. Interstitial edema is an abnormally large volume of fluid in the tissue between the body's cells.[7] Hypotension, which is defined as a systolic blood pressure of 90mmHg or less,[8] can occur as the fluid shifts outside of the blood vessels to the ***interstitial space***. Hypotension can also occur from the cytokines that signal ***vasodilation*** to occur. These changes can also result in the organs not being adequately perfused with blood flow. Reduced myocardial contractility can also occur,

meaning the heart is not pumping as effectively. This also contributes to hypotension and limits the blood flow to the body's organs.[6,7]

Respiratory changes:

The inflammatory response can cause ***bronchoconstriction***. This means the smooth muscle in the pathway that brings air into and out of the lungs narrows, which restricts the amount of air that can enter the lungs.[6,9] In patients with severe burns ***acute respiratory distress syndrome*** (ARDS) can occur. ARDS is a serious and life-threatening condition that occurs when fluid builds up in the tiny sacs in the lungs. The presence of fluid in these sacs prevents adequate air entry. This means less oxygen reaches the blood stream causing the organs to be deprived of the oxygen that is necessary for their functioning.[6,10]

Metabolic changes:

The continuous release of inflammatory mediators can alter the burn patient's normal metabolic response. This is known as a ***hypermetabolic response***, whereby the basal metabolic rate is increased to three times its normal rate.[4]

Nursing Considerations for the Metabolic Changes

As a result of the hypermetabolic response, the baseline vital signs can be elevated without an infectious cause.

- Temperature: elevated between 37-38.5 ºC.
- Heart rate: elevated between 100-120 ***BPM***.
- Respiratory rate: > 25 breaths per minute.[11,12,13]

The metabolic changes also necessitate early enteral feeding to prevent muscle protein breakdown and loss of body mass. Promoting nutritional intake early after the trauma also helps maintain normal gut health. It is important to note that the metabolic rate also increases with the size of the burn injury.[6,14,15]

Immunological changes:

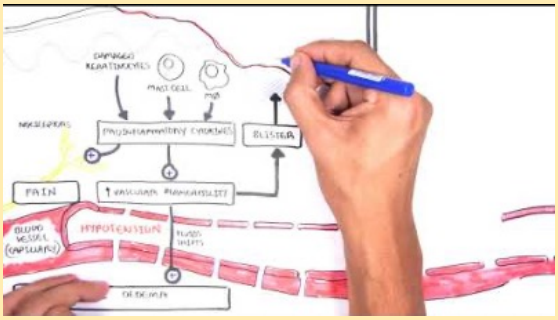
The profound inflammatory response that occurs following a burn injury leads to impaired immune function. This down regulation of the immune response occurs at both the cell mediated and humoral pathways and puts the patient at increased risk for infection.[6] Cell mediated, and humoral immunity are two types of adaptive immunity. Cell mediated immunity destroys intracellular pathogens, whereas humoral immunity destroys extracellular pathogens.[16]

One of the skin's important functions is to serve as a barrier against the invasion of microorganisms.[1,2] Thus, in addition to the impaired immune function due to the systemic responses that occur following a burn injury, the tissue destruction associated with burn injuries also puts the patient at a high risk for infection.

Click the image below to view a helpful video to review burn pathophysiology.

Additional Learning

Please view the following video for additional information on burn pathophysiology.



Source: Hasudungan, A. (2018, April 9). *Burns – pathophysiology* [Video]. YouTube. https://www.youtube.com/watch?v=Jaw8AKKVFRI [7]

Exercise 1.2: Burn Pathophysiology

Answer true (T) or false (F) to the following statements. Place an 'X' in the appropriate box. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 1.2: Burn Pathophysiology Answer Key**.

	Statements	T	F
1.	The local changes that occur in the skin following a burn injury are described as three damage zones: the zone of coagulation, the zone of stasis, and the zone of hyperaemia.		
2.	Tissue in the zone of coagulation will initially appear red but later turns white and may blanche with pressure.		
3.	Early enteral feeding is indicated following a burn injury because basal metabolic rate increases by three times.		
4.	The zone of hyperaemia is the point of maximum damage.		

	Statements	T	F
5.	Irreversible tissue loss occurs in the zone of stasis.		
6.	Systemic changes occur because of an inflammatory response that is initiated following a severe burn injury.		
7.	A burn patient may have a temperature of 38.2 and a heart rate of 115bpm without an infectious cause.		

1.3 Mechanism of Injury

It is important to identify the underlying cause or mechanism of injury as these factors influence the pathophysiology of the burn injury and the required clinical management. Burns are classified as **thermal**, **electrical**, or **chemical injuries**.[12]

Thermal Injuries

Thermal injuries represent most burn injuries and occur when tissue encounters heat sources, such as fire, steam, hot liquid, or a hot object/surface.

- ***Flame burns*:** commonly associated with inhalation injuries and concomitant trauma and tend to result in superficial partial thickness to full thickness injuries.

- ***Scalds***: commonly occur from spilling hot liquids or being exposed to hot bathing water. Scalds tend to result in superficial or superficial partial thickness burns. Immersion scalds may result in more severe burn injuries due to increased duration of contact.

- ***Contact burns*:** occur when a surface or object is extremely hot, or the contact was abnormally long. Contact burns tend to result in deep partial thickness or full thickness injuries.[4,6,12,17]

Figures 1.4 and **1.5** below provide examples of the potential appearance of thermal burns.

Figures 1.4 and 1.5

Examples of Thermal Burns

(Source) Thermal Burn contributed by DermNetNZ to Schaefer & Tannan (2021) is licensed under by CC BY 4.0 [18]

(Source) Full Thickness Thermal Burn to the Foot contributed by Mark A. Dreyer, DPM, FACFAS to Schaefer & Tannan (2021) is licensed under by CC BY 4.0 [18]

Electrical Injuries

The extent of an ***electrical injury*** is related to the voltage of the electrical current. Small, deep burns will be found at the entry and exit points of the electrical current in low-voltage electrical burns. Electrical burns can result in nerve injury and muscle damage.[12]

The muscle damage can lead to ***rhabdomyolysis***. This is a serious condition that results from the breakdown of skeletal muscle and the leakage of these contents into circulation. It can lead to systemic injuries, including an acute kidney injury manifested by elevated serum creatinine, electrolyte imbalances, and coagulopathies.[19] Diuresis can protect against kidney damage; therefore, **target urine output is typically 75-100ml/hr in adults**. An additional concern is that electrical injuries can result in fatal ***dysrhythmias***. As a result, these patients may require cardiac monitoring (telemetry) to monitor for dysrhythmias or blood work to monitor their cardiac enzyme levels.[12]

Additional Learning

Please refer to the most updated **204(NUR)-11-030 Cardiac Telemetry (Remote Inpatient Monitoring)** policy for additional information about this method of patient monitoring.

Types of Electrical Injuries

There are two types of electrical injuries high voltage and electrical arc.[4]

- ***High voltage injuries*:** include lightning and true electrical injuries. Lightning injuries involve extremely short but high voltage electrical current flowing through the individual's entire body. True electrical injuries involve an individual becoming part of the electrical current, for example if an individual grabs an electrical wire. In these circumstances, the individual will have entrance and exit sites of the electrical current.[20]

- ***Electrical arc injuries*:** occur when current travels through the air between two conductors and may result in electrical flash or electrical flame burns. Flash injuries are caused by an arc flash and are typically associated with superficial burns, since no electrical current travels through the skin. Flame injuries occur when an arc flash ignites clothing or nearby objects. The electrical current may or may not pass through the skin in these circumstances.[20]

Figures 1.6 and **1.7** below provide examples of the potential appearance of electrical injuries.

Figures 1.6 and 1.7

Examples of Electrical Injuries on Patient Extremities

(Source) Electrical Injuries (used with permission)[21]
Cushing, T., & Wright, R. K. (2020). *Electrical injuries in emergency medicine.* Medscape Drugs & Diseases. https://emedicine.medscape.com/article/770179-overview

Chemical Injuries

Chemical injuries occur when contact with a chemical, such as strong acids, alkalis, or organic compounds destroys tissue.[4] The chemicals can cause injury from absorption through the skin or mucous membrane, or by oral ingestion or inhalation. The extent and depth of a chemical burn is dependent upon the amount, type, and strength of the agent and the duration of contact.[12] Chemical burns are progressive injuries; therefore, it can be difficult to determine the severity of injury in the early days following a chemical burn injury.[4]

Figure 1.8 below provides an example of the potential appearance of a chemical injury.

Figure 1.8

Example of a Chemical Burn on a Patient's Hand

Critical Consideration
Caring for a Patient with a Chemical Burn Injury

Personal protective equipment such as gowns, gloves, and goggles should be worn by healthcare providers assisting a patient with a chemical burn injury. While protecting the care provider, the contaminated clothing should be removed from the patient, powdered agents should be brushed off, and the areas of contact should be irrigated with copious amounts of cool, running water.[22]

Exercise 1.3: Mechanism of Injury

Fill in the blank for the mechanism of injury that fits the description (thermal, chemical, or electrical). The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 1.3: Mechanism of Injury Answer Key**.

	Mechanism of Injury Description
1.	Patients may require cardiac monitoring or monitoring for symptoms of rhabdomyolysis following _____.

	Mechanism of Injury Description
2.	_____ represent most burn injuries and involve contact with a heat source.
3.	_____ can be progressive, making it difficult to determine severity in the early days following the injury.

CONCLUSION

You have completed **Module 1: Anatomy & Physiology of the Integument System and Pathophysiology of Burn Injuries**. You should now have an understanding of the anatomy and physiology of the integument system, the local and systemic responses that occur following a burn injury, and be able to define burn injury. Additionally, you should have gained an understanding of the various mechanisms of burn injuries. You may now continue to **Module 2: Supporting Burn Patients' Biopsychosocial Needs and Providing Pain Management**

MODULE 2:

SUPPORTING BURN PATIENTS' BIOPSYCHOSOCIAL NEEDS AND PROVIDING PAIN MANAGEMENT

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Module 2: Supporting Burn Patients' Biopsychosocial Needs and Providing Pain Management

The purpose of this module is to provide an understanding of the assessment and management of a burn patient's biopsychosocial needs. This includes social supports, coping mechanisms, spiritual and cultural needs, and ensuring adequate pain management.

This module contains evidence-based information and includes interactive exercises and optional videos to enhance the learning experience. The **answer key to the exercises can be found in Appendix A** of the e-learning resource manual. **Definitions of terms that are bolded and italicized can be found in the Glossary located in Appendix B** of the e-learning resource manual.

Stock photo from Microsoft Word

Learning Objectives

After completing this module, you will be able to:

1. Identify measures the Registered Nurse can take to support the burn patients' biopsychosocial needs; and
2. Describe the types of pain experienced by burn patients and identify pain management strategies.

2.1 Burn Patient's Biopsychosocial Needs

A burn injury is a traumatic event that can have physiological and psychological consequences for the patient. Burn patients may experience ***post-traumatic stress disorder***, ***anxiety***, and/or ***depression*** resulting from the burn injury.[23] This should be taken into consideration when completing your assessments and when providing nursing care as these mental health concerns can reduce the patient's ability to cope, result in maladaptive behaviours, and reduce the patient's ability to function.[24]

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The physical recovery required following a burn injury is paralleled by the emotional challenges the burn patients face. Patients with burn injuries are learning to **cope with physical limitations** and **changes in their physical appearance**. The physical limitations may include **amputations, limited range of motion from burn scars, and grafted areas that can be stiff and/or fragile**. These functional limitations that persist following wound healing may prevent the patient from returning to their previous occupation.[25] Changes to the burn patient's physical appearance, including scarring, can lead to **fear of stigmatizing reactions**, such as staring and unwanted questions. This can cause some burn patients to isolate themselves socially. This is concerning because social support has been noted to be important for post-traumatic growth and without that support the patient's progress may be hindered.[26]

The psychosocial assessment provides information on the burn patient's mental health and social well-being and helps provide an understanding of the burn patient to optimize the care provided.[24] Aspects to consider when completing the biopsychosocial assessment are outlined in **Table 2.1** below.

Table 2.1: Nursing Considerations for the Biopsychosocial Assessment

Assessment Categories	Considerations
Social History	Assess/determine the social supports available to the patient. Patients with meaningful social networks have been more likely to experience less severe mental health challenges and to recover better.[24]
Spiritual Assessment	Note the patient's religious background and their degree of involvement with the religious community or any spiritual practices. This can help determine any unresolved spiritual needs or concerns the patient has and appropriate referrals can be arranged.[24]
Cultural Assessment	Determine if the patient has any needs related to their ethnic and cultural background. These beliefs, values, and practices can then be respected and considered when providing patient care.[24]
Coping Skills	Determine the patient's typical coping mechanisms. This understanding can help foster adaptive coping skills. The RN can also build upon the patient's interests, hobbies, and strengths.[24]
Mood, Affect, and Behaviour	The patient's mood can be assessed by asking how they are feeling and observing verbal and non-verbal behaviours. Note if the patient's behaviours are appropriate to the situation, if they are making appropriate eye contact, and their affect.[24]
Sleep	Monitor and ask the patient how well they are sleeping. Burn patients often experience sleep disturbance, which may be associated with depression and anxiety. The hospital environment can be loud, and patients are awakened periodically for care. Pharmacological and non-pharmacological measures to aid with sleep may be warranted.[27]
Problematic Substance Use	Determine if the patient has a history of problematic substance use and whether this had any role in the patient's injuries. The patient may desire a referral to rehabilitative services.[24]
Mental Health History	Patients with a pre-existing history of mental health conditions are at a higher risk for adverse outcomes from their injury. It is important to consider how the patient was injured. If a patient's burn injuries are the result of ***self-immolation***, a consult will be sent to a psychiatrist. It will be necessary to assess the patient for any suicidal ideations and the patient will typically require one-to-one monitoring until further directed by a psychiatrist.[27] You can **assess for suicidal ideations** by asking: "Have you had thoughts of hurting yourself?"[24]

Certain aspects of the psychosocial assessment, including: **problematic substance use, social history, spiritual assessment, and cultural assessment may only need to be completed during the initial days following admission**. However, other aspects of the assessment may need to be

completed more frequently, **such as assessing for suicidal ideations** in a patient whose burn injuries are the result of self-immolation, assessing the patient's coping abilities, assessing mood, affect, and behaviour, and sleep.

Nursing Documentation Tip

Ensure you document the biopsychosocial assessment findings in the burn patient's chart. This should include any concerning findings that are relayed to the Physician or Nurse Practitioner and any referrals that have been offered (i.e., spiritual care professional).

Supporting Burn Patients' Biopsychosocial Needs

There are numerous ways the RN can support a burn patient's biopsychosocial needs. These are discussed in **Table 2.2** below.

Table 2.2: Strategies to Support Burn Patients' Biopsychosocial Needs

Strategies to Support the Burn Patients' Biopsychosocial Needs
Demonstrate support: The patient may have lost family members, friends, pets, their home, or personal property in the incident. In collaboration with mental health professionals, it is important to help the patient grieve at their own pace.[27] **Provide therapeutic communication** and take the time to listen to the patient's and their family's concerns and allow opportunities to ask questions. Allot time outside of dressing changes or other procedures.[25]
Consults: Ensure appropriate consults have been completed (Social Work, Mental Health Nurse, Psychiatrist/Psychologist). Advise the patient that psychological support from a professional can be provided at any time and outpatient mental health resources can be arranged for discharge.[25]
Goals: Help the patient set and achieve recuperative goals.
Support the Patient's Sense of Humor: Humor is believed to be a powerful adaptive coping mechanism that helps individuals form positive social connections by transforming negative emotions to positive ones.[23]
Social support: Including the patient's support people (family/friends) in care can be helpful. Family members and/or friends may also be anxious and distressed while the patient is being cared for and this can foster the same response in the patient.[28]

Supporting Burn Patients' Family Members

Including family members in care has been highlighted as a means of supporting burn patients' biopsychosocial needs. Family members may need encouragement and guidance, which can be provided by the RN.

Nursing Considerations for Burn Patients' Family Members

Encourage family/friends to be positive and hopeful but not to minimize the seriousness of the burn patient's injuries. Words of encouragement like **"what you are experiencing is difficult, but I believe you can get through it"** can be helpful.

Encourage family/friends to show empathy, not sympathy. Saying things like **"I know this is very difficult, I am going to be here to support you."** Avoid saying things like "I know how you feel" if you have not had a similar experience, as some burn patients may find this offensive.

Burn patients may be self-conscious about their appearance, encourage family/friends to be mindful of their nonverbal cues. Encourage family/friends to make eye contact, but not to stare at the injuries.

Encourage family/friends to be **supportive listeners**.[28]

Mental Health Concerns

Due to the traumatic nature of burn injuries and the emotional challenges associated with the recovery, burn patients may experience ***post-traumatic stress disorder***, ***anxiety***, and/or ***depression***.[23]

Stock Image from Microsoft Word

Nursing Considerations: PTSD, Anxiety, and Depression

It is important to assess and monitor the patient for signs and symptoms of PTSD, anxiety, and/or depression and to report any concerns to the Physician or Nurse Practitioner so that appropriate referrals and support can be provided. Since PTSD symptoms may not appear until after the patient has been discharged, it is important to educate the patient and their family members on this condition.

Nursing Documentation Tip

Ensure you provide documentation in the patient's chart of any signs and symptoms of mental health concerns that were noted and relayed to the Physician or Nurse Practitioner. You should also provide documentation of any consults/referrals offered and emotional support provided to the patient and/or their family member(s).

Click on the images below to view helpful videos to learn more about psychiatric considerations relevant to burn care.

Additional Learning

Please view the following videos for additional information about PTSD, anxiety, and depression.

Source: Psych Hub. (2020, April 6). *What is PTSD?* [Video]. YouTube. https://www.youtube.com/watch?v=2KXtlIX_yUs[29]

Source: Psych Hub. (2019, April 16). *What is anxiety?* [Video]. YouTube. https://www.youtube.com/watch?v=BVJkf8IuRjE[30]

Source: Psych Hub. (2020, July 21). *Major depressive disorder* [Video]. YouTube. https://www.youtube.com/watch?v=MZ5r99SBLrs[31]

Exercise 2.1: Biopsychosocial Needs Case Study

Stock Image from Microsoft Word

Mr. Clark is a 29-year-old man who was admitted to the burn unit in the early morning hours after obtaining burn injuries when he passed out on his couch with a lit cigarette after an evening of drinking. You are the RN assigned to care for Mr. Clark the next day shift and you are required to complete his health history, including a biopsychosocial assessment.

Answer the select-all-that-apply questions below. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 2.1: Biopsychosocial Needs Answer Key.**

1. Which of the following are important considerations for the biopsychosocial assessment of Mr. Clark?

☐ a. Determine if the patient has a history of problematic substance use.

☐ b. Determine if the patient has any special needs or considerations related to their culture/ethnic background.

☐ c. Determine the social supports available to the patient.

☐ d. Determine if the patient has any unresolved spiritual needs or concerns.

☐ e. All of the above

2. As the RN caring for Mr. Clark, which of the following are strategies you can take to support his biopsychosocial needs?

☐ a. Help Mr. Clark set and achieve recuperative goals.

☐ b. Demonstrate support and empathy by saying things like "I know how you are feeling."

☐ c. Enter a consult for the Registered Social Worker.

☐ d. Allow Mr. Clark the opportunity to ask questions and take the time to listen to his concerns.

☐ e. All of the above

2.2 Burn Pain

Pain is a major problem following a burn injury and can be very distressing for the patient. Burn pain varies greatly from patient to patient, can be highly unpredictable, and persistent. Pain can contribute to anxiety and reluctance to participate in wound care, rehabilitation, and activities of daily living. Therefore, it is important to ensure pain is accurately assessed and adequately treated.[32]

The therapies that are used to treat burn injuries contribute to the challenges associated with managing burn pain as many of these interventions are associated with pain, such as wound care procedures (dressing changes, ***debridement***, and ***hydrotherapy***), surgical procedures (***excision and grafting***), and physiotherapy exercises.[33] Burn care treatments and surgical procedures will be discussed in **Module 4.**

Additionally, the intensity of the burn pain experienced is not related to the extent of the burn injury. The depth of injury affects the pain and sensation experienced since burn injuries that penetrate the deep dermis and hypodermis may destroy sensory receptors resulting in decreased sensation.[32]

Stock Image from Microsoft Word

Pain management is also complicated by the various phases of pain experienced by burn patients. Burn pain is typically characterized by five phases.[32,34] These phases are described in **Table 2.3** below.

Table 2.3: Phases of Burn Pain

Phase of Burn Pain	Description	Treatment
Background Pain	Results from thermal injury and tissue destruction. Typically, of low to moderate intensity and of long duration.[32,34]	Regularly ordered: • Long-acting opiates (e.g., Morphine or Hydromorphone) • Acetaminophen • Non-steroidal anti-inflammatory drugs (NSAIDS) (e.g., Celebrex)[12]
Procedural Pain	Precipitated by procedures, such as wound debridement, dressing changes, hydrotherapy, or physiotherapy exercises. Typically, more intense than background pain but of a shorter duration.[32,34]	Medications given 30-minutes prior to the procedure: • Acetaminophen • Short-acting opiates (e.g., Morphine, Hydromorphone, Fentanyl)[12] • Anxiolytics (for patients who experience anticipatory procedural anxiety).[12,33]
Breakthrough Pain	Occurs unexpectedly at rest or during procedures when the medication regime for background and procedural pain are exceeded. May also occur when the patient is experiencing increased anxiety.[32,34]	Same treatment as background and procedural pain.
Postoperative Pain	A predictable and temporary increase in pain. Occurs after burn excision, skin harvesting, or skin grafting due to the creation of new wounds and typically lasts 2-5 days.[32,34]	• Acetaminophen • NSAIDS (e.g., Celebrex) • Morphine • Fentanyl • Patient-Controlled Analgesia (PCA) pump[12]
Chronic Pain	Pain that persists after 6 months or after the burn injuries and donor sites have healed. Neuropathic pain is the most common type of chronic pain.[32,34] Symptoms of neuropathic pain include: • Pain occurring without stimulation • Shooting, burning, or stabbing pain • Numbness or tingling ("pins and needles" sensation) • Allodynia (pain that occurs from a stimulus that is normally non-painful, such as cold, gentle brushing against the skin, pressure, etc.) • Hyperalgesia (an increased sensitivity and response to painful stimuli, such as pinpricks or heat).[35]	Regularly ordered: • Anti-seizure medications (e.g., Gabapentin [Neurontin] or Pregabalin [Lyrica]) • Antidepressant medications (e.g., Amitriptyline [Elavil] or Nortriptyline [Pamelor]) **These medications have a secondary use for neuropathic pain**.[12]

Exercise 2.2: Phases of Burn Pain

Fill in the blank for the phase of burn pain that matches the description. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 2.2: Phases of Burn Pain Answer Key.**

	Phases of Burn Pain
1.	_____ is typically more intense than background pain but of a shorter duration.
2.	_____ persists after 6 months or after the burn injuries and donor sites have healed.
3.	_____ results from tissue destruction and is typically of a long duration.
4.	_____ may also occur when the patient is experiencing increased anxiety.
5.	_____ is a predictable and temporary increase in pain and typically lasts two to five days.

Burn Pain Management Considerations

It is important to conduct a thorough pain assessment to optimize pain management. Pain assessment helps to determine which type of pain is the greatest problem and subsequently determine how best to treat it. Uncontrolled acute pain is believed to contribute to ***chronic pain***, ***neuropathic pain***, depression, and post-traumatic stress disorder.[36]

Stock Image from Microsoft Word

Additional Learning

Please refer to the most updated **204(NUR)-6-010 Screening and Assessment of Pain** policy for additional information on pain assessment.

Nursing Consideration: Anxiety and Pain

The anxiety a patient is experiencing can also contribute to their pain perception. Thus, a careful assessment of the patient's anxiety level is warranted in the context of treating pain. Anxiolytics have also been found to lessen burn pain by treating acute anxiety. Additionally, establishing a routine may be helpful for some patients who experience anxiety and anticipatory pain. This can help the patient prepare and plan for the day.[33]

Wound Care Pain Management

Wound care procedures, including **hydrotherapy, debridement, and dressing changes can be painful for the patient.** Complete a pain assessment and medicate the patient for pain 30-minutes prior to beginning wound care.

!!Allergies!! Ensure you have reviewed the patient's allergies prior to administering an analgesic.

It will be necessary to reassess the patient's pain throughout wound care and to provide analgesics accordingly.

Including non-pharmacological measures of pain management, such as relaxation or distraction can be helpful. Play music or television during wound care if the patient is agreeable. This can help distract the patient and reduce the pain and anxiety associated with dressing changes. Some larger burn centres have incorporated virtual reality as a non-pharmacological pain management measure during procedures, such as dressing changes.[36]

Click the image below to view a helpful video on pain management for burn patients.

Additional Learning

Please view the following video for additional information on the management of pain related to burns.

Source: University of Washington Medicine. (2019). *Burns 501: Burn Pain – the basics* [Video]. YouTube. https://www.youtube.com/watch?v=8T68wYwzI9I[37]

Pain Assessment and Management Documentation

The aspects of your pain assessment and the interventions provided for pain management should be documented in the patient's chart. These documentation considerations are outlined in **Table 2.4** below.

Table 2.4: Pain Assessment and Documentation

Pain Assessment and Management Documentation Should Include:
Provoking and relieving, Quality, Region and radiation, Severity, and Time (PQRST) assessment findings
Patient's appearance
RN's observations
Medication and dosage of analgesic administered
Non-pharmacological measures taken
Patient's response to pain management efforts

Exercise 2.3: Pain Assessment and Management

Answer true (T) or false (F) to the following statements. Place an 'X' in the appropriate box. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 2.3: Pain Assessment and Management Answer Key.**

	Statements	T	F
1.	The intensity of burn pain is related to the extent of the burn injury.		
2.	Treatment for neuropathic pain may include anti-seizure and anti-depressant medications.		
3.	Breakthrough pain occurs unexpectedly at rest or during procedures when the medication regime for background and procedural pain are exceeded.		
4.	Anxiolytics are not beneficial for the treatment of burn patients' pain.		
5.	A thorough pain assessment can help determine the type of pain experienced by the patient and how best to treat it.		

Exercise 2.4: Pain Case Study

You are the RN assigned to Mr. Smith, a 57-year-old patient who obtained burn injuries while burning garbage in his backyard. Mr. Smith states he was resting in bed this morning when he began experiencing a "shock-like" pain that is radiating down his right arm to his fingers. Mr. Smith rates the pain as 5/10. Mr. Smith stated he experienced this pain yesterday afternoon when his wife was helping him put his robe on. Mr. Smith stated he tried repositioning, but this has not helped.

Stock Image from Microsoft Word

Answer the questions below based on the description above. The answers to this exercise may vary, but suggested answers can be found in **Appendix A** of the e-learning resource manual under **Exercise 2.4: Pain Case Study Answer Key.**

1.	**Fill in the table with the pain assessment data you can obtain from the above information.**	**Answers**
	P – Provoking and Relieving	
	Q – Quality	
	R – Region and Radiation	
	S – Severity	
	T – Time	
2.	**What additional questions would you ask the patient?**	
3.	**Based on the assessment findings, what type of pain do you think the patient is experiencing?**	
4.	**What medications may be helpful to treat this type of pain?**	

CONCLUSION

You have completed **Module 2: Supporting Burn Patients' Biopsychosocial Needs and Providing Pain Management**. You should have gained an understanding of the assessment and management of a burn patients' biopsychosocial needs, as well as considerations for the provision of adequate pain management. You may now continue to **Module 3: Assessment of a Burn Patient.**

MODULE 3:

ASSESSMENT OF A BURN PATIENT

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Module 3: Assessment of a Burn Patient

The purpose of this module is to provide an understanding of the assessment considerations for a burn patient. The module describes methods of calculating total body surface area of burn injuries and the classification of burn injuries by depth. The module also includes information on the head-to-toe assessment of a patient with burn injuries.

This module contains evidence-based information and includes interactive exercises and optional videos to enhance the learning experience. The **answer key to the exercises can be found in Appendix A** of the e-learning resource manual. **Definitions of terms that are bolded and italicized can be found in the Glossary located in Appendix B** of the e-learning resource manual.

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Learning Objectives

After completing this module, you will be able to:

1. Describe the methods of calculating the total body surface area of a burn injury;
2. Distinguish between the characteristics of the types of burn injuries by depth; and
3. Discuss important considerations for the head-to-toe assessment of a burn patient.

3.1: Burn Wound Assessment


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An assessment of the burn wounds is necessary to determine the wound progression and to help determine wound management options.[38]

The burn wounds should be assessed with each dressing change. The frequency will be ordered by the Physician or Nurse Practitioner. If the patient has multiple burn wounds, each wound should be assessed separately.

The burn wound assessment should include:


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- Anatomical location
- Size (width, depth, and length)
- Tissue type and amount (e.g., granulation, slough, eschar, etc.)
- Exudate type (e.g., serous, serosanguineous, sanguineous, purulent, etc.) and amount (e.g., none, scant, small, moderate, or large)
- Presence or absence of odour
- Type of wound edge (e.g., attached, unattached, rolled, etc.)
- Appearance, temperature, colour, and integrity of the ***periwound*** tissue (e.g., intact, reddened, indurated, macerated, excoriated, etc.).[12,38]

Additional Learning

Please refer to section 7.2 of the Newfoundland and Labrador Skin and Wound Care Manual for additional information on the various wound assessment considerations (exudate types, wound bed, and peri-wound characteristics).

You can complete this 30-minute Wound Assessment Module from Connecting Learners with Knowledge to learn more and improve your wound assessment skills. This is licensed under by CC BY-NC-ND 2.5 CA.

Nursing Documentation Tip

The burn wound assessment findings should be documented in the patient's chart. You should provide documentation of any concerning findings that were relayed to the Physician or Nurse Practitioner. Additionally, you should include whether the burn wounds were assessed by the Physician or Nurse Practitioner.

Calculating Total Body Surface Area (TBSA)

The total burn area is expressed as a percentage of the TBSA. There are three common methods of assessing the extent of the burn wound, the ***Lund and Browder Chart***, the ***Wallace Rule of Nines***, and the ***Palmar Surface or Hands Method***, which are defined below.[12,17,39] The method used commonly depends on physician preference or the distribution of the injuries. It is important to note that the depth of the burn injury may increase over time. As a result, the TBSA is usually reassessed after 24 to 72 hours.

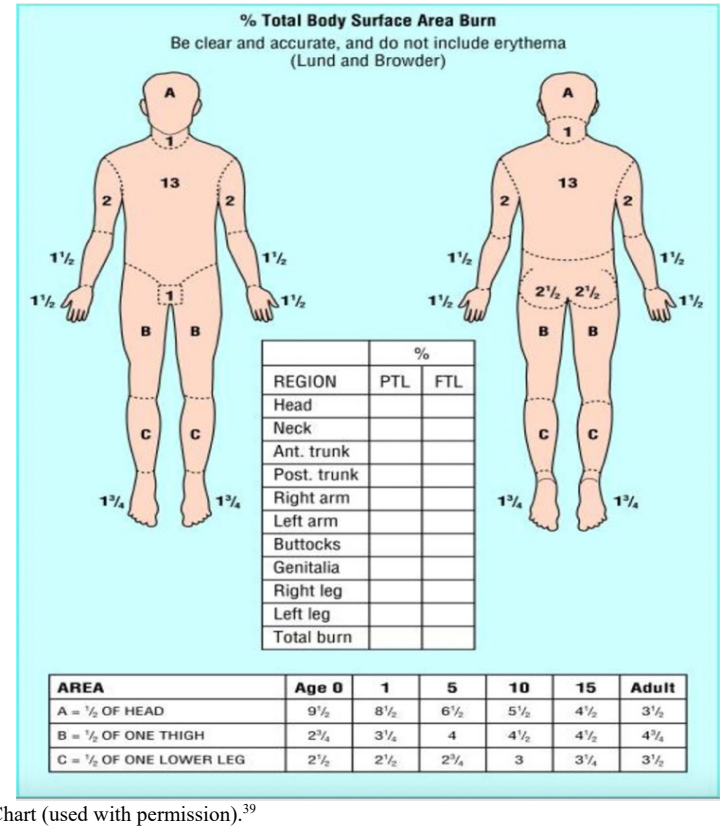
Remember
Superficial burns are not included in the calculation of TBSA.

Lund and Browder Chart

A tool for estimating TBSA of a burn injury that was created by Dr. Charles Lund and Dr. Newton Browder in 1942. The Lund and Browder chart provides an ease of comparison during subsequent assessments and takes into consideration the variations in TBSA with age.[12] The BSA of the head decreases in percentage with age, while the BSA for the legs increases in percentage with age.[39]

Figure 3.1

Lund and Browder Chart

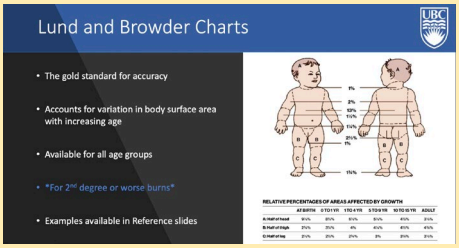


(Source) Lund and Browder Chart (used with permission).[39]
Hettiaratchy, S., & Papini, R. (2004). Initial management of a major burn: II – assessment and resuscitation. *The British Medical Journal, 10*, 101-103. https://www.doi.org/10.1136/bmj.329.7457.101

Click the image below to view a helpful video on the Lund and Browder Chart

Additional Learning

Please view the following video **from 5:44 to 6:51** for additional information on the Lund and Browder Chart.



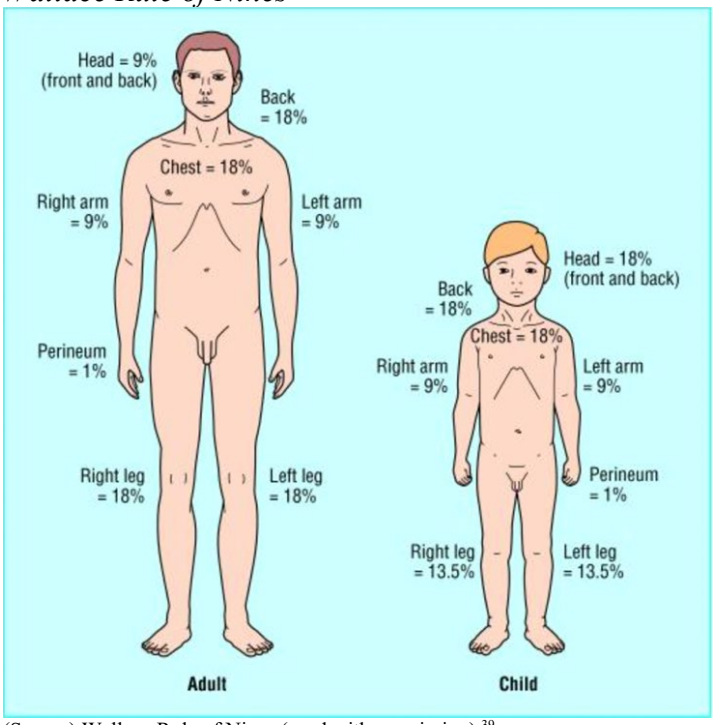
Source: UBC Plastic Surgery Medical Educational Videos. (2021, July 3). *Burns – How to assess burn size* [Video]. YouTube. https://www.youtube.com/watch?v=qEwx7FYDQ-4[40]

Wallace Rule of Nines

A tool created by Alexander Wallace in 1951 to estimate the TBSA of a burn injury. It is a quick way of estimating medium (15-85% TBSA) to large burns (>85% TBSA) in adults. The major anatomic structures of the body are divided into regions divisible by 9. This method may not be as accurate in children as it does not compensate for variations in body shape with age.[12,17,39]

Figure 3.2

Wallace Rule of Nines



(Source) Wallace Rule of Nines (used with permission).[39]

Hettiaratchy, S., & Papini, R. (2004). Initial management of a major burn: II – assessment and resuscitation. *The British Medical Journal, 10*, 101-103. https://www.doi.org/10.1136/bmj.329.7457.101

Click the image below to view a helpful video on the Wallace Rule of Nines.

Additional Learning

Please view the following video for additional information on the Wallace Rule of Nines.

Source: Registered Nurse RN. (2018, March 30). *Rule of nines for burns in adult nursing NCLEX lecture with examples* [Video]. YouTube. https://www.youtube.com/watch?v=JRa9F2PVmL0[41]

Palmar Surface Method/Hands Method

A quick and simple method of calculating TBSA that is more accurate for relatively small burns (<15% TBSA) or for large burns (>85% TBSA) by measuring the unburnt skin. However, it is not an accurate assessment for medium-sized burns (15-85% TBSA). The palmar surface of the hand, including the fingers and the thumb closed together equals 1%.[12,17,39]

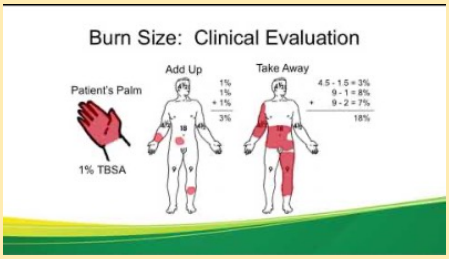
Figure 3.3

Palmar Surface of the Hand Depicting 1% TBSA (personally owned)

Click the image below to view a helpful video on the Palmer Surface Method.

Additional Learning

Please view the following video **from 10:20 to 12:43** for additional information on the Palmar Surface Method.



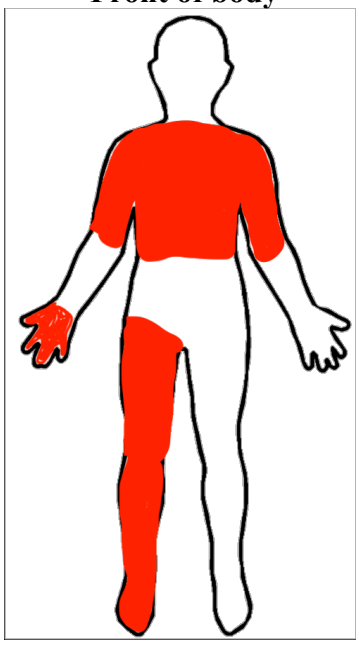
Source: Surgery 101. (2019, July 23). *Acute burn injuries – Dr. Kwan* [Video]. YouTube. https://www.youtube.com/watch?v=4hcPn9f2gNY[42]

Exercise 3.1: Calculating TBSA of Burn Injuries

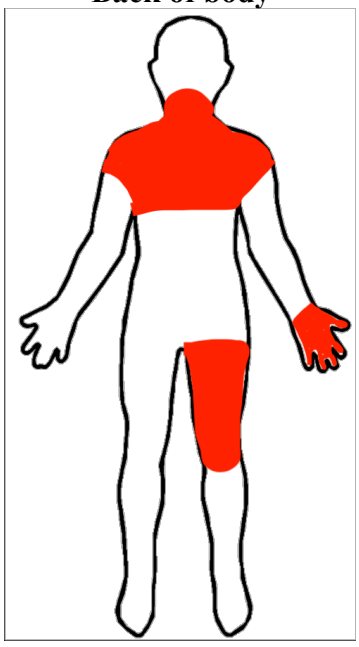
The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 3.1: Calculating TBSA of Burn Injuries Answer Key**.

Mr. Roberts, a 34-year-old male received superficial partial thickness and deep partial thickness burns while welding in his garage. His burn injuries are highlighted in red in the images below.

Front of body



Back of body



1. Using the Lund and Browder chart, determine the TBSA of Mr. Roberts' burn injuries.

2. Using the Wallace Rule of Nines method, determine the TBSA of Mr. Roberts' burn injuries.

3. Explain why you would or would not use the Palmar Surface Method for determining the TBSA of Mr. Roberts' burn injuries.

Remember

The calculations are an estimate and may vary by a small percentage between individual assessors.

Burn Wound Depth

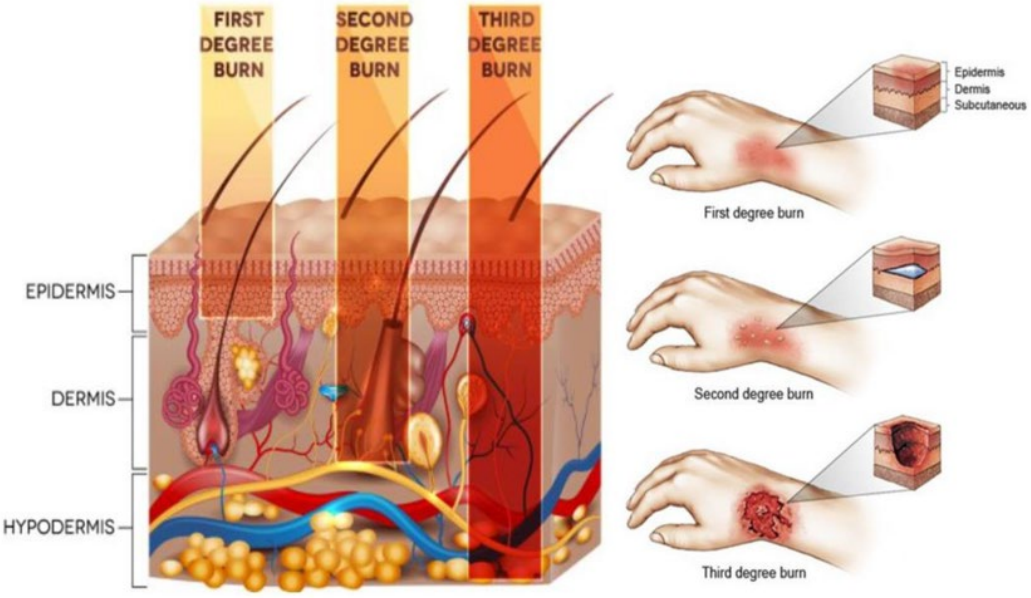
Burn injuries are classified by the depth of injury. This refers to layers of the skin (the epidermis, dermis, and hypodermis) that the burn wounds penetrate through.[43] It is important to note that it may be difficult to determine the depth of injury during the first several days as the burn injury can evolve.[12]

Classifications of Burn Injury Depth

There are four classifications of burn injuries by depth: superficial, superficial partial thickness, deep partial thickness, and full thickness.[4] The image below illustrates the layers of the skin these burn wounds penetrate. In the image first degree refers to superficial burns, second degree refers to deep partial thickness burns, and third degree refers to full thickness burns.

Figure 3.4

Classification of Burn Injury Depth



(Source) Illustration of different depth of invasion for burn injury by Owda et al., 2019[44] is licensed under by CC BY 4.0

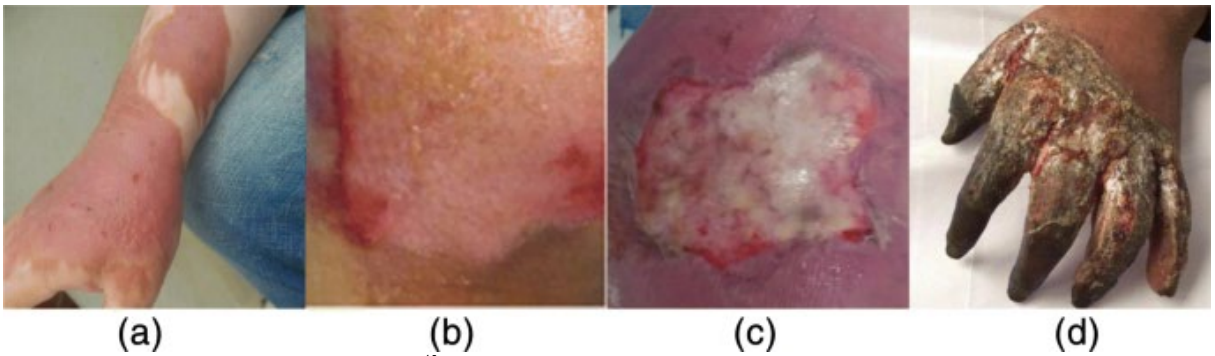
Table 3.1 below provides a comparison of the four classifications of burn wounds by depth and includes information on the typical appearance of these burns, pain and sensation associated, typical healing time, and common causes.

Table 3.1: Characteristics of Burn Types According to Depth

	Superficial (also known as epidermal)	**Superficial Partial Thickness**	**Deep Partial Thickness**	**Full Thickness**
Depth of Injury	• Epidermis only[4,12]	• Epidermis and superficial dermis[2,4, 12]	• Epidermis and deep dermis[2,4, 12] • Underlying structures are not exposed[2, 12]	• Full-thickness skin loss[2, 12] • Underlying structures (e.g., bone, muscle, tendon) exposed in 4th degree[12]
Appearance	• Red or pink[4, 12] • Dry[4] • Blanchable[4, 12] • Slight edema[2, 12] • No blisters[2,4, 12]	• Red[4, 12, 12] • Moist[2,4, 12] • Blanchable[12,43] • Marked edema[2] • Blisters present[2,4, 12]	• White, tan, or brown[4, 12] • Dry and waxy[4, 12] • Blotchy/mottled[2, 12] • Not blanchable[4, 12,43] • Edema[2] • Blisters may be present[2, 12]	• Yellow, brown/black, or dark red[12,43] • White sheen[2] • Dry, leathery, charred[2,4,43] • Not blanchable[12,43] • Edema[2, 12] • Thrombosed vessels visible[12]
Pain and Sensation	• Sensations intact[2, 12] • Mild pain[4]	• Sensations intact[12] • Moderate pain[4]	• Deep pressure intact but pinprick absent[12] • Pain varies[12]	• Sensations not intact[2, 12]
Healing	• No surgical intervention required[4] • Heals within 7-10 days[4]	• Heals within 14-21 days[2,4]	• Surgical intervention often required for healing[4] • Heals within six weeks[2]	• Surgical intervention required for healing[2,4]
Skin Function	• Skin function preserved[2]	• Skin functions lost[2]	• Skin functions lost[2]	• Skin functions lost[2]
Common Causes	• Sunburn, scalding, flash flame, or electrical flash[2,4, 12]	• Sunburn, scalding, steam, brief contact with flame or hot surface/object, or electrical flash[2, 12]	• Scalding, steam, contact with flame or a hot surface/object[12]	• Scalding from immersion, prolonged exposure to flame or a hot surface/object, chemicals, or electricity[2, 12]
Other	• **Not included in calculation of total body surface area burned**[4,43]	• Burn wound may evolve and become deeper[4]	• Associated with scar formation and possible contracture formation[2]	

Figure 3.5

Burn Injuries by Depth (A: Superficial; B: Superficial Partial Thickness; C: Deep Partial Thickness; D: Full Thickness)



(Source) Different burn depth by Jiao et al., 2019[45] is licensed under CC BY 4.0

Factors Influencing Burn Wound Depth

There are various factors that can affect burn wound depth. Primarily, the extent of a burn injury is proportional to the **temperature and the duration of contact** with the heat source. The **patient's age** can also affect the depth of injury as elderly patients tend to have a thinner dermis, which can result in deeper burns. The **anatomical location** of the burn can affect the depth since areas such as the dorsum of the hands, the ears, and perineum have thinner skin, which can result in deeper burns.[4]

Nursing Consideration: Caring for Patients with Diabetes Mellitus (DM) and/or Peripheral Vascular Disease (PVD)

Co-morbidities, such as DM and PVD, can also result in deeper burns.[12]

Patients with DM are at risk for ***peripheral neuropathy*** and similarly, patients with PVD may develop peripheral nerve dysfunctions, including pain and sensory deficiencies. As a result, patients with DM and PVD often experience cold feet, leading to a desire to warm their feet. However, this presents a risk of burn injury from prolonged contact with a hot surface by attempting to warm their feet on heaters or with hot water.[46,47] Due to the sensory impairment these patients may be unaware of the burn injury resulting in a delay in seeking care.[48] The care of these patients is complicated by the impaired wound healing associated with DM and PVD.[46,47]

As the RN caring for this population, you can provide education to prevent subsequent injuries or delays in care. Encourage the patient to:

- Assess their feet daily
- Wash their feet daily
- Avoid going barefoot[49]

Click the images below to view helpful videos on assessing burn wound depth.

Additional Learning

Please view the following videos for additional information on assessing burn wound depth.

Source: Victorian Adult Burns Services. (2016, October 19). *Burn wound assessment* [Video]. YouTube. https://www.youtube.com/watch?v=NOVqaB1KBGA[5]

Source: University of Washington Surgery. (2013, April 26). *Burns 101 assessment* [Video]. YouTube. https://www.youtube.com/watch?v=DbE0iCq25Z4[51]

Exercise 3.2: Burn Wound Depth

The descriptions in the left column and the burn wound depths in the right column are currently incorrectly aligned. Match the burn wound depth to the appropriate description. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 3.2: Burn Wound Depth Answer Key.**

	Description	Answer
1.	This level of burn injury results in little pain or sensation and requires surgical intervention to heal.	Superficial
2.	This level of burn injury involves the epidermis only and appears pink to red in colour.	Superficial partial thickness
3.	This level of burn injury appears red and moist and may evolve and become deeper.	Deep partial thickness
4.	This level of burn injury appears dry, may have blisters present, and may require surgical intervention to heal.	Full thickness

3.2 Head-to-toe Assessment Considerations for Burn Patients

In acute care settings, such as the burn unit, a physical assessment should be performed at the beginning of the shift or when you are prompted by a change in the patient's clinical status. This assessment should be ongoing while providing care, such as bathing or wound care for burn patients. The initial assessment helps identify changes in the patient's condition and provides a comparison from previous shifts.[8] A focused head-to-toe assessment helps gather data about your patient and the findings can inform the plan of care.[38] You should complete a head-to-toe assessment of a burn patient as you would with all patients. However, there are some important considerations for patients with burn injuries. The importance of each portion of the assessment may vary according to the severity of the patient's burn injuries and the mechanism of injury.

Remember

You should **perform hand hygiene** and don appropriate **PPE** prior to having contact with the burn patient. This includes completing your assessment.

Ensure assessment data is documented and the Physician or Nurse Practitioner are notified of any abnormal findings. You should also document any interventions ordered based on these findings and the subsequent outcomes.

A more thorough assessment is warranted if abnormalities are noted or if the patient's condition necessitates it.[8]

Similarly, vital signs will be monitored and recorded and may be ordered more frequently if the burn patient is experiencing complications.

Neurological Assessment in Burn Patients

The neurological assessment begins with the first interactions as you gather information about the burn patient's appearance, communication patterns, and general behaviour.[38] A burn patient's neurological function may be altered by factors such as medications, infection, a neurological deficit due to concomitant trauma, the inhalation of toxic gases, or fluid loss.[38,52]

Aspects of the Neurological Assessment to Include:

- Orientation (person, place, and time)
- Confusion Assessment Method (CAM)
- Gross motor function
- Sensation (paresthesia and/or paralysis)[38]

Nursing Considerations for the Neurological Assessment

Changes in gross motor function and sensation may be indicative of compartment syndrome.[53]

Compartment syndrome is discussed on page 190 and 191.

Additional Learning

The CAM is a validated tool used to assess the presence of delirium.[54] Please refer to the most updated **PRC-028 Delirium Screening and Management (Adult Acute Care)** policy for additional information about this method of patient monitoring.

Respiratory Assessment in Burn Patients

The respiratory assessment is one of the most crucial portions of the head-to-toe assessments. This is because changes in a patient's respiratory function can quickly become life threatening. These changes may be prompted by a variety of factors, including immobility, infection, and fluid overload.[8] Burn patients may be at risk for an ***inhalation injury*** and are susceptible to developing pneumonia. Additionally, an increase in respiratory rate may be a sign of a serious infection (e.g., sepsis).[12]

An inhalation injury is a potentially serious complication of burn injuries, particularly if the patient has facial, neck, or chest burns.[12] Under most circumstances, these patients will be admitted to the Intensive Care Unit. However, while initially the patient's airway may be stable, the swelling can progress and cause issues.

Aspects of the Respiratory Assessment to Include:

- Auscultate breath sounds
- Respiratory rate
- Oxygen saturation
- Cough – productive/non-productive
- Monitor for respiratory distress
- Monitor for signs of an inhalation injury[38]

Stock Image from Microsoft Word

Nursing Considerations for the Respiratory Assessment

As part of your respiratory assessment, ensure there is an **oral airway, high humidity oxygen set up, and suction set up** (with catheters and Yankeur) available at the burn patient's bed space.[55] Humidified oxygen is helpful for airway inflammation.[8] Having these items set up in advance can save time in the event of an **acute change in the patient's respiratory status** that requires urgent intervention.

Given the acute progression that can occur due to an inhalation injury, it is important to be aware of and to monitor for the **associated signs and symptom**s:

- Singed eyebrows or nasal hairs
- Darkened or reddened oral and nasal mucosa
- Carbonaceous sputum (sooty sputum) or soot on the burn patient's teeth, tongue, or throat
- Erythema or swelling of the ***oropharynx*** or ***nasopharynx***
- Difficulty swallowing or inability to clear secretions
- Voice changes (raspy hoarse voice)
- Brassy, barking cough
- Change in breath sounds (grunting or stridor)
- Agitation and/or anxiety
- Tachypnea, use of accessory muscles, nasal flaring, and/or sternal retraction[12,17]

Critical Consideration: Signs of Respiratory Distress

- Shortness of breath
- Diminished breath sounds
- Cyanosis of nail beds and lips
- Nasal flaring
- Use of accessory muscles
- Sternal retraction[8,38]

*Remember, due to the hypermetabolic response, burn patients may exhibit a respiratory rate of up to 25 breaths per minute.[14] However, progressive tachypnea can be a sign of respiratory distress or sepsis.[12]

*If the patient is receiving a central nervous system depressant for their analgesic or anxiolytic, then a decrease in respiratory rate may be a sign of toxicity or overdose and will require immediate nursing intervention.[56]

As described in Module 1, the systemic changes that occur due to a burn injury can result in respiratory changes, in severe burns, this can lead to ARDS. As a result of ARDS, the patient may exhibit:

- Severe shortness of breath
- Tachypnea (>25 breaths per minute)
- Hypotension (SBP < 90mmHg)
- Confusion and fatigue
- Cyanosis around the lips and of the nail beds[57]

Nursing Documentation Tip

Any change in the burn patient's respiratory status should be reported urgently to the Physician or Nurse Practitioner. The assessment findings, associated interventions, and subsequent outcomes should be documented in the patient's chart.

Burn Shock and Sepsis

Monitoring patterns and trends in vital signs can help identify changes in the burn patient's clinical status that warrant further investigation and intervention.[38] These changes can include **burn shock and sepsis, potentially life-threatening complications**.[12] Annually, sepsis affects approximately 18 million people globally and is ranked the **12th leading cause of death**. In Canada, approximately **one in 18 deaths are related to sepsis**.[58] Given the life-threatening nature of these complications, it is important to know the burn patient's goals of care and end of life wishes. The Physician or Nurse Practitioner will typically have this conversation and complete the Advanced Care Planning form with the patient and their family members upon admission.

Critical Consideration: American Burn Association's[17] Indicators for Sepsis in Burn Patients

Sepsis may be suspected if the burn patient exhibits three or more of the following findings:

- Temperature >39 or <36.5°C
- Progressive tachypnea (>25 breaths/minute)
- Progressive tachycardia (>110 beats/minute)
- ***Thrombocytopenia*** (<100,000 uL, after day 3 post-resuscitation)
- Hyperglycemia (>11.1mmol/L or >25% increase in insulin dosing over 24 hours).
- Enteral feeding intolerance (abdominal distension, gastric residuals greater than twice the hourly feeding rate, or diarrhea >2500ml/24 hours)

Critical Consideration: Burn Shock

The ***hypovolemia*** and ***hypoperfusion*** that can occur because of the systemic changes is known as "***burn shock***."

Additional signs and symptoms to monitor for and report promptly to the Physician or Nurse Practitioner include: hypotension, decreased body temperature, rapid/weak/thready pulse, rapid breathing, cool, clammy, and pale skin, confusion, anxiety, weakness, and unconsciousness.[12]

Burn shock is managed with aggressive fluid resuscitation.[59] The RN should monitor the burn patient's vital signs and urine output as ordered by the Physician or Nurse Practitioner.

Nursing Documentation Tip

The burn patient's vital signs should be recorded in the patient's chart. This will allow the team to monitor trends and determine appropriate interventions.

The burn patient's intake and output should also be accurately recorded so that the team can ensure the patient is receiving adequate fluid resuscitation.

Click the image below to view a helpful video on sepsis.

Additional Learning

Please view the following video for additional information on **sepsis**.

Source: Nursing SOS. (2021, February 23). *Sepsis signs and symptoms (and critical thinking)* [Video]. YouTube. https://www.youtube.com/watch?v=VPZ1FRnYuOk[60]

Cardiovascular Assessment in Burn Patients

As discussed in Module 1, burn injuries can result in systemic changes that can affect the cardiovascular system, including interstitial edema, hypotension, and inadequate perfusion. This contributes to the importance of completing a cardiovascular assessment.

Stock Image from Microsoft Word

Aspects of the Cardiovascular Assessment to Include:

- Vital signs
- Apical heart rate and rhythm
- Edema
- Fluid balance[38]

Remember

Due to the hypermetabolic response that occurs following a burn injury, **baseline temperature, heart rate, and respiratory rate may be elevated**. This can persist for months and can make diagnosing infection challenging.[12,14]

Nursing Considerations for the Cardiovascular Assessment

Burn patients may have extensive open wounds that put them at risk for **fluid and electrolyte losses**.[8] The Physician and Nurse Practitioner will order blood work as appropriate to monitor the patient's electrolytes.

As per policy, **ensure the patient has two large bore IVs**.[61] This is important should the patient need to receive intravenous fluid boluses or blood products. Large gauge cannulas, 18 or 20 gauge, promote rapid flow of blood components.[8]

Peripheral Neurovascular Assessment in Burn Patients

A neurovascular assessment is particularly important for patients with burn injuries affecting an extremity, especially if it is a ***circumferential burn*** due to the risk of ***compartment syndrome***.[62] The edema and the progression of the burn injury can lead to neurovascular compromise that can lead to permanent deficits, loss of a limb, or even death without early recognition and treatment.[12]

Aspects of the Peripheral Neurovascular Assessment to Include:

- Assess pulses (palpation or doppler)
- Capillary refill
- Compare temperature of the extremities to the rest of the body
- Assess sensation

  Remember to compare each limb bilaterally.[38]

Nursing Documentation Tip

Ensure the neurovascular assessment is documented so that changes can be identified and addressed promptly.

The Physician or Nurse Practitioner will order the frequency of neurovascular assessments.

Nursing Considerations for the Neurovascular Assessment

Monitoring the progression of edema to the burn area is important due to the **risk of developing compartment syndrome**.

Remove all clothing and jewelry as edema can cause restriction.[12]

Circumferential Burns and Compartment Syndrome

Deep partial and full-thickness burns are characterized by ***eschar*** formation.[43] **When these burns encompass the full circumference of a digit, extremity, or the torso, they are called circumferential burns**.[62] Circumferential burns are particularly problematic because the dry, inflexible eschar tissue can create a tourniquet-like effect, impairing circulation and muscle movement. Following fluid resuscitation, tissue edema typically increases due to third spacing, which can increase tissue pressure.[63,64] Depending on the location of the injury, this can result in respiratory or circulatory compromise.[64]

Figure 3.6

Bilateral Circumferential Leg Burns

(Source) Bilateral Circumferential Leg Burns (used with permission)[65]
www.vicburns.org.au The Victorian Adult Burns Service, Alfred Health, Melbourne, Australia

When circumferential burns are located **around an extremity**, distal circulation is compromised. Without intervention, the tourniquet-like effect can lead to ***compartment syndrome***.[64]

When circumferential burns are located **around the torso**, normal respiratory movements are restricted, which limits normal respiration and ventilation, leading to respiratory failure if untreated.[62] Similarly, circumferential burns around the torso can lead to ***abdominal compartment syndrome***. The increase in abdominal cavity pressure can lead to multiorgan failure if left untreated.[66]

Nursing Considerations for Compartment Syndrome:

Report the presence of circumferential burns to the Physician or Nurse Practitioner.

Elevate the affected area. You can raise the head of the bed to sit the patient up if appropriate and you can elevate affected limbs.[53,67]

Critical Consideration: Compartment Syndrome

Compartment syndrome is a painful and life-threatening condition that occurs when elevated pressure within a compartment of the body restricts circulation. It can lead to ischemia, muscle and nerve damage, and organ dysfunction if it is not treated promptly.[53,67]

Assess for the six Ps of compartment syndrome:

- **Pain:** new, deep, persistent pain that may be poorly localized and increase when stretching or manipulating the muscles. It is unrelieved by pain medications.
- **Pallor:** pale, shiny skin with swelling and tightness. Bruising may also be present.
- **Paresthesia:** pins and needles, tingling, or burning sensation.
- **Paralysis:** numbness and deteriorating motor function.
- **Pulselessness:** diminished or absent pulse.
- **Poikilothermia:** change in temperature or the presence of coolness in the affected area.[53,67]

Assess for signs and symptoms of abdominal compartment syndrome:

- Abdominal distension
- Pain
- Hypotension
- Decreased urinary output[66]

Nursing Documentation Tip

Ensure you document the location of the circumferential burns in the patient's chart as well as any signs or symptoms of compartment syndrome that were noted. You should also ensure you document the reporting of these findings to the Physician or Nurse Practitioner, any interventions ordered and completed, and the response.

Click the image below to view a helpful video on circumferential burns.

Additional Learning

Please view the following video for additional information on circumferential burns.

Source: Victorian Adult Burns Service. (2016, October 19). *Circumferential burn assessment* [Video]. YouTube. https://www.youtube.com/watch?v=1Ifc8XJzOik&t=28s[68]

Gastrointestinal Assessment in Burn Patients

Burn patients are at risk for abdominal compartment syndrome and have increased energy requirements due to the hypermetabolic response.[14,66] Thus, it is important to complete an assessment of the gastrointestinal system.

Aspects of the Gastrointestinal Assessment to Include:

- Palpate the abdomen
- Presence/absence of abdominal pain
- Auscultate bowel sounds
- Flatus and last bowel movement
- Nutritional intake
- Weight (as ordered)[38]

Stomach by Unknown Author is licensed under CC BY-SA 3.0

Genitourinary Assessment in Burn Patients

The genitourinary assessment can provide key information about the burn patient's fluid and hydration status. Target urine output is typically 30-50ml/hr for an adult burn patient. This is increased to 75-100ml/hr for patients with electrical burns.[12]

Aspects of the Genitourinary Assessment to Include:

- Urine output (colour and consistency)
- Fluid balance
- Palpate the suprapubic abdomen[38]
- Presence/Absence of pain
- Urinary retention

Nursing Considerations for the Genitourinary Assessment

It is typically desired for a burn patient to have an indwelling urinary catheter. See the most updated **220-BPC-005 Admission to 4 North B, HSC Burn Treatment Area** policy regarding this.

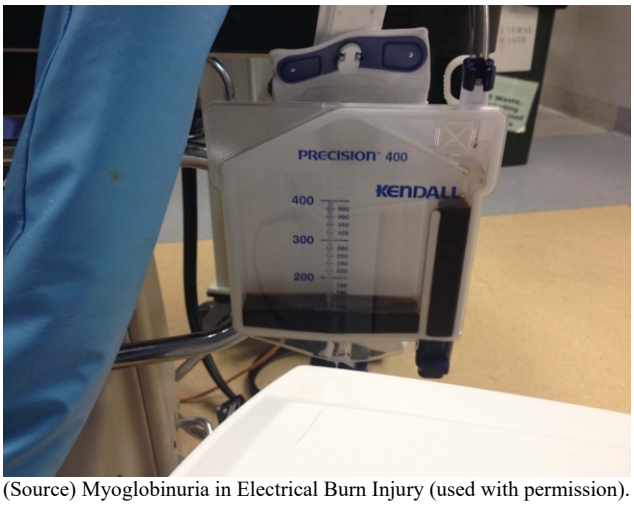
However, a urinary catheter places the patient at risk for a catheter-associated urinary tract infection (CAUTI). Therefore, it will be important to monitor for signs and symptoms of a UTI (fever, chills, malodorous urine, cloudy urine, presence of sediment, etc.).[8]

If the patient has experienced an electrical burn, you should monitor for dark-coloured urine, indicating ***myoglobinuria***.[12] See **Figure 3.7** below for an example of myoglobinuria.

Notify the Physician or Nurse Practitioner of any signs or symptoms of a UTI, the presence of myoglobinuria, or if the patient's urine output is sustained below the targeted range. **A burn patient with severely decreased urine output may be receiving inadequate fluid resuscitation and be at risk of burn shock**.[17]

Figure 3.7

Myoglobinuria in Electrical Burn Injury



(Source) Myoglobinuria in Electrical Burn Injury (used with permission).
www.vicburns.org.au The Victorian Adult Burns Service, Alfred Health, Melbourne, Australia

Nursing Documentation Tip

Ensure you document the patient's intake and output.

It is also important to document any abnormal findings, such as sustained decreased urine output, signs/symptoms of a UTI, or myoglobinuria.

Document the reporting of these findings to the Physician or Nurse Practitioner, the interventions ordered, and the response.

Integument Assessment in Burn Patients

The assessment of the patient's skin can be completed throughout the other system assessments and during bathing or wound care. Abnormalities of the skin can be indicative of other health issues.[38]

Aspects of the Integument Assessment to Include:

- Colour
- Moisture
- Temperature
- Appearance of mucous membranes (moist/dry)
- Presence of lesions, rashes, or pressure injuries[38]

Nursing Considerations for the Integument Assessment

Excessive moisture puts the patient at risk for skin breakdown and excessive temperature may indicate infection.[38]

Musculoskeletal Assessment in Burn Patients

A patient's ability to move their body and maintain an upright position provides information about their muscle strength and the mobility assistance they may need. A musculoskeletal assessment is important to prevent falls and injuries.[38] For burn patients, a musculoskeletal assessment can help identify contracture formation that leads to decreased function of a joint. Subsequently, the Registered Occupational Therapist can prepare splints to help reduce and prevent contracture formation.[12]

Aspects of the Musculoskeletal Assessment to Include:

- Range of motion of extremities
- Presence of deformities, edema, pressure areas, and bruises
- Presence of contractures related to burns
- Assess strength (compare extremities bilaterally)
- Fall risk assessment[38]

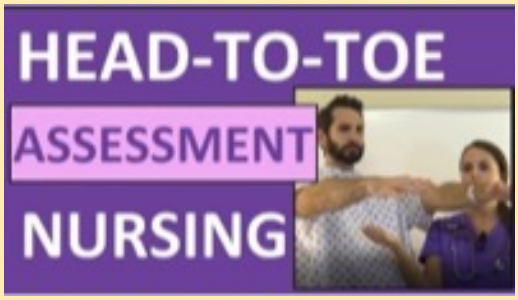
Additional Learning

Please refer to the most updated **204(NUR)-2-030 Fall Risk Assessment, Prevention, and Intervention: Acute and Long-Term Care (In-Patient Units)** policy for additional information on the fall risk assessment.

Click the image below to view a helpful video to review the head-to-toe assessment.

Additional Learning

Please view the following video if you would like a refresher on completing a head-to-toe assessment.



(Source) Registered Nurse RN. (2017, November 3). *Head-to-toe assessment nursing* [Video]. YouTube. https://www.youtube.com/watch?v=gG8kh8MfnGY[69]

Assessment Documentation Considerations

It is important to ensure your physical assessment findings are documented in the burn patient's chart. Aspects to include in the documentation are discussed in the nursing text box below.

Nursing Documentation Tips for the Physical Assessment

The documentation should include:

- The assessment findings from each system (both normal and abnormal) ***Any abnormal findings should be reported to the Physician or Nurse Practitioner**
- The reporting of any abnormal findings to the Physician or Nurse Practitioner
- The interventions ordered and completed based on these findings
- The patient's response to the intervention and any subsequent monitoring

Exercise 3.3: Head-to-toe Assessment

Answer the following true (T) or false (F), select-all-that-apply, and matching questions. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 3.3: Head-to-toe Assessment Answer Key**.

Answer true (T) or false (F) to the following statements. Place an 'X' in the appropriate box.

	Statements	T	F
1.	Since you are not exposing the burn wounds, you do not need to wear PPE while completing your head-to-toe assessment.		
2.	If a patient exhibits two of the following symptoms: increased temperature, tachypnea, tachycardia, thrombocytopenia, hyperglycemia, or enteral feeding intolerance, sepsis in burn patients may be suspected.		
3.	Stridor, carbonaceous sputum, and a brassy, barking cough are all potential signs of an inhalation injury.		
4.	Circumferential burns around a digit, extremity, or the torso present the risk of compartment syndrome.		
5.	Burn patients require a low calorie, high protein diet to meet their increased metabolic needs and to help with wound healing.		
6.	Target urine output is typically 15-30ml/hr for an adult burn patient.		

	Statements	T	F
7.	If the patient has multiple burn wounds, you should assess and document on each wound separately.		
8.	Due to the hypermetabolic response, baseline temperature, heart rate, and respiratory rate may be elevated.		
9.	A peripheral neurovascular assessment is important, particularly if a patient has circumferential burns because the dry, inflexible eschar tissue can create a tourniquet-like effect that impairs circulation and muscle movement.		
10.	The hypovolemia and hypoperfusion that occur due to systemic changes is known as burn shock.		
11.	Signs of burn shock include: hypotension, increased temperature, and bradycardia.		

Answer the following select-all-that-apply questions by placing an "X" in the appropriate box(es).

12. Which of the following are signs of an inhalation injury?

- ☐ a. Change in breath sounds (grunting or stridor)
- ☐ b. Carbonaceous sputum
- ☐ c. Singed eyebrows or nasal hairs
- ☐ d. Voice changes (raspy hoarse voice)
- ☐ e. All of the above

13. Which of the following should be available at each burn patient's bedspace?

- ☐ a. High humidity oxygen
- ☐ b. Suction
- ☐ c. Tracheostomy spreaders
- ☐ d. Oral airway
- ☐ e. Chest tube clamps

Match the descriptions on the left to the appropriate sign of compartment syndrome on the right:

	Description	Answer
14.	Numbness and deteriorating motor function	Paresthesia
15.	Diminished or absent pulse	Pain
16.	New, deep, or persistent and may be poorly localized	Poikilothermia
17.	Pins and needles or burning sensations	Paralysis
18.	Pale, shiny skin with swelling and tightness.	Pulselessness
19.	Change in temperature or a presence of coolness in the affected area.	Pallor

CONCLUSION

You have completed **Module 3: Assessment of a Burn Patient**. You should have gained an understanding of the considerations to be taken when assessing a burn patient's injuries and when completing the physical head-to-toe assessment. You may now continue to **Module 4: Treatments, Surgical Interventions, and Postoperative Care**.

MODULE 4:

TREATMENTS, SURGICAL INTERVENTIONS, AND POSTOPERATIVE CARE

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Module 4: Treatments, Surgical Interventions, and Postoperative Care

The purpose of this module is to provide an understanding of the treatments, interventions, and care required for burn injuries. These care measures are essential for the proper healing of burn wounds.[12] This includes proper assessment of the burn wounds so that progress can be monitored and measures such as hydrotherapy, wound debridement, and the selection of appropriate wound care products that support burn wound healing. This module will help provide an understanding of the purpose and benefits of common wound care measures and surgical procedures and prepare you for the care of burn patients postoperatively.

This module contains evidence-based information and includes interactive exercises and optional videos to enhance the learning experience. The answer key to the exercises can be found in **Appendix A** of the e-learning resource manual. Definitions of terms that are bolded and italicized can be found in the **Glossary located in Appendix B** of the e-learning resource manual.

Stock Image from Microsoft Word

Learning Objectives

After completing this module, you will be able to:

1. Discuss measures to prepare for burn wound care;
2. Identify measures to protect burn patients from infection;
3. Identify criteria for blister management;
4. Explain the purpose and benefits of wound debridement;
5. Describe the purpose and benefits of hydrotherapy and how to use the burn tub and whirlpool;
6. Identify common burn wound care products and their appropriate use; and
7. Discuss the indications and care required for skin grafting, donor sites, and an escharotomy.

4.1 General Burn Wound Care Information

Burn wound care is complex and requires a specialized knowledge.[70] This begins with knowledge of the infection prevention and control measures, preparation for care, and burn care supplies and products, which will be discussed in the following sections.

Infection Prevention and Control Measures for Burn Patients

As discussed in the initial module of this e-learning resource one of the skin's important functions is to serve as a barrier against the invasion of microorganisms. Thus, the tissue destruction associated with burn injuries puts the patient at a high risk for infection.[1,6] As a result, it is important to remember **infection prevention and control considerations** when preparing to provide care to patients with burn injuries. Examples of such considerations are discussed in the nursing considerations text box below.

Nursing Considerations: Infection Prevention and Control

1. Burn patients should be assigned a private room for **medical reasons** due to their increased risk for infection.
2. An isolation cart stocked with isolation gowns, masks, hair nets, and gloves should be placed outside the patient's room.
3. Appropriate **personal protective equipment (PPE)** should be worn during patient contact.
4. Family members/visitors should also wear appropriate PPE.
5. Complete hand hygiene appropriately.
6. Place a blood pressure cuff, thermometer, stethoscope, and other necessary equipment in the patient's room to avoid cross contamination between patients. **This equipment should still be regularly cleaned with appropriate disinfectants** (e.g., Accel wipes).
7. Live plants and flowers **are not permitted** in the patient's room as they can carry bacteria.
8. Aseptic technique should be utilized during wound care. To **avoid cross contamination of wounds**, you may need to use additional supplies (e.g., multiple sets of sterile gloves, Adson forceps, Metzenbaum scissors, etc.).[71,72]

Burn Care Preparation

Ensuring you are properly prepared to provide burn care can be essential to easing the experience both for yourself and for the patient.

It is helpful to review the patient's chart to familiarize yourself with the patient prior to providing care. Your familiarity with the patient and their plan of care can help ease the burn patient's anxiety and ensure they are comfortable.[73]

Additionally, there are many factors that can affect wound healing, including the burn patient's comorbidities, or allergies that may prevent the use of certain dressings or products.[74] Reviewing the previous note prior to completing wound care can provide information on the wound status,

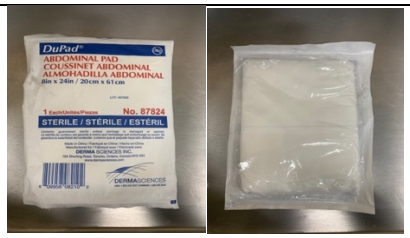
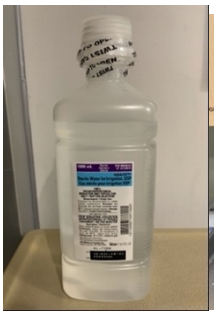
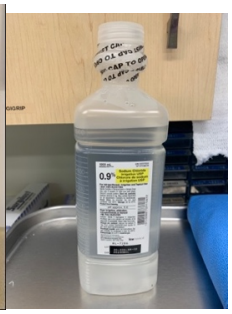
such as the anatomical location, tissue type, ***exudate***, periwound appearance, and pain.[74] This information can help you determine how the burn injury is progressing. Reviewing the previous note can also provide you with an estimation of the amount of wound care products you will need to prevent wastage or having to leave the room to obtain more supplies.

Burn Care Supplies

The burn unit has a burn care cart that is used during burn wound care. Ensure the burn care cart is stocked with the supplies you will need during wound care. The items on the burn care cart may include those depicted in **Table 4.1** below.

Nursing Tip:
It is a courtesy to the RN who will be caring for the patient after you to have the burn care cart restocked after use.

Table 4.1: Common Burn Cart Items

Common Burn Cart Items		
 **Figure 4.1:** Sterile Bowl	 **Figure 4.2:** Adson Forceps	 **Figure 4.3:** Metzenbaum scissors
 **Figure 4.4:** Sterile Towels	 **Figure 4.5:** Sterile Scissors	 **Figure 4.6:** Abdominal Pads
 **Figure 4.7:** Sterile Gloves	 **Figure 4.8:** Sterile Kling	 **Figure 4.9:** Sterile H_2O  **Figure 4.10:** Sterile 0.9% Normal Saline

Common Burn Cart Items		
 **Figure 4.11:** 8x4 Gauze	 **Figure 4.12**: Exu-Dry	 **Figure 4.13:** Surgilast

Legend:
Figures 4.1, **4.2**, **4.3**, **4.5**, **4.6**, **4.8**, **4.9**, **4.10**, **4.11**, **4.12**, & **4.13** are personally owned.
Figure 4.4: (used with permission) Cardinal Health. (n.d.). *OR towel, x-ray detectable, sterile, disposable.* https://shop.cardinalhealth.ca/webapp/wcs/stores/servlet/en/chc/or-towel-x-ray-detectable-sterile-disposable[75]
Figure 4.7: Sterile Gloves by Doyle & McCutcheon (2021) is licensed under by CC BY 4.0[76]

Burn Wound Care Products

The wound care products utilized during burn care will depend on the characteristics of the wound and will typically change as the wound progresses through healing. **The Physician or Nurse Practitioner will order the frequency of dressing changes and the products to be used**. The Physician or Nurse Practitioner will view the burn wounds at regular intervals and should be notified of any changes noted that may affect the dressing choice. The information presented can provide a better understanding of why the Physician or Nurse Practitioner will order these products.

	Common Wound Care Products Used for Burn Wounds
1.	ACTICOAT Flex
2.	Jelonet
3.	Adaptic
4.	Inadine
5.	Collagenase
6.	Aquacel Ag
7.	Silvercel
8.	Polysporin
9.	Aloe Vesta

Nursing Consideration

Please note that these products are discussed regarding their use for burn wounds, but they also have other indications which are not applicable to this module.

Nursing Documentation Tip

Ensure you provide documentation in the patient's chart of the wound care products utilized during burn care.

ACTICOAT Flex 3 and Flex 7

Product	Description	Instructions	Contraindications and Precautions
ACTICOAT Flex  **Figure 4.14:** ACTICOAT Flex 3 **This product will be ordered by the Physician or Nurse Practitioner**	A silver coated antimicrobial barrier dressing that is indicated for partial and full thickness burn wounds and recipient graft sites. ACTICOAT Flex 3 maintains its antimicrobial properties for three days. ACTICOAT Flex 7 maintains its antimicrobial properties for seven days.[77]	After cleansing and drying the wound, ACTICOAT Flex can be cut to the shape of the wound as necessary. Use sterile water to moisten the dressing (not normal saline) and apply the dressing in the direction of stretch along a limb to allow for movement. Cover with a moistened secondary dressing (e.g., Sterile water moistened 8x4 gauze). May be used as a wound contact layer with Negative Pressure Wound Therapy.[77]	**Do not use on a patient with a hypersensitivity to silver.** Remove if the patient is undergoing Magnetic Resonance Imaging due to concerns over heating and image distortion.[77,78] Patient may experience pain (stinging) as the silver is loaded into the wound. Not compatible with oil-based product (paraffin or petrolatum). May need to moisten or soak the dressing to assist with removal and prevent disruption of wound healing.[77]

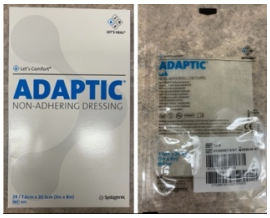
Legend:
Figure 4.14: Personally owned

Jelonet

Product	Description	Instructions	Contraindications and Precautions
Jelonet  **Figure 4.15:** Jelonet **This product will be ordered by the Physician or Nurse Practitioner**	Low-adherent paraffin gauze dressing indicated for superficial to deep partial thickness burns, donor sites (the area where the skin graft is harvested from), and graft sites.[12,79] Used with wounds that have granulation and epithelialization tissue as these wound tissues should be kept moist. Meshed design allows drainage to pass onto a secondary dressing, while keeping the wound bed moist. Low adherence reduces the risk of damage to healthy granulation tissue and pain during dressing changes. Can be used in combination with a topical antiseptic, antibiotic, or Collagenase.[79]	After cleansing and drying the wound, Jelonet can be cut to the size of the wound and layered as necessary. Cover with a dry or moistened secondary dressing, depending on the amount of exudate (e.g., sterile water or normal saline moistened 8x4 gauze).[79]	May not be appropriate for heavily exudating wounds as it can contribute to semi-occlusive tissue maceration. Usually requires daily dressing changes, depending on the condition of the wound and the amount of exudate.[79]

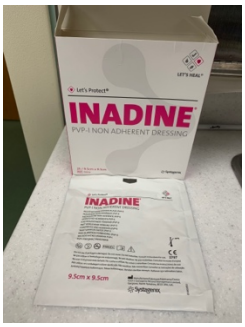
Legend:
Figure 4.15: (used with permission) Schaan Healthcare Products. (2021). *Jelonet paraffin gauze dressing.* https://schaanhealthcare.ca/products/jelonet[79]

Adaptic

Product	Description	Instructions	Contraindications and Precautions
Adaptic  **Figure 4.16:** Adaptic **This product will be ordered by the Physician or Nurse Practitioner**	Non-adherent, petrolatum impregnated dressing indicated for dry to highly exudating wounds, such as superficial to deep partial thickness burns, donor sites, and graft sites. Used with wounds that have granulation and epithelialization tissue as these wound tissues should be kept moist. Meshed design allows drainage to pass onto a secondary dressing, while keeping the wound moist. Non-adherent nature of the dressing reduces the risk of damage to healthy granulation tissue and pain during dressing changes.[12,80]	After cleansing and drying the wound, cut or fold to the size of the wound. Cover with a dry or moistened secondary dressing depending on the amount of exudate (e.g., sterile water or normal saline moistened 8x4 gauze). May be used as a wound contact layer in conjunction with Negative Pressure Wound Therapy. May be left in place for several days depending on the condition of the wound and the amount of exudate.[80]	If more than one piece of Adaptic is required, ensure the dressings overlap to prevent adherence to the wound bed. Adaptic is petrolatum impregnated; therefore, not compatible with ACTICOAT Flex.[80]

Legend:
Figure 4.16: Personally owned

Inadine

Product	Description	Instructions	Contraindications and Precautions
Inadine  **Figure 4.17:** Inadine **This product will be ordered by the Physician or Nurse Practitioner**	Non-adherent knitted dressing impregnated with a polyethylene glycol base that contains 10% Povidone Iodine. Serves as an antimicrobial dressing. Indicated for burns with hypergranulation tissue. The non-adherent nature reduces the risk of damage to healthy granulation tissue and pain during dressing changes.[81]	After cleansing and drying the wound, cut or fold to fit the wound bed. Can be covered with a dry or moistened secondary dressing depending on the amount of exudate. When the dressing colour fades to white, the dressing should be changed (one to three days, depending on exudate amount).[81]	Inadine use should be limited to four sheets, particularly in patients with thyroid issues. Gentle stretching of the dressing from opposite corners can aid with removal.[81]

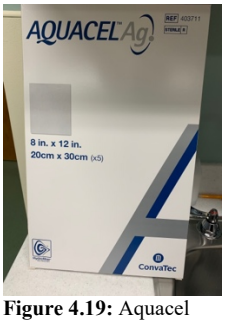
Legend:
Figure 4.17: Personally owned

Collagenase

Product	Description	Instructions	Contraindications and Precautions
Collagenase  **Figure 4.18:** Collagenase **Since Collagenase is medicated, it requires a medication order from the Physician or Nurse Practitioner and will be delivered by pharmacy.**	Medicated ointment that breaks down slough tissue through enzymatic debridement. Indicated for debridement of deep partial and full thickness burns with slough and eschar tissue present.[82]	Complete conservative sharp debridement **(once trained)** as possible and then cleanse the wound bed prior to application. Apply directly to the wound bed at 2mm thickness. Cover with a secondary dressing (e.g., Jelonet or moistened 8x4 gauze). Wound beds with sufficient exudate will activate the collagenase, otherwise, a moistened secondary dressing will be required.[82]	May cause erythema to surrounding healthy tissue; therefore, periwound skin should be protected with products such as Vaseline or zinc oxide paste. Do not use with dressings containing silver or iodine, as these will inactivate the collagenase. Should not be applied to newly grafted areas.[82]

Legend:
Figure 4.18: Personally owned

Aquacel Ag

Product	Description	Instructions	Contraindications and Precautions
Aquacel Ag  **Figure 4.19:** Aquacel Ag **This product will be ordered by the Physician or Nurse Practitioner**	Antimicrobial dressing designed to manage exudate, infection, and biofilm.[83] Indicated for superficial partial and deep partial thickness burns, and donor sites.[12] Composed of a gelling fibre that is stitched to make it stronger and more absorbent. Forms into a cohesive gel when it meets wound exudate, and contours to the wound bed to prevent dead space where bacteria can grow. Also available without silver (e.g., Aquacel Extra, Aquacel Foam) and there are additional silver containing products available (e.g., Aquacel Ag Extra, Aquacel Ag Foam).[83]	After cleansing and drying the wound, apply Aquacel Ag, ensuring it overlaps the wound edges by at least 1cm (the dressing will shrink as it soaks up exudate). Cut or fold the dressing to size if needed. Cover with a dry secondary dressing (e.g., 8x4 gauze). Can soak dressing to minimize pain and disruption of wound healing with removal. Change when saturated (i.e., when the dressing is soaking through with exudate) or every 3-4 days.[84]	**Do not use on a patient with a hypersensitivity to silver.** Aquacel Ag (and other silver containing Aquacel products) should not be used on patients undergoing Magnetic Resonance Imaging due to concerns over heating and image distortion.[78,83] Do not apply a moistened dressing over the Aquacel Ag dressing, as this will turn the dressing into a cohesive gel prematurely.[84]

Legend:
Figure 4.19: Personally owned

Silvercel

Product	Description	Instructions	Contraindications and Precautions
Silvercel  **Figure 4.20:** Silvercel **This product will be ordered by the Physician or Nurse Practitioner**	An antimicrobial alginate dressing that is silver coated and helps manage exudate in moderate to heavily exuding wounds.[85] Indicated for use in superficial partial thickness and deep partial thickness burns and donor sites.[12] Nuderm is the non-silver containing calcium alginate dressing equivalent of Silvercel.	After cleansing and drying the wound, apply Silvercel, ensuring the dressing overlaps the wound edges by at least 1cm (the dressing will shrink as it soaks up exudate). Cut or fold the dressing to the size of the wound. Cover and secure with a non-occlusive secondary dressing. Change dressing when saturated or every 3-4 days. Can soak dressing to minimize pain for the patient and prevent disruption of wound healing with removal.[85]	**Do not use on a patient with a hypersensitivity to silver.** Remove prior to Magnetic Resonance Imaging due to concerns of overheating and image distortion.[78,85]

Legend:
Figure 4.20: Personally owned

Polysporin

Product	Description	Instructions	Contraindications and Precautions
Polysporin  **Figure 4.21:** Polysporin **Since Polysporin is medicated, it requires a medication order from the Physician or Nurse Practitioner and will be delivered by pharmacy.**	Antibiotic ointment indicated for infection prevention with burns.[86] Often used for patients with facial burns on the burn unit.	For facial burns on a male patient, ensure daily shaves are completed. A helpful tip is to mix Muko Lubricant gel with unscented soap for patients who find shaving cream painful due to the alcohol content. Following facial shave, cleanse and dry and apply a thin layer of Polysporin. Can be applied one to three times daily.[86]	*Remember, the Physician or Nurse Practitioner will order the frequency.

Legend:
Figure 4.21: Personally owned

Aloe Vesta

Product	Description	Instructions	Contraindications and Precautions
Aloe Vesta  **Figure 4.22:** Aloe Vesta **This product will be ordered by the Physician or Nurse Practitioner**	A non-scented, non-sensitizing, pH-balanced moisturizer.[87]	Once burn wounds and donor sites have closed, the newly epithelialized skin is still fragile, and the wound maturation or remodeling phase can last up 12 months. The newly healed skin will never reach 100% strength of the original wound and will have about 80% of the tensile strength.[88] As a result, the areas should be moisturized regularly. This can help prevent dryness and itching.[12] Aloe Vesta should be applied to closed wounds at least twice daily.	Patients can also use another non-scented, non-sensitizing, pH-balanced moisturizer of their preference. **Do not use on a patient with a hypersensitivity to aloe.**

Legend:
Figure 4.22: Personally owned

Exercise 4.1: Wound Care Products

Answer the following true (T) or false (F) and select-all-that-apply questions. For the true and false questions place an 'X' in the appropriate box. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 4.1: Wound Care Products Answer Key.**

	Statements	T	F
1.	Adaptic and ACTICOAT Flex can be used in combination.		
2.	ACTICOAT Flex should be moistened with sterile water for activation.		

	Statements	T	F
3.	Jelonet is a paraffin gauze dressing of low-adherence.		
4.	Inadine should be changed once the colour of the dressing has faded.		
5.	Collagenase is indicated for superficial burns.		
6.	Aquacel Ag and Silvercel should overlap the wound edges by at least 1cm to accommodate for the dressing shrinking when it begins soaking up exudate.		
7.	Jelonet and Adaptic are both useful dressing choices for granulation and epithelialization tissue.		

Answer the following select-all-that-apply questions by placing an "X" in the appropriate box(es).

8. Which of the following wound care products are considered antimicrobial?

- ☐ a. ACTICOAT Flex
- ☐ b. Polysporin
- ☐ c. Jelonet
- ☐ d. Aquacel Ag
- ☐ e. Silvercel

9. Which of the following statements are true regarding the use of Aloe Vesta?

- ☐ a. Newly epithelialized skin will only achieve 80% of its original tensile strength
- ☐ b. Aloe Vesta should be applied every second day
- ☐ c. Aloe Vesta is a non-scented, non-sensitizing, pH balanced moisturizer
- ☐ d. Aloe Vesta will not only help with dryness, but itchiness as well
- ☐ e. Aloe Vesta should be applied to deep partial thickness burn wounds

4.2 Burn Care Treatments

A variety of care measures may be required to ensure the proper healing of burn wounds.[12] These burn wound treatments will be discussed throughout this section and include: blister management, wound debridement, and hydrotherapy. There are some important considerations to take in preparation for these treatment regimes, which are discussed in the nursing considerations text box below.

Nursing Considerations for Burn Care Preparation

As was discussed in Module 1, burn patients have issues with ***thermoregulation*** due to the loss of this function of the skin, particularly in larger burns.[1] Therefore, it is important to turn up the heat in the patient's room or in the tub room (wherever you are completing wound care) and to ensure the warmer is stocked with blankets. Many patients find burn care traumatic. It may be helpful to move the patient from their hospital room to the tub room for burn care to ease stress and ensure the hospital room remains a safe and relaxing environment for the patient.

The burn unit has privacy screens and "Burn Care in Progress" signs that you can place outside the door. This will minimize disruptions during burn wound care and help ensure the burn patient's privacy is maintained.

!Reminder!
Assess and medicate the patient for pain 30-minutes prior to any burn care procedure. Provide documentation of the assessment findings, medication given, and the patient's response.

Burn Injury Blister Management

Management and care of blisters is a common question with burn wound care. The Physician or Nurse Practitioner will advise you if a blister should be left or deroofed. Deroofing refers to removal of the burn blister fluid and of the dead tissue.[89]

Figure 4.23

Burn Injury Blister (used with permission)

Once you have received training and are deemed competent and proficient, you may perform the skill of deroofing blisters. This typically requires you to observe a senior RN you are assigned with during training and then to be supervised completing the skill until deemed proficient. Otherwise, **obtain assistance from a senior RN who has received training, the Nurse Practitioner, or the Wound Care Specialis**t.

Nursing Tip

Please note that solely completing this learning module does not provide the training necessary to complete this skill. Since this is a specialized skill, ensure you use caution, ask questions, and seek support as needed.

The Physician and Nurse Practitioner generally follow the guidelines listed in **Table 4.2** when making decisions regarding deroofing blisters.

Table 4.2: Blister Deroofing Guidelines

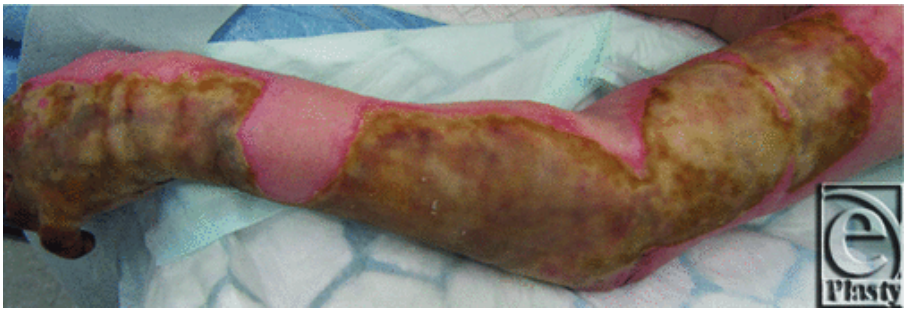
A blister should be deroofed if it is:
Greater than 1 square cm
Filled with cloudy serous fluid or blood
In an area prone to break with routine activities
Inhibiting joint function
From a chemical burn[12]

Burn Wound Debridement

Debridement involves the removal of dead tissue, such as slough and eschar, from the wounds to promote wound healing. The ***devitalized tissue*** serves as a source of nutrients for bacteria and acts as a physical barrier for ***re-epithelialization***; therefore, its removal is vital to wound management and healing.[90] Wound debridement is completed with each dressing change when devitalized tissue is present.[91] However, the amount of debridement completed will depend on how the patient tolerates this intervention.

Figure 4.24

Burn Wound Eschar



(Source) Burn Eschar on the Left Forearm and Dorsum of the Hand (used with permission).
Yim, G., H., Ahmad, Z., & Jeffrey, S. L. A. (2015). The WoundWand and its novel use in burn excision surgery. *ePlasty, 15*(1), 1-5. https://www.hmpgloballearningnetwork.com/site/eplasty/case-report-woundwand-and-its-novel-use-burn-excision-surgery[92]

Types of Debridement

There are five types of debridement. The types listed in bold will be further discussed:
1. Autolytic debridement (the body's own enzymes)
2. Biological debridement (e.g., maggots)
3. **Enzymatic debridement**
4. **Mechanical debridement**
5. **Surgical debridement**

Enzymatic Debridement

This type of debridement involves the use of an exogenous enzyme, such as collagenase, to debride devitalized tissue. Collagenase works by digesting the collagen in the devitalized tissue, thereby allowing it to detach and be removed from the wound.[90]

Figure 4.25 below depicts the progression of a burn wound following the use of an enzymatic debridement agent. The top image (A) illustrates the dry, white appearance of a deep partial to full thickness burn wound prior to treatment and the images below (B) depict the results of the enzymatic debridement in removing the devitalized tissue.[93]

Figure 4.25

Before and After Enzymatic Debridement

(Source) Full Thickness Burn Before (A) and After (B) Enzymatic Debridement by Palao et al. (2017)[93] is licensed under by CC BY-NC 4.0

Mechanical Debridement

Mechanical debridement involves the removal of devitalized tissue with a moving force. **Mechanical debridement is non-selective and may also result in the removal of viable tissue**. It can also cause significant pain for the patient. Mechanical debridement may be completed using wet-to-dry dressings (dressing is applied wet and removed when dry), and hydrotherapy/irrigation methods.[90]

Surgical/Sharp Debridement

Surgical/sharp debridement involves the removal of devitalized tissue using sharp instruments (scalpel, Metzenbaum scissors, curettes, etc) and can be completed at the bedside by the Physician, Nurse Practitioner, or Wound Care Specialist, or in the operating room. Surgical/sharp debridement presents the risk of bleeding.[90] **Please note that solely completing this learning module does not provide the training necessary to complete surgical or sharp debridement.**

Nursing Considerations for Conservative Sharp Debridement

Aside from the use of enzymatic and mechanical debridement, a form of sharp debridement, known as conservative sharp debridement, can be completed by the RNs on the burn unit. This involves the use of Metzenbaum scissors and Adson forceps to cut away and remove devitalized tissue.

This is a specialized skill which requires training. Once you have received training to burn care and have demonstrated competency, you can complete this debridement independently.[91] This typically requires you to observe a senior RN you are assigned with and then to be supervised completing the skill until deemed proficient. Otherwise, obtain assistance from a senior RN who has received training, the Nurse Practitioner, or the Wound Care Specialist. **Please note that solely completing this learning module does not provide the training necessary to complete this skill.**

*Since this is a specialized skill, ensure you use caution, ask questions, and seek support as needed.

Additional Learning

Please refer to the most updated **220-BPC-020 Conservative Sharp Debridement of Burn Wound: 4 North B, HSC** policy for additional information regarding conservative sharp debridement.

Hydrotherapy

Hydrotherapy involves the use of warm water, either through immersion in a tub or in a shower with running water. This process gently cleanses the burn wounds and helps promote healing by softening and removing dead tissue to allow new healthy tissue to form.[94] **On 4 North B, there is a burn care tub, a portable whirlpool tub, and patients who have less burn injuries and are**

more independent may choose to use the shower in their room. The burn care tub is equipped with a lift to ease the patient in and out.[94] The benefits of hydrotherapy are outlined below.

Examples of the benefits of hydrotherapy include:

- Easing the removal of dressings
- Removes dead skin and bacteria to minimize the risk of infection
- Softens dead tissue to help with the process of debridement
- Enhance healthy tissue formation
- Decrease the risk of scar tissue formation
- Facilitate physiotherapy by providing additional comfort to the patient during ROM exercises
- Psychological benefits as some patients feel relaxed and comforted by hydrotherapy sessions.[95,96]

Nursing Considerations for Hydrotherapy

Remember to assess and manage pain appropriately and to don appropriate PPE.

Hydrotherapy must be **ordered by the Physician or Nurse Practitioner**. This order will include the frequency of hydrotherapy.

For the burn tub, set the water temperature to 34 to 40°C. For the whirlpool ensure the temperature is reading within the green margin on the temperature dial.[94]

Hydrotherapy can be a useful time to complete wound debridement.[91] You can complete conservative sharp debridement, or you can also use the foam portion of a Chlorhexidine or Povidone Iodine scrub brush during hydrotherapy to assist with debridement.

If you are unable to complete the dressings in the burn tub room, cover the burn wounds with sterile towels and then cover the patient with heated blankets to transport them back to their room.

It is important to ensure you are hydrated prior to beginning the care, as it can get very warm from the PPE, the warmth of the room, and the warm water being used.

The hydrotherapy tub and the whirlpool must be carefully disinfected after each use. Once you are finished using this equipment, please notify the Patient Care Coordinator so they can arrange to have this cleaning completed.

Figure 4.26: Chlorhexidine Scrub Brush (used with permission)[97]
SP Medical. (2015). *Surgical scrub brush with 4% chlorhexidine.* https://spmedical.ca/en/medicalproducts/desinfection/brosse-chirugicale-chlorhexidine-4.html

Additional Learning

Please refer to the most updated **220-BPC-025 Hydrotherapy for Burn Clients: 4 North B, HSC** policy for additional information regarding hydrotherapy.

Click the image below to view a helpful video on hydrotherapy.

Additional Learning

Please view the following video on hydrotherapy for more information.

Source: Pro Healthcare Products. (2018, August 1). *The power of therapeutic whirlpools & hydrotherapy for pain relief* [Video]. YouTube. https://www.youtube.com/watch?v=v0IktJZ9UBA[98]

Burn Care Documentation

It is important to ensure your burn wound assessments and the care measures are documented in the patient's chart. Aspects to include in the documentation are discussed in the text box below.

Nursing Documentation Tips for Burn Wound Care

If the patient has multiple burn wounds, ensure each burn wound is documented on separately.

The documentation should include:

- Wound care preparation (e.g., pre-medication with analgesic and/or anxiolytic, etc.)
- Burn wound assessment findings (as outlined in Module 3)
- Wound care interventions (e.g., method of wound cleansing, hydrotherapy, debridement, etc.)
- Wound care product(s) used
- Patient's response to the intervention

Exercise 4.2: Wound Care Treatments

Answer the following select-all-that-apply questions by placing an 'X' in the appropriate box(es). The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 4.2: Wound Care Treatments Answer Key.**

1. The guidelines the Physician and Nurse Practitioner follow when deroofing blisters include:

- [ ] a. Greater than 1 square cm
- [ ] b. Filled with clear serous fluid
- [ ] c. In an area prone to break with routine activities
- [ ] d. Inhibiting joint function
- [ ] e. From an electrical burn

2. Wound debridement:

- [ ] a. Can be completed conservatively (with specialized training) using Metzenbaum scissors and Adson forceps
- [ ] b. Should be completed with every second dressing change
- [ ] c. Can be completed during hydrotherapy
- [ ] d. Should be completed to the patient's tolerance
- [ ] e. Involves the removal of devitalized tissue

3. The benefits of hydrotherapy include:

- [ ] a. Enhancing healthy tissue formation
- [ ] b. Softening dead tissue to help with the process of debridement
- [ ] c. Facilitating physiotherapy
- [ ] d. Minimizing the risk of infection by removing dead skin and bacteria
- [ ] e. All of the above

Exercise 4.3: Burn Care Preparation Case Study

Jennifer is the Registered Nurse assigned to care for Mrs. Grimes, a 73-year-old woman who received burn injuries when she overturned a kettle of boiled water. Mrs. Grimes is ordered to receive hydrotherapy today with her dressing changes. List five measures Jennifer should take to prepare for Mrs. Grimes' hydrotherapy and dressing changes.

The answers to this exercise may vary, but suggested answers can be found in **Appendix A** of the e-learning resource manual under **Exercise 4.3: Burn Care Preparation Answer Key.**

1.	
2.	
3.	
4.	
5.	

4.3 Burn Surgical Procedures and Postoperative Care

A burn injury that will not heal spontaneously with wound care and dressing changes within two to three weeks, or is too deep to heal spontaneously, such as deep partial and full thickness burns, will require surgical intervention.[43]

Skin Grafting

Early excision and grafting of the burn wounds are common surgical procedures that are often integral to burn wound healing and optimizing outcomes for the burn patients. Skin grafting involves the placement of skin, either from the patient themselves or another source, over an area of the body where skin has been lost (in this case from a burn injury). Skin grafts are used for extensive burn wounds and burn wounds that could produce prominent scarring. These procedures are typically associated with a decrease in the length of stay and faster healing time for the burn patient.[99]

The Plastic Surgeon will excise devitalized tissue and place the graft over healthy, viable granulation tissue. This may begin as early as post-burn day #3, once burn resuscitation has been adequately completed. The Plastic Surgeon may use **autografts**, **allografts**, or synthetic skin substitutes (e.g., Integra).

Autografts

Autografting involves harvesting the patient's healthy skin.[99] **The area where the skin is taken from is known as the donor site**. Common donor sites include, the anterior or lateral thigh, abdomen, or buttocks, while less common donor sites may include the back, chest, and arms.[100] **Autografts may be full-thickness or split-thickness depending on the thickness of the dermis harvested.** The differences between full-thickness and split-thickness grafts are outlined in **Table 4.3** below.

Table 4.3: Full-Thickness and Split-Thickness Skin Grafts

Autograft Type	Description
Full-thickness skin graft (FTSGs)	Involve harvesting the epidermis and dermis to the underlying fat layer. Commonly used for grafting over joints, small surface areas, or cosmetic areas as it results in a better tissue match, and less scarring and contracture formation (e.g., face, neck, hands etc.). Usually sutured in place. A disadvantage is that FTSGs create a full thickness wound at the donor site; therefore, donor site is unable to self-regenerate. They also have a higher failure rate than split-thickness skin grafts due to the thicker layer of dermis that is used.[99,101]
Split-thickness skin graft (STSGs)	Involve harvesting the epidermis and the upper layer of the dermis. After two to three weeks of healing the same donor site can be re-harvested. If a meshed STSG is used, there is a lower risk of seroma or hematoma formation beneath the graft as the meshing allows fluid to pass through. Meshed grafts can be stretched to cover a larger surface area.[99,101]

Allografts

Allografts involve the use of skin from another human source, commonly human cadaver skin and less commonly living relatives. Allografts are often used when there is questionable readiness for autografting, when the total body surface area of the burn wound is larger than the available donor sites, or when burn wounds are complex and of indeterminate depth. There is a **greater risk of rejection associated with allografts**, meaning the graft is less likely to adhere to the recipient site. For this reason, allografts will typically be removed after 10-14 days and replaced either with new allografts or with autografts if possible.[99]

You may hear the adherence of the skin graft to the recipient site referred to as the "take" of the graft. A skin graft may be referred to as "taking well" or "not taking."[102] Risks for graft failure and factors promoting graft adherence are outline in **Table 4.4** below.

Table 4.4: Risks for Graft Failure and Factors Promoting Graft Adherence

Risks for Graft Failure:	Factors Promoting Graft Adherence:
Seroma or hematoma formation (causes lifting of the graft off the wound bed)	Close contact between the skin graft and the recipient site
Shearing forces	Reduced mobility to prevent shearing
Edematous tissue	Elevation to reduce swelling
Infected tissue (slough or necrotic tissue)	Presence of granulation tissue and absence of slough or necrotic tissue
Exposed bone or tendon	No exposed tendon or bone
Poorly vascularized wound bed[101]	Well-vascularized recipient wound bed
	Absence of infection[102,103]

Additional Learning

Please refer to section 4.5 of the Newfoundland and Labrador Skin and Wound Care Manual for **additional information on wound infection**.

Figure 4.27

Healthy, Well-Adhered Skin Graft

(Source) Split-thickness skin graft to right lower leg
by Braza & Fahrenkopf (2021)[100] is licensed under by CC BY 4.0

Signs of a Healthy Skin Graft:

- Pink in colour
- Blanchable
- Not lifting from the wound bed[100,103]

Figure 4.28

Unhealthy Skin Graft

(Source) Non-viable split-thickness skin graft to right dorsal hand and wrist by Braza & Fahrenkopf (2021) is licensed under by CC BY 4.0[100]

Signs of an Unhealthy Skin Graft:

- Hematoma or seroma formation
- Graft lifting from the wound bed
- Signs of infection (purulent drainage, slough tissue)
- Darkening skin, or yellow/brown in colour
- Non-blanchable[100]

Skin Graft Site Care

There are specific considerations for graft site care that are important to know. This primarily surrounds the dressings and care of the skin graft sites. The patient may return from the operating room with a Negative Pressure Wound Therapy dressing, or the graft site may be covered with an antimicrobial dressing, a foam dressing, or a non-adherent dressing (e.g., Jelonet). This is typically left in place for 5- to 7-days and should not be removed until ordered by the Physician. The dressing is left in place for this length of time because it typically takes this long for the skin graft to become adherent to the recipient site.[103,104]

Additional Learning

Please refer to Section 10.0 of the Newfoundland and Labrador Skin and Wound Care Manual for **additional learning on Negative Pressure Wound Therapy.**

You may reinforce or change the outer layers of the dressing if there is a large amount of exudate, **but you should not remove the dressing to the graft site unless ordered by the Physician**. If you must change the outer layers, it is important to know that the secondary dressings are essential to secure the graft in place and soak up the exudate that passes through the primary dressing. This helps facilitate graft take.[102]

Once the inner dressing is ordered to be removed by the Physician, you can assess the skin graft site as you would any burn wound site, keeping in mind the signs of a healthy and unhealthy graft.

Staple and suture removal will be ordered by the Physician or Nurse Practitioner but may begin on post-op day #7. This can be completed by the RN as ordered.

Nursing Considerations for Skin Graft Care

The patient may require the Bair Hugger post-operatively to keep the graft site warm. The Bair Hugger is a temperature management system that uses a forced-air warming blanket.[105] If this is warranted, it will be **ordered by the Physician or Nurse Practitioner postoperatively**.

Mobilization, range of motion exercises, and physiotherapy are usually on hold for 5- to 7-days (or until indicated by the Physician or Nurse Practitioner) post-operatively to **prevent shearing of the graft** until the skin graft has adhered to the recipient wound bed and epithelialization has occurred.

Skin grafting can result in contractures (a thicker graft results in less contracting), which can inhibit range of motion.[101,103] Skin grafting can also cause pain, itchiness, altered pigmentation, and temperature intolerance.[102] The patient may need support to cope with these changes and education on how to manage the pain, itchiness, and temperature intolerance.

Nursing Documentation Tips for Skin Graft Care

The skin graft assessment findings, wound care interventions (e.g., dressing changes, suture/staple removal), and dressings applied should be included in the documentation.

*If you are only changing the outer layers, you would still document this intervention.

Your documentation should also include measures taken to promote graft take (e.g., elevation of the area, compliance with reduced mobility, use of the Bair Hugger as ordered) and the education and support provided to cope with the changes precipitated by skin grafts.

Click the image below to view a helpful video on the Bair Hugger Temperature Management Unit.

Additional Learning

Please view the following short video for additional information on the Bair Hugger Temperature Management Unit.

Source: Anderson, J. F. (2016, February 11). *3M Bair Hugger temperature management unit 775* [Video]. YouTube. https://www.youtube.com/watch?v=CJw5Tfefq5E[106]

Donor Site Care

If an autograft is used, the area where the skin graft is harvested from is known as the donor site. Donor sites are typically chosen based on the match of skin tone colour and texture and the size of the burn wound to be covered.[103] Donor sites typically heal within one to two weeks and can be re-harvested within two to three weeks.[100]

The burn patient will return from the operating room with an alginate dressing in place over the donor site. It is normal for there to be serous or serosanguineous drainage from the donor site. Therefore, the site is usually covered with a bulky dressing upon return from the operating room.[103]

Nursing Considerations for Donor Site Care

The outer layers of the dressing may be changed but the alginate dressing **should be left in place and trimmed away as it lifts off the skin**. Once the alginate dressing has completely lifted off, the site can typically be left open to air. At this point, you can assess the donor site as you would with all burn wound sites.

If the site is still draining, you can apply jelonet or adaptic followed by a secondary dressing (8x4 gauze and an abdominal pad, secured with kling or surgilast). This dressing should be changed daily.[103]

Once the donor site can be left open to air, you should keep the site moist by applying Aloe Vesta moisturizer at least twice daily. Donor sites are pink to red in colour but will fade as the site heals as is depicted in **Figure 4.29** and **4.30** below.[107]

Nursing Tip

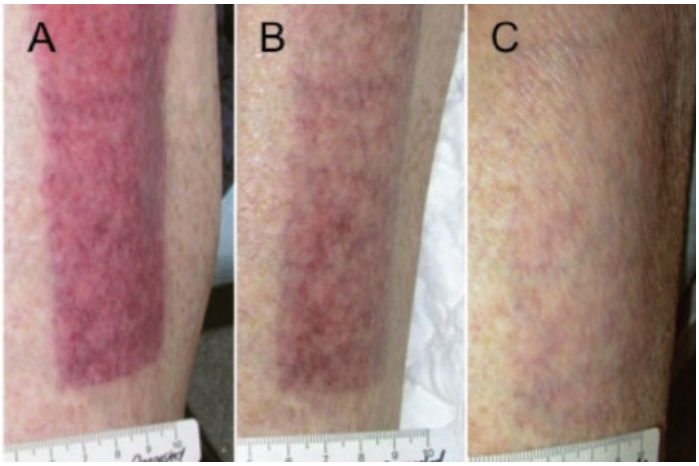
Some patients are allergic to aloe, ensure you have reviewed the burn patient's allergies and monitor for a response when using Aloe Vesta.

Figure 4.29

Donor Site Eight Days Postoperative

Figure 4.30

Donor Sites 1, 3, and 12 months postoperative



(Source) Appearance of one donor wound (A) 1, (B) 3 and (C) 12 months postoperatively by Danielsen et al. (2012)[107] is licensed under by CC BY-NC 4.0

Nursing Documentation Tips for Donor Site Care

The donor site assessment findings, wound care interventions, and dressings applied should be included in the documentation.

*If you are only changing the outer layers, you would still document this intervention.

Escharotomy

An escharotomy is a surgical procedure that is required for circumferential full thickness burns that are contributing to **respiratory or circulatory compromise**. An escharotomy involves creating an incision through the full thickness burns down to the subcutaneous fat to release the eschar tissue, thereby reducing its constrictive effects, restoring distal circulation, and allowing adequate ventilation. This procedure can be limb and lifesaving. An escharotomy can be performed at the bedside or in the operating room by the Physician.[63,64] Please note a bedside nurse will not be performing this task. The information on escharotomies is provided for your understanding, so that you can answer patient questions, and are familiar with aspects of care.

A useful analogy is to compare the full thickness burns and the constrictive eschar tissue to a cast that is too tight and the escharotomy to splitting the cast to relieve the constriction.[43]

Nursing Considerations for Postoperative Escharotomy Care

Post-operatively, the wound should be **monitored closely for**:

- Bleeding
- Signs of incomplete release
  - Distal ischemia for burns to extremities (complete a neurovascular assessment)
  - Signs of respiratory distress and poor ventilation for chest and abdominal burns
- Infection
- Neuromuscular Injury[63,64]

Assess the escharotomy site as you would with all burn wound sites.

Dressings:
Saline-moistened gauze should be applied along the escharotomy incision to keep the area moist. Similarly, any exposed bone, muscle, or tendon should be kept moist.[43]

Nursing Documentation Tip

The escharotomy site assessment findings, wound care interventions, and dressings applied should be included in the documentation.

Click the image below to view a helpful video of an escharotomy.

Additional Learning

For your interest, you can view the following video of a Physician performing an escharotomy at the bedside. Remember, this task is not performed by a bedside nurse.

Source: Victorian Adult Burns Service. (2016, October 25). *Escharotomy* [Video]. YouTube. https://www.youtube.com/watch?v=G6DGBO24njQ[108]

Exercise 4.4: Burn Surgical Procedures and Postoperative Care

Answer the following fill in the blank, select-all-that-apply, and true (T) or false (F) questions. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 4.4: Burn Surgical Procedures and Postoperative Care Answer Key**.

	Burn Surgical Procedures
1.	An _____ is a surgical procedure that involves creating an incision through the full thickness burns down to the subcutaneous fat.
2.	A graft that is harvested from the burn patient's own skin is known as an _____.
3.	This type of grafting involves the use of skin from another human source: _____.
4.	_____ are created by harvesting the epidermis and the upper layer of the dermis.
5.	The area where the skin graft is harvested from is known as the _____.

Answer the following select-all-that-apply questions by placing an 'X' in the appropriate box(es).

6. Which of the following are risks for skin graft failure?

☐ a. Seroma or hematoma formation

☐ b. Shearing forces

☐ c. Infected tissue

☐ d. Edematous tissue

☐ e. All of the above

7. Which of the following are factors that promote graft take?

- [ ] a. A well-vascularized recipient wound bed
- [ ] b. Close contact between the skin graft and the recipient site
- [ ] c. Absence of infection
- [ ] d. Elevation to reduce swelling
- [ ] e. Increased mobilization

8. Which of the following statements are true regarding donor sites?

- [ ] a. Donor sites typically heal within 3- to 4-weeks
- [ ] b. Donor sites are pink to red in colour
- [ ] c. The donor site dressing should be changed on post-op day #3
- [ ] d. Once they are left open to air, donor sites should be kept moist by applying Aloe Vesta moisturizer
- [ ] e. All of the above

9. Which of the following statements are true regarding escharotomies?

- [ ] a. Post-operatively, the wound should be monitored for bleeding and signs of incomplete release
- [ ] b. A dry dressing should be applied along the escharotomy incision
- [ ] c. An escharotomy is a potentially limb and life-saving procedure
- [ ] d. An escharotomy can be performed at the bedside or in the operating room
- [ ] e. All of the above

Answer the following true (T) and false (F) questions by placing an 'X' in the appropriate box.

	Statements	T	F
10.	Skin grafts are typically required for superficial burns and full thickness burns.		
11.	Skin graft dressings typically remain in place for 5- to 7-days and should not be removed unless ordered by the Physician or Nurse Practitioner.		
12.	Serous or serosanguineous drainage from a donor site is an abnormal finding and should be reported to the Physician or Nurse Practitioner.		
13.	An escharotomy is considered a limb and life-saving procedure because it reduces the constrictive effects of the eschar, restores distal circulation, and allows adequate ventilation.		
14.	It is important to keep the escharotomy incision, and exposed bone, muscle, and tendon moist with saline-soaked gauze.		

CONCLUSION

You have completed **Module 4: Treatments, Surgical Interventions, and Postoperative Care**. You should now have an understanding of the measures to prepare for burn wound care and treatments for burn injuries, including: blister management, debridement, and hydrotherapy. You should also have an understanding of the common burn wound surgical procedures and the respective postoperative care including: skin grafting and escharotomies. You may now continue to **Module 5: The Interdisciplinary Team and Discharge Planning and Preparation**.

MODULE 5:

THE INTERDISCIPLINARY TEAM AND DISCHARGE PLANNING AND PREPARATION

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Module 5: The Interdisciplinary Team and Discharge Planning and Preparation

The purpose of this module is to provide education on the roles and responsibilities of the interdisciplinary team and important considerations for burn patients who are being prepared for discharge home. This will include patient and family education that should be provided and outpatient referrals that may be required. Discharge preparation can be anxiety provoking for the burn patient and their family members. The knowledge obtained will allow the RN to avail of the expertise of the interdisciplinary team members, ease the discharge transition, reduce uncertainties for the patient and their family, and support the optimization of discharge outcomes.

This module contains evidence-based information and includes interactive exercises and optional videos to enhance the learning experience. The **answer key to the exercises can be found in Appendix A** of the e-learning resource manual. **Definitions of terms that are bolded and italicized can be found in the Glossary located in Appendix B** of the e-learning resource manual.

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Learning Objectives

After completing this module, you will be able to:

1. Discuss the role of the interdisciplinary team members in the care of a patient with burn injuries;
2. Discuss burn patient discharge education considerations; and
3. Identify outpatient referrals that may be necessary upon discharge of a patient with burn injuries.

5.1 The Interdisciplinary Team

Burn care is complex and requires a multidisciplinary approach. RNs must collaborate with members of the interdisciplinary team to support the burn patient and their care needs. These interdisciplinary team members include, the **Physician and Nurse Practitioner, Registered Physiotherapist**, **Occupational Therapist**, **Dietitian**, and **Social Worker**, **Psychiatrist**, and a **Spiritual Care Professional.**

The Physician and the Nurse Practitioner

The burn patient will be admitted under the care of a Plastic Surgeon. The Nurse Practitioner works closely alongside the Physician. There may also be resident physicians on the burn patient's healthcare team. The Physician(s) and the Nurse Practitioner collaborate to determine the care and treatments the patient will need. Any questions or concerns you have regarding the burn patient's care should be directed towards these team members.

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Nursing Considerations: Information to Direct to the Physician and/or Nurse Practitioner

Any abnormal or worsening assessment findings or lab results so that any required interventions can be ordered.

Questions or concerns of the patient or their family member(s) that you are unable to address.

Referrals or supports desired by the patient or their family member(s) (e.g., if the patient requests a referral to a mental health professional for counselling).

Nursing Documentation Tip

Ensure you provide documentation of any abnormal or worsening assessment findings, questions, or concerns that were directed towards the Physician or Nurse Practitioner.

Registered Physiotherapist (RPT)

The RPT has a significant role in completing assessments of the burn patient's functional status and facilitating mobility and range of motion of joints.[12] **A consult should be sent to the RPT when a patient is admitted with burn injuries**.[55] The burn patient will typically be seen by the RPT daily and may be required to continue seeing a RPT after they are discharged home. Encourage the patient to complete the exercises as they have been directed to by the RPT.[109] The benefits of physiotherapy are outline in **Table 5.1** below.

Table 5.1: Benefits of Physiotherapy

Benefits of Physiotherapy
Increase and maintain range of motion
Increase strength, functional use of limbs, and activity tolerance
Provide chest physiotherapy for burn patients with congestion or an inhalation injury
Prevent and reduce contractures
Reduce itchiness and swelling
Optimize the ability to complete activities of daily living[109,110]

Nursing Considerations for Coordinating Physiotherapy

Initially when the burn patient is admitted, the RPT will see the patient during dressing changes and hydrotherapy. For this reason, it is important to coordinate the timing of dressing changes with the RPT.

A patient with more severe burn injuries will require weekend physiotherapy. The regular RPT will coordinate this. However, **if a burn patient is admitted over the weekend, you will need to page the weekend RPT to coordinate care.**

If physiotherapy is not being completed during dressing changes, it is important to remember that the patient may need to receive analgesic medication prior to participating in physiotherapy exercises.

Registered Occupational Therapist (ROT)

The ROT is another important source of support for the burn patient. The ROT supports the patient in optimizing their ability to complete activities of daily living (ADLs).[111] **A consult should be sent to the ROT when a patient is admitted with burn injuries**.[55] The patient may be required to continue seeing a ROT after they are discharged home.[109] The benefits of occupational therapy are outline in **Table 5.2** below.

Table 5.2: Benefits of Occupational Therapy

Benefits of Occupational Therapy
Increase and maintain range of motion
Increase strength
Prevent and reduce contractures (e.g., with splinting)
Manage scarring (e.g., with pressure garments)
Provision of aids (e.g., adaptive utensils, wheelchairs) and home modifications (e.g., shower chair, grab bars)
Optimize ability to complete ADLs[109,111]

Registered Dietitian

The hypermetabolic response that results following a burn injury presents great challenges in meeting the patient's energy and protein requirements, which are necessary for wound healing.[14,112] The Registered Dietitian helps by assessing and monitoring the burn patient's dietary needs, providing nutritional recommendations, and patient and family education.[12] **A consult should be sent to the Registered Dietitian when a patient is admitted with burn injuries**.[55]

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In collaboration with the Physician or Nurse Practitioner, the Registered Dietitian will help determine how the burn patient should be fed. This may be through ***enteral nutrition*** with oral intake or nasogastric feeds, or ***parenteral nutrition*** with Travasol and fat emulsion lipids.[113] The Registered Dietician will make suggestions to manage nutritional intake as necessary by writing orders that the Physician or Nurse Practitioner will need to agree with.

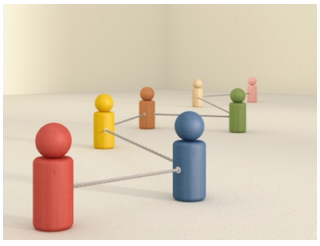
Nursing Considerations to Support the Burn Patient's Dietary Needs

- Complete calorie counts (helps monitor and ensure the patient is receiving sufficient nutritional intake)
- Complete routine weights as ordered (helps ensure the patient is maintaining body mass)
- Provide oral nutrition supplementation as ordered (e.g., Boost or Ensure products)
- Monitor oral fluid intake to help ensure adequate oral hydration
- Encourage family members to bring in nutritious food options the patient likes to help achieve sufficient nutritional intake

Nursing Documentation Tip

Ensure the calorie counts, weights, and enteral/parenteral intake are being recorded.

Registered Social Worker (RSW)



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RSWs are concerned with a patient's social and psychological well-being. The RSW completes biopsychosocial assessments and develops treatment interventions that address the financial, practical, physical, social, and emotional impacts of the patient's illness and injuries. The RSW can also provide resources and supportive counselling to patients and their family members. **A consult should be sent to the RSW when a patient is admitted with burn injuries**.[55]

Additionally, the RSW collaborates with the interdisciplinary team to assist with discharge planning. The RSW will help determine the care and support a patient may need upon discharge home and can refer patients to community resources when needed.[114]

Psychiatrist

The Physician or Nurse Practitioner will consult a psychiatrist as deemed necessary for the burn patient's care needs based on your assessment findings. The Psychiatrist can help the patient address anxiety and psychological stress, improve coping mechanisms, and may make medication suggestions.[12] The Psychiatrist may also order surveillance measures (e.g., constant surveillance for a patient whose burn injuries occurred due to self-immolation).

Spiritual Care Professional

A spiritual care professional will come to visit the patient and their family should they desire to avail of this service. The spiritual care professional can help meet the patient's spiritual care needs and provide a link to the patient's faith or religious community. The spiritual care professional can also provide palliative support.[12]

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5.2 Discharge Planning and Preparation

Discharge planning helps ensure the patient is adequately prepared for their transition home and reduces uncertainties that can contribute to the anxiety the patient may be feeling. Burn patients and their family members may want information on potential treatments or solutions for certain problems they can encounter throughout the recovery process. These issues can include pain, pruritus, temperature sensitivities, and scar management.

The education provided through discharge planning can help the patient manage these challenges that occur as their burn injuries heal and evolve. It can be helpful to provide discharge information throughout the duration of the patient's hospital stay as this may be less overwhelming and intimidating for the patient and their family.

Nursing Tip

Please note that this means allotting time to complete education during the patient's hospitalization. It is not typically beneficial to provide teaching during treatments or procedures. Patients and family members have reported difficulty retaining information during these situations.[25] The education provided should be documented in the burn patient's chart as well as the patient's and/or their family member(s) reported understanding.

Including family members in discharge planning and preparation is important as they are also experiencing similar uncertainties and anxieties as the patient, and they are often highly involved in the patient's care during their transition home.[25]

The following are areas for the RN to discuss with patients and their family members throughout the hospital stay. **Discharge planning can be initiated at any point during the patient's hospital stay**; however, all information should be reviewed just prior to the burn patient's discharge home.

Hygiene

Advise the patient and their family member(s) that the patient can complete hygiene care at home either in the tub, shower, or by sponge bathing. Ensure the patient is aware to check the temperature of the water with unburned skin, as newly healed skin is more sensitive and can be easily injured.


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Instruct the patient to use an unscented soap, a soft washcloth, and not to scrub the fragile new skin on healed burns or donor sites.[109]

If the patient has dressings that are being cared for by a Community Health Nurse, advise the patient and their family member(s) that it may be helpful to complete hygiene care prior to the scheduled dressing change time.

Advise male patients that once facial burns are completely healed, they may grow a beard or moustache again.


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Moisturizing

Encourage the patient to continue moisturizing several times daily using non-scented, water-based, alcohol-free moisturizer. This will keep healed skin grafts, donor sites, and healed burns from becoming too dry and will also help decrease itchiness.[12]

Nursing Consideration:
Moisturizers to Recommend

Aveeno®
Lubriderm®
Nivea®
Vaseline Intensive Care®[109]

Moisturizing Tips

Advise the patient to wash their hands before putting on moisturizer and to ensure the lotion is rubbed in thoroughly, otherwise it will dry on the skin and clog the pores.[109]

Pruritus Management

Pruritis, or itchiness, is the irritating sensation that occurs during the healing process of burn wounds. It is a common complication following a burn injury and it can lower the quality of life of the patient as it can persist for several years.[115] Post-burn pruritus can be worsened by heat, stress, and physical activity.[12] There is no evidence supporting a single best treatment to manage post-burn pruritus; however, many treatment options are available, and you can educate the patient on these prior to discharge.[32,115]

Nursing Consideration: Pruritus Treatment

1. Advise the patient to keep the skin moistened with a non-scented moisturizer.
2. Advise the patient to keep the area cool.
3. Medications, such as topical and oral antihistamines can help manage pruritus. Pregabalin and Gabapentin, while less commonly used, have shown efficacy in treating post-burn pruritus. The patient can discuss these options with their Physician.
4. Inform the patient that relaxation and distraction techniques may also be helpful.
5. Advise the patient to wear pressure garments as discussed with the ROT.[12,115]

Temperature Sensitivity

Patients with burn injuries are often less tolerant of extremes in temperature until their new skin fully matures.[23]

Tips for the heat:
Advise the patient to plan activities for the cooler times of the day and avoid extensive heat exposure.[109]

Tips for the cold:
Advise the patient to dress accordingly by layering clothing or wearing warmer clothing. It may be especially important for the patient to ensure their hands (mittens may be more helpful than gloves), feet, and head are covered. They should avoid extensive periods of cold exposure and check often for frostbite if it is necessary to be in the cold for a long period of time.[109]

Sun Safety


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Advise the patient and their family member(s) that the burn patient should be vigilant of sun protection since newly healed skin and donor sites are very sensitive and may burn more easily.[116] These areas can burn and blister after minutes of sun exposure and can become hyperpigmented or permanently damaged with direct sun exposure.[109]

Critical Consideration: Sun Safety Tips

Advise the patient that sun avoidance is key when possible. The sun is strongest from noon to 3pm. It is important to remember that harmful ultraviolet (UV) rays can penetrate clouds, therefore, it is helpful to find shaded areas when possible.

Advise the patient that clothing choices can provide protection from the sun. Wearing wide brimmed hats (at least a 3-inch brim all the way around to protect the neck, ears, and face), sunglasses, loose fitting, darker coloured clothing, or specialized sun-protective clothing that has Ultraviolet Protective Factor (UPF) can be helpful. A UPF of 30 or higher is recommended.

Advise the patient to apply water-based sunscreen of at least SPF 30, 30-minutes before going outside and to reapply every two hours or more frequently if swimming or sweating heavily.[117]

Scarring and Discolouration

Burn scars occur from injury to the dermis and are believed to arise due to prolonged wound healing. More severe burns that take 14 days or longer to heal are at higher risk for scarring. With proper management scars typically fade over time but some may be permanent.[116] Pressure garments are one method of scar management and are discussed below. Refer to **Figures 5.1** and **5.2** below for examples of burn scars.

Figures 5.1 and 5.2

Examples of Burn Scars from a Scald Injury that Occurred 51 Years Prior

(Source) Burn Scars on the Upper Arms from Scald Injuries (used with permission)

Aside from scarring due to burn injuries, the treatments and interventions required for healing can result in skin that appears different. For example, skin grafts will appear different than the surrounding skin, both in texture and pigmentation. Similarly, donor sites may have a different pigmentation than the surrounding skin. The appearance of these sites may alter significantly as the graft matures from the initial days post-operatively. Advise the patient and their family member(s) that it can take 18 months to two years for this to occur, but they may never look the same as surrounding skin.[103]

Nursing Documentation Tip
All health promotion information provided to the patient and their family member(s), including their understanding, should be documented in the patient's chart.

Pressure Garments

Once the burn injuries no longer require dressing changes, it may be recommended that the patient wear pressure garments. These are worn to control scarring and prevent ***contracture*** formation by helping the scar mature and improving the look of the injured skin. Burn scars can take 9 months to 3 years to mature.[118] If contractures prevent the range of motion of a joint, the patient may require minor surgical procedures to release the contracture.[119]

Nursing Considerations for Pressure Garments

Pressure garments:

- Should fit snugly
- Be worn 7 days a week for 23 hours a day, only removed for hygiene
- Be washed with mild detergent and allowed to air-dry daily (it is useful to have two sets)
- Should be replaced once they are stretched and not fitting snugly (typically within 3 months)
- May need to be worn for 6 months to 2-3 years.[118]

Benefits of Pressure Garments:

- Decrease redness
- Flatten raised areas
- Soften scars
- Prevent contractures and thereby maintain range of motion
- Help with itching and pain.[109]

Nutrition

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Advise the patient and their family member(s) that the patient will need extra calories and protein to continue to support the wound healing process. **The Registered Dietitian can speak with the patient and their family about healthy eating.** This may be especially helpful if the patient has other dietary restrictions, such as a diabetic diet.

Encourage the patient to monitor their weight and to speak to their Physician if they are not maintaining their weight.[109]

Pain

Pain, particularly neuropathic pain, can persist even as the burn wounds heal and evolve. Scarring and contractures can also contribute to pain and discomfort.[36] Advise the patient to discuss their pain experience with the Physician or Nurse Practitioner so that it can be appropriately managed upon discharge home.

Helpful Tip:

If the patient still has dressings that are being changed by a Community Health Nurse and they are still experiencing procedural pain, it may be necessary to take pain medication 30 minutes prior to the scheduled dressing change.[109]

Emotional Considerations


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Discharge home is an exciting and happy time for the patient and their family. However, it is normal for the patient to feel anxious or frustrated at times.[120]

Advise the patient and their family member(s) that it is normal for the patient to feel like they need time to adjust, to feel upset or angry throughout the recovery process, and to have concerns about their appearance.[109]

Important Consideration for Patients' Emotional Well-being

Ensure the patient is aware that if they ever feel that their problems are too overwhelming or if they are having a particularly difficult time adjusting that counselling and other services are available. Advise the patient to discuss this with their Physician.

Encourage the patient to talk to their family and/or friends about how they are feeling. Their support people may have similar feelings and can help them work through the emotions.[109]

Nursing Tip

Unfortunately, there are no formal support groups for burn injury survivors in the province of Newfoundland and Labrador at present. However, there are some organizations that may be of interest and benefit to the patient. You can provide the burn patient and their family member(s) with information about these organizations during discharge preparation. These organizations include Camp Connect,[121] the Phoenix Society for Burn Survivors,[122] and AboutFace.[123]

Click on the hyperlinks provided to visit their websites and learn more about these organizations and the support they can offer to burn injury survivors and their families.


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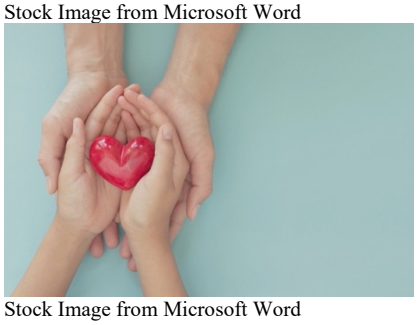
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Activities of Daily Living

Encourage the patient to do as much for themselves as they can and to set goals to do a little more each day. It may be beneficial to do more difficult tasks in the morning and lighter tasks in the afternoon. Advise the patient that it is normal to feel tired and that they may need to prioritize the tasks they want to do independently, to pace themselves, and to rest between tasks.[109]

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Encourage the patient to leave their home and do things they enjoy as they are able. It is also beneficial to encourage the patient to stay in touch and spend time with family and loved ones since social support is important for post-traumatic growth.[26]

5.3 Outpatient Referrals


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Outpatient referrals are often necessary for the continued care and support of the patient following discharge home. The interprofessional team will collaborate to determine the referrals the patient will require upon discharge. The Physician, Nurse Practitioner, RN, RPT, ROT, and RSW are usually the members of the team most closely involved in discharged planning. As the RN, you can contribute by relaying the patient's concerns and your observations while caring for the patient.

Nursing Documentation Tip
Provide documentation of any discharge concerns that were relayed to the Physician or Nurse Practitioner.

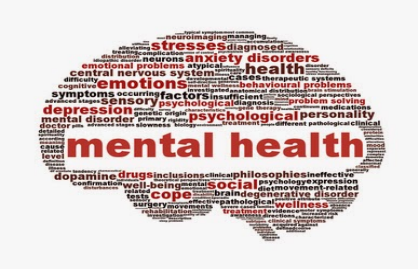
Community Health Nurse (CHN)

If the patient still has burn injuries that require dressing changes a referral will be send to the CHN. This referral will be ordered by the Physician or Nurse Practitioner and should include the frequency of dressing changes and the wound care products required. As the RN, you will ensure the referral has been completed and sent to the discharge liaison RN. Advise the patient that they will be contacted by the CHN to schedule their dressing change.

Remember
Remind the patient of hygiene and pain management considerations prior to dressing changes.

Mental Health Resources

Depending on the patient's agreeability, outpatient referrals may be sent to the appropriate mental health resources by the Physician or Nurse Practitioner.



However, the patient may not be prepared for the adjustment associated with the transition home upon discharge.[109] Ensure the patient and their family member(s) are aware that these services can be availed of at any time and advise them to speak with their Physician if they wish to have a referral sent.

Outpatient Therapies

The patient may be required to continue seeing a RPT and/or ROT after they are discharged home.[109] These referrals will be arranged as necessary. During discharge teaching, encourage the patient to complete the exercises, and to wear any splints and pressure garments as directed by these health care professionals.

Discharge Education Documentation

The information and education provided during the discharge planning and preparation process should be documented in the patient's chart. Specific aspects of this documentation are provided in the text box below.

Nursing Documentation Tips for Discharge Education

Ensure you provide documentation in the patient's chart of any teaching and health promotion education provided. This should include information provided verbally and any booklets or information pamphlets provided. Provide documentation of any questions or concerns raised by the patient or their family member(s) that were addressed.

Ensure you provide documentation in the patient's chart of any referrals offered and arranged. This includes referrals the patient or their family were offered but declined.

Provide documentation of the date and time of follow up appointments as applicable.

Ensure you complete documentation of the information provided on community supports to the patient and their family member(s).

Additionally, it is important to document if the patient and their family member(s) indicated understanding of the information.

Exercise 5.1 The Interdisciplinary Team and Discharge Preparation

Answer true (T) or false (F) to the following statements. Place an 'X' in the appropriate box. The answers to this exercise can be found in **Appendix A** of the e-learning resource manual under **Exercise 5.1: The Interdisciplinary Team and Discharge Preparation Answer Key**.

	Statements	T	F
1.	Post-burn pruritis can be treated by moisturizing, keeping cool, and utilizing antihistamines.		
2.	The patient should check the temperature of the water with their newly healed skin prior to completing hygiene care.		
3.	Pressure garments can help by softening and flattening scars, reducing redness, and reducing itchiness and pain.		
4.	The patient should continue a high calorie, high protein diet upon discharge home to support wound healing.		
5.	The patient should avoid extensive heat or cold exposure due to temperature sensitivities.		
6.	Post-burn pruritis commonly subsides a few months after the injuries heal.		
7.	Skin graft sites and scars can take two years to mature but may never look the same as the surrounding skin.		
8.	Specialized sun protective clothing that has an UPF of 30 or greater are beneficial to wear outside.		
9.	The patient should apply a sunscreen with at least SPF 15 prior to going outside.		
10.	All healed areas should be moisturized several times daily to help prevent itchiness and dryness.		
11.	The patient must decide if they would like a referral to mental health services prior to discharge home.		
12.	The benefits of physiotherapy include: increasing range of motion, strength, and the functional use of limbs and reducing contractures, itchiness, and swelling.		
13.	Aspects of occupational therapy include: splinting, pressure garments, and provision of adaptive aids.		
14.	The patient must be completed with physiotherapy and occupational therapy services prior to discharge home.		
15.	The documentation of discharge education should include: the information provided verbally, booklets/pamphlets provided, outpatient referrals arranged, and community supports discussed.		

CONCLUSION

You have completed **Module 5: The Interdisciplinary Team and Discharge Planning and Preparation**, the final module of this e-learning resource. You should have gained an understanding of the roles and responsibilities of the interdisciplinary team members, considerations for discharge education, and outpatient referrals.

Congratulations on completing the Self-Directed E-Learning Resource for Nurses on the Assessment, Monitoring, and Treatment of Patients with Burn Injuries. It is hoped that you enjoyed this learning experience and feel that this e-learning resource has helped prepare you to care for patients with burn injuries.

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Appendix A: Answer Key

Exercise 1.1: Anatomy and Physiology of the Skin Answer Key

Structure	Function
1. Sweat gland	C. Helps with the excretion of cellular waste products and the regulation of water loss.
2. Dermis	E. Houses sweat glands, hair, hair follicles, muscles, sensory neurons, and blood vessels.
3. Sensory receptors	A. Help identify touch, heat, cold, and pain.
4. Epidermis	D. Serves as a barrier to the environment.
5. Hypodermis	B. Connects the skin to the muscle and tissue below.

Exercise 1.2: Burn Pathophysiology Answer Key

	Statements	T	F
1.	The local changes that occur in the skin following a burn injury are described as three damage zones: the zone of coagulation, the zone of stasis, and the zone of hyperaemia.	X	
2.	Tissue in the zone of coagulation will initially appear red but later turns white and may blanche with pressure. Tissue in the zone of coagulation will appear white or charred.		X
3.	Early enteral feeding is indicated following a burn injury because basal metabolic rate increases by three times.	X	
4.	The zone of hyperaemia is the point of maximum damage. The zone of coagulation is the point of maximum damage.		X
5.	Irreversible tissue loss occurs in the zone of stasis. Irreversible full-thickness tissue damage with no tissue perfusion occurs in the zone of coagulation.		X
6.	Systemic changes occur because of an inflammatory response that is initiated following a severe burn injury.	X	
7.	A burn patient may have a temperature of 38.2 and a heart rate of 115bpm without an infectious cause.	X	

Exercise 1.3: Mechanism of Injury Answer Key

	Mechanism of Injury Description
1.	Patients may require cardiac monitoring or monitoring for symptoms of rhabdomyolysis following **electrical injuries**.
2.	**Thermal injuries** represent most burn injuries and involve contact with a heat source.
3.	**Chemical injuries** can be progressive, making it difficult to determine severity in the early days following the injury.

Exercise 2.1: Biopsychosocial Needs Answer Key

1. Which of the following are important considerations for the biopsychosocial assessment of Mr. Clark?

[ ] a. Determine if the patient has a history of problematic substance use.

[ ] b. Determine if the patient has any special needs or considerations related to their culture/ethnic background.

[ ] c. Determine the social supports available to the patient.

[ ] d. Determine if the patient has any unresolved spiritual needs or concerns.

[X] **e. All of the above**

2. As the RN caring for Mr. Clark, which of the following are strategies you can take to support his biopsychosocial needs?

[X] **a. Help Mr. Clark set and achieve recuperative goals.**

[ ] b. Demonstrate support and empathy by saying things like "I know how you are feeling." Unless you have had a similar experience, avoid saying "I know how you feel" as some burn patients may find this offensive.

[X] **c. Enter a consult for the Registered Social Worker.**

[X] **d. Allow Mr. Clark the opportunity to ask questions and take the time to listen to his concerns.**

[ ] e. All of the above

Exercise 2.2: Phases of Burn Pain Answer Key

	Phases of Burn Pain
1.	**Procedural pain** is typically more intense than background pain but of a shorter duration.
2.	**Chronic pain** persists after 6 months or after the burn injuries and donor sites have healed.
3.	**Background pain** results from tissue destruction and is typically of a long duration.
4.	**Breakthrough pain** may also occur when the patient is experiencing increased anxiety.
5.	**Postoperative pain** is a predictable and temporary increase in pain and typically lasts two to five days.

Exercise 2.3: Pain Assessment and Management Answer Key

	Statements	T	F
1.	The intensity of burn pain is related to the extent of the burn injury. The intensity of the burn pain experienced is not related to the extent of the burn injury. The depth of injury affects the pain and sensation experienced.		X
2.	Treatment for neuropathic pain may include anti-seizure and anti-depressant medications.	X	
3.	Breakthrough pain occurs unexpectedly at rest or during procedures when the medication regime for background and procedural pain are exceeded.	X	
4.	Anxiolytics are not beneficial for the treatment of burn patients' pain. Anxiolytics are also commonly used in conjunction with opioids for the treatment of burn pain. Anxiolytics have been found to lessen burn pain by treating acute anxiety.		X
5.	A thorough pain assessment can help determine the type of pain experienced by the patient and how best to treat it.	X	

Exercise 2.4: Pain Case Study Answer Key

1.	Fill in the table with the pain assessment data you can obtain from the above information.	**Potential answers (answers may vary)**
	P – Provoking and Relieving	• **Spontaneous this morning** • **? evoked by gentle brushing of the robe against his skin yesterday**
	Q – Quality	• **"Shock-like"**
	R – Region and Radiation	• **Right arm, radiating to his fingers**
	S – Severity	• **5/10**
	T – Time	• **At present and yesterday afternoon**
2.	What additional questions would you ask the patient?	• **How severe is the pain at its worst?** • **How severe is the pain at its least?** • **Is the pain constant or intermittent?** • **How long does it last?** • **Did you take any medications for the pain yesterday? If so, what was the effect of that?**
3.	Based on the assessment findings, what type of pain do you think the patient is experiencing?	• **Neuropathic pain**
4.	What medications may be helpful to treat this type of pain?	• **Anti-seizure (Gabapentin or Pregabalin) or anti-depressant medications (Amitriptyline or Nortriptyline).**

Exercise 3.1: Calculating TBSA of Burn Injuries Answer Key

1. Using the Lund and Browder chart, determine the TBSA of Mr. Roberts' burn injuries.

Lund and Browder Chart Method

	%	
REGION	PTL	FTL
Head		
Neck	1	
Ant. trunk	13	
Post. trunk	6.5	
Right arm	5	
Left arm	2	
Buttocks		
Genitalia		
Right leg	14.75	
Left leg		
Total burn	42.25	

2. Using the Wallace Rule of Nines method, determine the TBSA of Mr. Roberts' burn injuries.

Wallace Rule of Nines Method:

- **Chest: 9%**
- **Back: 9%**
- **Arms: 4.5%**
- **Hands: 2%**
- **Right leg: 13.5%**
  Total: 38%

3. Explain why you would or would not use the Palmar Surface Method for determining the TBSA of Mr. Roberts' burn injuries.

The Palmar Surface Method would not be appropriate for this burn because it is more accurate for relatively small burns (<15% TBSA) or for large burns (>85% TBSA), as opposed to medium sized burn injuries like Mr. Roberts'.

Exercise 3.2: Burn Wound Depth Answer Key

	Description	Answer
1.	This level of burn injury results in little pain or sensation and requires surgical intervention to heal.	**Full thickness**
2.	This level of burn injury involves the epidermis only and appears pink to red in colour.	**Superficial**
3.	This level of burn injury appears red and moist and may evolve and become deeper.	**Superficial partial thickness**
4.	This level of burn injury appears dry, may have blisters present, and may require surgical intervention to heal.	**Deep partial thickness**

Exercise 3.3: Head-to-toe Assessment Answer Key

	Statements	T	F
1.	Since you are not exposing the burn wounds, you do not need to wear PPE while completing your head-to-toe assessment. You should wear PPE during contact with the patient, including completing your head-to-toe assessment.		X
2.	If a patient exhibits two of the following symptoms: increased temperature, tachypnea, tachycardia, thrombocytopenia, hyperglycemia, or enteral feeding intolerance, sepsis in burn patients may be suspected. Sepsis may be suspected if the patient exhibits *three* or more of the symptoms.		X
3.	Stridor, carbonaceous sputum, and a brassy, barking cough are all potential signs of an inhalation injury.	X	
4.	Circumferential burns around a digit, extremity, or the torso present the risk of compartment syndrome.	X	

	Statements	T	F
5.	Burn patients require a low calorie, high protein diet to meet their increased metabolic needs and to help with wound healing. Burn patients require a *high* calorie, high protein diet.		X
6.	Target urine output is typically 15-30ml/hr for an adult burn patient. Target urine output is typically 30-50 ml/hr in an adult burn patient.		X
7.	If the patient has multiple burn wounds, you should assess and document on each wound separately.	X	
8.	Due to the hypermetabolic response, baseline temperature, heart rate, and respiratory rate may be elevated.	X	
9.	A peripheral neurovascular assessment is important, particularly if a patient has circumferential burns because the dry, inflexible eschar tissue can create a tourniquet-like effect that impairs circulation and muscle movement.	X	
10.	The hypovolemia and hypoperfusion that occur due to systemic changes is known as burn shock.	X	
11.	Signs of burn shock include: hypotension, increased temperature, and bradycardia. Signs of burn shock include hypotension, decreased body temperature, rapid/weak/thready pulse, rapid breathing, cool, clammy, and pale skin, confusion, anxiety, and weakness, and unconsciousness.		X

12. Which of the following are signs of an inhalation injury?

[ ] a. Change in breath sounds (grunting or stridor)

[ ] b. Carbonaceous sputum

[ ] c. Singed eyebrows or nasal hairs

[ ] d. Voice changes (raspy hoarse voice)

[X] e. **All of the above** (These amongst others are all signs of an inhalation injury).

13. Which of the following should be available at each burn patient's bedspace?

[X] **a. High humidity oxygen**

[X] **b. Suction**

[ ] c. Tracheostomy spreaders

[X] **d. Oral airway**

[ ] e. Chest tube clamps

(It is not necessary to have tracheostomy spreaders or chest tube clamps at each burn patient's bedspace, only those with a tracheostomy or a chest tube, respectively).

	Description	Answer
14.	Numbness and deteriorating motor function	**Paralysis**
15.	Diminished or absent pulse	**Pulselessness**
16.	New, deep, or persistent and may be poorly localized	**Pain**
17.	Pins and needles or burning sensations	**Paresthesia**
18.	Pale, shiny skin with swelling and tightness	**Pallor**
19.	Change in temperature or a presence of coolness in the affected area	**Poikilothermia**

Exercise 4.1: Wound Care Products Answer Key

	Statements	T	F
1.	Adaptic and ACTICOAT Flex can be used in combination. Adaptic is petrolatum impregnated; therefore, not compatible with ACTICOAT Flex.		X
2.	ACTICOAT Flex should be moistened with sterile water for activation.	X	
3.	Jelonet is a paraffin gauze dressing of low adherence.	X	
4.	Inadine should be changed once the colour of the dressing has faded.	X	
5.	Collagenase is indicated for superficial burns. Collagenase is indicated for debridement of deep partial and full thickness burns with slough and eschar tissue present.		X
6.	Aquacel Ag and Silvercel should overlap the wound edges by at least 1cm to accommodate for the dressing shrinking when it soaks up exudate.	X	
7.	Jelonet and Adaptic are both useful dressing choices for granulation and epithelialization tissue.	X	

8. Which of the following wound care products are considered antimicrobial?

[X] a. **ACTICOAT Flex**

[X] b. **Polysporin**

[ ] c. Jelonet (Jelonet is not antimicrobial)

[X] d. **Aquacel Ag**

[X] e. **Silvercel**

9. Which of the following statements are true regarding the use of Aloe Vesta?

[X] a. **Newly epithelialized skin will only achieve 80% of its original tensile strength**

[ ] b. Aloe Vesta should be applied every second day (Aloe Vesta should be applied at least twice daily).

[X] c. **Aloe Vesta is a non-scented, non-sensitizing, pH balanced moisturizer**

[X] d. **Aloe Vesta will not only help with dryness, but itchiness as well**

[ ] e. Aloe Vesta should be applied to deep partial thickness burn wound (Aloe Vesta should be applied to newly epithelializing closed wounds).

Exercise 4.2: Wound Care Treatments Answer Key

1. The guidelines the Physician and Nurse Practitioner follow when deroofing blisters include:

[X] a. **Greater than 1 square cm**

[ ] b. Filled with clear serous fluid (Filled with cloudy serous fluid or blood)

[X] c. **In an area prone to break with routine activities**

[X] d. **Inhibiting joint function**

[ ] e. From an electrical burn (From a chemical burn)

2. Wound debridement:

[X] a. **Can be completed conservatively (with specialized training) using Metzenbaum scissors and Addison forceps**

[ ] b. Should be completed with every second dressing change (Should be completed with every dressing change when devitalized tissue is present)

[X] c. **Can be completed during hydrotherapy**

[X] d. **Should be completed to the patient's tolerance**

[X] e. **Involves the removal of devitalized tissue**

3. The benefits of hydrotherapy include:

[ ]	a. Enhancing healthy tissue formation
[ ]	b. Softening dead tissue to help with the process of debridement
[ ]	c. Facilitating physiotherapy
[ ]	d. Minimizing the risk of infection by removing dead skin and bacteria
[X]	e. **All of the above**

Exercise 4.3: Burn Care Preparation Answer Key

List five measures Jennifer should take to prepare for Mrs. Grimes' hydrotherapy and dressing changes. **Potential answers (answers may vary):**

1.	Review the patient's chart.
2.	Ensure the blanket warmer is stocked and the heat is turned up.
3.	Ensure the burn cart is stocked.
4.	Place the privacy screen and "Burn Care in Progress" signs.
5.	Medicate the patient for pain 30-minutes prior.

Exercise 4.4: Burn Surgical Procedures and Postoperative Care Answer Key

	Burn Surgical Procedures
1.	An **escharotomy** is a surgical procedure that involves creating an incision through the full thickness burns down to the subcutaneous fat.
2.	A graft that is harvested from the burn patient's own skin is known as an **autograft**.
3.	This type of grafting involves the use of skin from another human source: **allografting**.
4.	**Split-thickness skin grafts** are created by harvesting the epidermis and the upper layer of the dermis.
5.	The area where the skin graft is harvested from is known as the **donor site.**

6. Which of the following are risks for skin graft failure?

[ ] a. Seroma or hematoma formation

[ ] b. Shearing forces

[ ] c. Infected tissue

[ ] d. Edematous tissue

[X] e. **All of the above**

7. Which of the following are factors that promote graft take?

[X] a. **A well-vascularized recipient wound bed**

[X] b. **Close contact between the skin graft and the recipient site**

[X] c. **Absence of infection**

[X] d. **Elevation to reduce swelling**

[ ] e. Increased mobilization (Mobilization, range of motion, and physiotherapy are usually on hold for 5- to 7-days to prevent shearing).

8. Which of the following statements are true regarding donor sites?

[ ] a. Donor sites typically heal within 3- to 4-weeks (Donor sites typically heal within 1- to 2- weeks and can be re-harvested within 2- to 3-weeks).

[X] b. **Donor sites are pink to red in colour**

[ ] c. The donor site dressing should be changed on post-op day #3 (Donor site dressings should be left in place and trimmed away as it lifts off the skin).

[X] d. **Once they are left open to air, donor sites should be kept moist by applying Aloe Vesta moisturizer**

[ ] e. All of the above

9. Which of the following statements are true regarding escharotomies?

X	a.	**Post-operatively, the wound should be monitored for bleeding and signs of incomplete release**
	a.	A dry dressing should be applied along the escharotomy incision (A saline-moistened dressing should be applied along the escharotomy incision).
X	b.	**An escharotomy is a potentially limb and life-saving procedure**
X	c.	**An escharotomy can be performed at the bedside or in the operating room**
	d.	All of the above

	Statements	T	F
10.	Skin grafts are typically required for superficial burns and full thickness burns. (Skin grafts are typically required for deep partial and full thickness burns).		X
11.	Skin graft dressings typically remain in place for 5- to 7-days and should not be removed unless ordered by the Physician or Nurse Practitioner.	X	
12.	Serous or serosanguineous drainage from a donor site is an abnormal finding and should be reported to the Physician or Nurse Practitioner. (Serous or serosanguineous drainage from a donor site is normal).		X
13.	An escharotomy is considered a limb and life-saving procedure because it reduces the constrictive effects of the eschar, restores distal circulation, and allows adequate ventilation.	X	
14.	It is important to keep the escharotomy incision, and exposed bone, muscle, and tendon moist with saline-soaked gauze.	X	

Exercise 5.1: The Interdisciplinary Team and Discharge Preparation Answer Key

	Statements	T	F
1.	Post-burn pruritis can be treated by moisturizing, keeping cool, and utilizing antihistamines.	X	
2.	The patient should check the temperature of the water with their newly healed skin prior to completing hygiene care. The patient should check the temperature of the water with their unburned skin.		X
3.	Pressure garments can help by softening and flattening scars, reducing redness, and reducing itchiness and pain.	X	

	Statements	T	F
4.	The patient should continue a high calorie, high protein diet upon discharge home to support wound healing.	X	
5.	The patient should avoid extensive heat or cold exposure due to temperature sensitivities.	X	
6.	Post-burn pruritis commonly subsides a few months after the injuries heal. Post-burn pruritus can persist for several years.		X
7.	Skin graft sites and scars can take two years to mature but may never look the same as the surrounding skin.	X	
8.	Specialized sun protective clothing that has an Ultraviolet Protective Factor of 30 or greater are beneficial to wear outside.	X	
9.	The patient should apply a sunscreen with at least SPF 15 prior to going outside. The patient should apply a sunscreen with at least SPF 30 prior to going outside.		X
10.	All healed areas should be moisturized a maximum of once daily to help prevent itchiness and dryness. All healed areas should be moisturized at least twice daily.		X
11.	The patient must decide if they would like a referral to mental health services prior to discharge home. A referral to mental health services can be arranged at any time the patient desires.		X
12.	The benefits of physiotherapy include: increasing range of motion, strength, and the functional use of limbs and reducing contractures, itchiness, and swelling.	X	
13.	Aspects of occupational therapy include: splinting, pressure garments, and provision of adaptive aids.	X	
14.	The patient must be completed with physiotherapy and occupational therapy services prior to discharge home. The patient may require a referral to an outpatient RPT and/or ROT when discharged home.		X
15.	The documentation of discharge education should include: the information provided verbally, booklets/pamphlets provided, outpatient referrals arranged, and community supports discussed.	X	

Appendix B: Glossary of Terms

Abdominal Compartment Syndrome
A painful and life-threatening condition that can occur due to circumferential burns around the torso that result in elevated pressure within the abdominal cavity.[1]

Acute Respiratory Distress Syndrome
A serious and life-threatening condition that occurs when fluid builds up in the tiny sacs in the lungs. The presence of fluid in these sacs prevents adequate air entry.[2]

Anxiety
A disorder that involves feelings of intense, excessive, and persistent worry and fear that can interfere with daily activities and are difficult to control.[3]

BPM
Beats per minute.

Bronchoconstriction
Contraction of the smooth muscles of the bronchus. This narrowing restricts the amount of air that can pass into and out of the lungs and can result in wheezing and shortness of breath.[4]

Burn Shock
The combination of distributive and hypovolemic shock that occurs following a burn injury due to intravascular volume depletion.[5]

Capillaries
Tiny blood vessels that connect the smallest portion of the artery to the smallest portion of the vein.[6]

Chemical Injury
A burn injury that occurs due to contact with a chemical, such as strong acids, alkalis, or organic compounds.[7]

Chronic Pain
Pain that is ongoing and persists for longer than six months.[8]

Circumferential Burns
When a burn injury encompasses the full circumference of a digit, extremity, or the torso.[9]

Compartment Syndrome
A painful and life-threatening condition that occurs when elevated pressure within a compartment of the body restricts circulation.[10]

Contact burns
Burn injuries that occur due to contact with a hot object or surface.[11]

Contracture
Occurs when a burn scar matures, thickens, and tightens causing a pull upon surrounding tissues. This typically occurs over a joint and can decrease or prevent movement.[12]

Cytokines
Small proteins released by cells that effect the interactions and communications between cells, including signaling an immune response.[13]

Debridement
The removal of necrotic or infected tissue from a wound bed.[14]

Depression
A mood disorder that affects how an individual feels, thinks, and behaves. Also referred to as major depressive disorder or clinical depression.[15]

Devitalized Tissue
Tissue which is unviable for the healing process because it favors bacterial growth in the wound bed. Slough and eschar are examples of devitalized tissues.[16]

Dysrhythmia
An abnormal rhythm of the heart that occurs when the electrical signals coordinating the heartbeat are not functioning properly.[17]

Eschar
Devitalized necrotic tissue that is thick, hard, and leathery.[18]

Electrical Arc Injury
A burn injury that occurs when current travels through the air between two conductors and an individual encounters the resulting electrical flash or flame.[19]

Electrical Injury
A burn injury that occurs when high-energy electrical current travels through the body due to contact with an electrical source.[20]

Enteral Nutrition
Any method of feeding that uses the gastrointestinal tract to deliver nutrition and calories. This may include an oral diet or tube feeding.[21]

Excision and Grafting
The surgical removal of necrotic wound tissue and the covering of the exposed wound with a graft. Grafting involves using cutaneous tissue from one portion of the patient's body, another individual's body, or using a synthetic skin substitute to cover a wound.[22]

Exudate
The fluid and cells that accumulates in a wound from the walls of a damaged or overextended vein.

Exudate can be serous, serosanguineous, or sanguineous and the consistency may be thin, thick, milky, or purulent.[18]

Flame burn
A burn injury that occurs due to direct or indirect exposure to a flame source. [23]

High Voltage Injury
A burn injury that occurs when an individual has been exposed to electricity of a particularly high strength.[18]

Hydrotherapy
Wound cleansing that uses warm running water as a means of decontaminating burn sites. Hydrotherapy can be completed with immersion baths or showers.[24]

Hypermetabolic Response
A response to injury characterized by increased blood pressure and heart rate, peripheral insulin resistance, and increased protein and lipid catabolism. This results in increased energy expenditure, increased body temperature, protein loss, and muscle wasting. This response can occur following any trauma or body injury but is particularly severe and sustained for burn patients.[25]

Hypoperfusion
A reduced amount of blood flow that can result in inadequate delivery of vital oxygen and nutrients to the body tissues and organs.[26]

Hypovolemia
A state of low extracellular fluid volume that generally occurs due to combined sodium and water loss.[27]

Inhalation Injury
Damage to the respiratory tract or lung tissue from heat, smoke, or chemical irritations that are carried into the airway during inspiration.[28]

Interstitial space
The fluid filled space between the tissue cells of the body.[29]

Lund and Browder Chart
The most accurate and widely used chart to calculate total body surface area affected by a burn injury.[30]

Myoglobinuria
The presence of an excess of myoglobin in the urine that occurs due to muscle breakdown and can lead to an acute kidney injury. The urine will appear dark in colour.[31]

Nasopharynx
The pharynx is also known as the throat. The nasopharynx is the uppermost portion of the pharynx

that begins behind the nose. The nostrils lead to the nasopharynx and there are openings on each side of the nasopharynx that lead to the ears.[32]

Neuropathic Pain
Pain that occurs due to damage to the nervous system (peripheral nerves, spinal cord, or brain).[33]

Oropharynx
The pharynx is also known as the throat. The oropharynx is the middle portion of the pharynx that begins behind the mouth and includes the soft palate, side and back walls of the throat, tonsils, and the back one-third of the tongue.[34]

Palmar Surface Method/Hands Method
A method of estimating the total body surface area of relatively small or large burns using the palm of the hand, including the fingers.[35]

Parenteral Nutrition
The delivery of nutrients and calories into a vein.[21]

Peripheral Neuropathy
Weakness, numbness, pain, and impaired circulation that occur due to damage to the peripheral nerves (the nerves located outside the brain and spinal cord), commonly in the hands and feet.[36]

Periwound
The skin that immediately surrounds the wound.[22]

Post-Traumatic Stress Disorder
A mental health condition that occurs after a witnessed or experienced traumatic event that involved a real or threatened death or injury.[37]

Pruritus
An itching, irritating sensation of the skin that is often caused by dryness.[38]

Re-epithelialization
The formation of new epithelium, the tissue that lines the outer surface of the organs and blood vessels, and skin appendages. The epidermis is an example of epithelial tissue. Re-epithelialization is the goal of wound closure.[39]

Rhabdomyolysis
A serious condition that results from the breakdown of skeletal muscle and the leakage of these contents into circulation. It can lead to systemic injuries, including an acute kidney injury, electrolyte imbalances, and coagulopathies.[40]

Scald
A burn injury that results from exposure to high-temperature liquid.[23]

Self-Immolation
The deliberate act of setting oneself on fire as a method of suicide.[41]

Thermal Injury
A skin injury caused by excessive heat. Thermal injuries typically occur due to contact with hot surfaces, liquids, steam, or flame.[42]

Thermoregulation
The mechanism by which a stable core body temperature is maintained despite external temperatures.[43]

Thrombocytopenia
A condition characterized by a low blood platelet count. Platelets are the blood cells that help blood clot.[44]

Vascular permeability
The blood vessels' ability to control the passage of molecules and cells in and out of the vessel.[45]

Vasodilation
Widening of the blood vessels that occurs because of relaxation of the muscles in the walls of the blood vessels.[46]

Wallace Rule of Nines
A tool used to assess the total body surface area of a burn injury.[47]

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