Consensus Statement
Emergency Burn Care
April 2026

PARTICIPANTS / CONSULTANTS	
Dr. Jayson Dool, Plastic Surgeon, The Moncton Hospital (TMH)	Leisa Ouellet, Trauma Coordinator Trauma NB Lead Author
Dr. Tushar Pishe, Medical Director, Trauma New Brunswick (NB)	Vincent Farquhar, Regional Director Trauma NB
Dr. Susan Skanes, Plastic Surgeon, Dr. Georges-L.-Dumont University Hospital Centre	Susan Benjamin, Trauma Resource Nurse (TRN) Trauma NB SJRH
Dr. Allison Wong, Plastic Surgeon, Saint John Regional Hospital (SJRH)	Julie DuPlessis, TRN Trauma NB The Doctor Everett Chalmers Regional Hospital
Dr. Geoff Cook, Plastic Surgeon, SJRH	Stacey McEachern, TRN Trauma NB TMH
Dr. Cherie Adams, Chief Emergency Medicine, SJRH Trauma Control Physician Trauma NB	Véronique Jean, TRN Trauma NB CRH
Dr. Mackenzie Howatt Emergency Medicine Physician Trauma Control Physician Trauma NB	Julie Ringuette, Trauma Coordinator Trauma NB
Dr. Colin Rouse Emergency Medicine Physician Trauma Control Physician Trauma NB	Julie Savoie, TRN Trauma NB Campbellton Regional Hospital
Dr. Andrew Dickinson, Emergency Medicine Physician Upper River Valley Hospital	Jessica Raymond, TRN Trauma NB Edmundston Regional Hospital
Dr. Jay Mekwan Clinical Lead Provincial Trauma Simulation Program Trauma NB	Nicholas Maclean, Epidemiologist Trauma NB
Dr. Jacques Albert, Emergency Medicine Physician, TMH	Alicia Davies, Knowledge Translation Specialist Trauma NB
Dr. John Mowatt, Intensivist, SJRH	Liam Walsh, Pharmacist, Emergency Medicine, SJRH
Dr. Mathieu Doiron Emergency Medicine Physician Chaleur Regional Hospital (CRH)	

EVIDENCE CONSIDERED IN REACHING THE CONSENSUS STATEMENT:

1. American Burn Association. (2023). *Advanced Burn Life Support Course Manual.*
2. American College of Surgeons . (2018). *ATLS Advanced Trauma Life Support Student Course Manual Tenth Edition.*
3. BC Emergency Medicine Network. (2019, Nov 26). Point of Care emergency clinical summary: *Major Burns Trauma*.
4. Bettencourt AP, Romanowski KS, Joe V, Jeng J, Carter JE, Cartotto R, Craig CK, Fabia R, Vercruysse GA, Hickerson WL, Liu Y, Ryan CM, Schulz JT. Updating the Burn Center Referral Criteria: Results From the 2018 eDelphi Consensus Study. J Burn Care Res. 2020 Sep 23;41(5):1052-1062. doi: 10.1093/jbcr/iraa038
5. Frostbite clinical practice guidelines and care protocols. (n.d.). https://frostbitecare.ca/health-professionals/frostbite-clinical-practice-guidelines-and-care-protocols
6. Cartotto R, Burmeister DM, Kubasiak JC. Burn Shock and Resuscitation: Review and State of the Science. J Burn Care Res. 2022 Feb 26: irac025. doi: 10.1093/jbcr/irac025
7. Cartotto R, Johnson LS, Savetamal A, Greenhalgh D, Kubasiak JC, Pham TN, Rizzo JA, Sen S, Main E. American Burn Association Clinical Practice Guidelines on Burn Shock Resuscitation. J Burn Care Res. 2024 May 6;45(3):565-589. doi: 10.1093/jbcr/irad125.

8. Cauchy E, Chetaille E, Marchand V, Marsigny B. Retrospective study of 70 cases of severe frostbite lesions: a proposed new classification scheme. *Wilderness & Environmental Medicine*. 2001;12(4):248-255. doi:10.1580/1080-6032(2001)012[0248: RSOCOS]2.0.CO;2

9. Emergency Nurses Association. (2023). *Trauma Nursing Core Course Provider Manual Ninth Edition.*

10. ISBI Practice Guidelines Committee. (2016). ISBI Practice Guidelines for Burn Care. *ScienceDirect*, 953-1021.

11. Jeschke MG, van Baar ME, Choudhry MA, Chung KK, Gibran NS, Logsetty S. Burn injury. Nature Reviews Disease Primers. 2020; 6: 11.doi: 10. 1038/s41572-020-0145-5

12. J.H. Badulak, e. a. (2018, February). *Defining the criteria for intubation of the patient with thermal burns.* Retrieved from www.sciencedirect.com: https://doi.org/10.1016/j.burns.2018.02.016

13. Kaushik, S. Bird, S. (2025, June). *Uptodate.com*. Retrieved from Wolters Kluwer: https://www.uptodate.com/contents/topical-chemical-burns-initial-evaluation-and-management

14. Kaveh Borhani-Khomani, S. P. (2017). Assessment of burn size in obese adults; a literature review. *Journal of Plastic Surgery and Hand Surgery* , 375-380.

15. McIntosh SE, Freer L, Grissom CK, et al. Wilderness Medical Society Clinical Practice Guidelines for the Prevention and Treatment of Frostbite: 2024 Update. *Wilderness & Environmental Medicine*. 2024;35(2):183-197. doi:10.1177/10806032231222359

16. Metcalf M. (2020) Changing perspectives in the prehospital management of patients with severe burns. Journal of Paramedic Practice Vol12 No. 2 Retrieved from Magonlinelibrary.com by 130.014.143.093 on September 13, 2024

17. Nguyen ATM, Chamberlain K, Holland AJA. Paediatric chemical burns: a clinical review. Eur J Pediatr. 2021 May;180(5):1359-1369. doi: 10.1007/s00431-020-03905-z

18. Phillip Rice Jr, D. O. (2018, July). *Emergency care of moderate and severe thermal burns in adults.* Retrieved from UpToDate.com: https://www.uptodate.com/contents//emergency-care-of-moderate-and-severe-thermal-burns-in-adults

19. Radzikowska-Büchner, E.; Łopuszynska, I.; Flieger, W.; Tobiasz, M.; Maciejewski, R.; Flieger, J. An Overview of Recent Developments in the Management of Burn Injuries. Int. J. Mol. Sci. **2023**, 24, 16357. https://doi.org/10.3390/ijms242216357

20. Royal Children's Hospital Melbourne: Nursing management of burn injuries. (2015 , December). *Nursing management of burn injuries*.

21. Schaffer DH, Poole ND, Traylor J. Cyanide Toxicity. [Updated 2025 Feb 22]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK507796/

22. Stiles, K. (2018). Emergency management of burns: part 1. *Emergency Nurse*, 36-42.

23. Stiles, K. (2018, June). Emergency management of burns: part 1. Emergency Nurse. *Emergency Nurse*. Retrieved from RCNI Publishing Company Limited 2018.

24. Sunnybrook Hospital . (2018). *Emergency treatment of burn patients*. Retrieved from Sunnybrook.ca: https://sunnybrook.ca/content/?page=emergency-treatment-burn-patients

25. Sunnybrook Hospital: Ross Tilley Burn Centre. (2018). *Emergency Department Standard of Burn Care* . Retrieved from Sunnybrook Hospital: Ross Tilley Burn Centre: http://sunnybrook.ca/content/?page=standard-burn-care

26. Therese Djärv, Matthew Douma, Tina Palmieri, Daniel Meyran, David Berry, David Kloeck, Jason Bendall, Laurie J. Morrison, Eunice M. Singletary, David Zideman. Duration of cooling with water for thermal burns as a first aid intervention: A systematic review, Burns, Volume 48, Issue 2, 2022,Pages 251-262, ISSN 0305-4179, https://doi.org/10.1016/j.burns.2021.10.007

27. *TREKK - Translating Emergency Knowledge for Kids*. (n.d.). https://trekk.ca/topic/burns/

28. Walker SB, Clack JE, Dwyer TA. An integrative literature review of factors contributing to hypothermia in adults during the emergent (ebb) phase of a severe burn injury. Burns. 2024 Aug;50(6):1389-1405. doi: 10.1016/j.burns.2024.03.028

29. Wibbenmeyer L, Lacey AM, Endorf FW, Logsetty S, Wagner ALL, Gibson ALF, Nygaard RM. American Burn Association Clinical Practice Guidelines on the Treatment of Severe Frostbite. J Burn Care Res. 2024 May 6;45(3):541-556. doi: 10.1093/jbcr/irad022

30. Wiechman, S. a. (2018, September). *uptodate.com.* Retrieved from Wolters Kluwer: https://www.uptodate.com/contents/management-of-burn-wound-pain-and-itching/print

31. Zhai Y, Cai S, Zhang Y. The diagnostic accuracy of Critical Care Pain Observation Tool (CPOT) in ICU patients: A systematic Review and Meta Analysis. Retrieved from www.sciencedirect.com: https://doi.org/10.1016/j.jpainsymman.2020.06.006.

PREAMBLE:

This update builds on the work of the previous 2018 Working Group and incorporates the latest research and expert opinion. We would like to thank everyone involved in the production of the 2019 version and the present version of this document for their commitment and diligence in producing these valuable resources.

This consensus statement summarizes recommendations for the care of trauma patients who have suffered a burn injury either as an isolated injury or as part of a composite of injuries. Recommendations are based on current best practice and is adapted from medical literature. It is recognized that the geography, population, and availability of specialized services in New Brunswick provide a unique context to be considered in any overall recommendations for the care of burn patients.

SCOPE:

The statement outlines the preferred guidance for adult and pediatric patients who have experienced a major burn injury which includes:

- Prehospital guidance
- Emergency/resuscitative care
- Transfer criteria
- Destination guidance
- Initial burn care including those that do not require admission but may require specialist referral

Surgical burn management, intensive care management and radiation burns are outside the scope of this document.

BACKGROUND:

1. A burn injury occurs "...when some or all of the cells in the skin or other tissues are destroyed by heat, electrical discharge, friction, chemicals, or radiation. Burns are acute wounds caused by an isolated, non-recurring insult, and healing ideally progresses rapidly through an orderly series of steps".

2. Advanced Trauma Life Support (ATLS) principles will guide the initial assessment and resuscitation of the burn injured patient using the mnemonic ABCDE in a systematic approach.

3. Burn injury distinguishes itself from all other trauma by its unprecedented inflammatory response during the initial 24-48 hours. Myocardial depression and increased capillary permeability result in rapid and extensive fluid shifts and the depletion of intravascular volume.

4. Early and appropriate fluid resuscitation is essential to acute burn management and is aimed at avoiding burn shock. Second and third-degree burns involving $\geq$20% Total Body Surface Area (TBSA) in adults and $\geq$15% in children are major burns and require dedicated burn shock fluid resuscitation. Mortality is increased if resuscitation is delayed greater than 2 hours following a major burn injury. Refer to Appendix A for description of burn depth.

5. Over and under fluid resuscitation must be avoided as they have been determined to impact morbidity and mortality.

6. It is of critical importance to trigger early activation of the Trauma Line in all patients assessed as having a major burn or other Trauma NB approved criteria for potential burn transfer (refer to page 10-11). When required, assistance in determining TBSA, fluid resuscitation parameters and evaluation of correct pathway to specialized burn care management may be initiated.

7. Burn injuries are less frequent than other forms of trauma, however burns can have life altering consequences for both the injured person and the family. Initial clinical interventions in burn care are linked to patient outcomes.

8. Supporting clinicians in the management of traumatic burn injury is essential. Evidence demonstrates that the early emergency care received by the major burn patient has a significant impact on morbidity and mortality. Guidance for pre-hospital personnel and trauma teams involved in the early care of burn injury is essential as they are a key part of the burns team.

9. Hypothermia can have detrimental effects on any trauma patient and is present in a burn patient when the internal temperature is less than 36.5ºC. This differs from a healthy person in which the threshold is 35ºC. Hypothermia in the early phase of burn injury has been shown to worsen the prognosis in terms of mortality and duration of treatment, irrespective of other clinical factors.

10. Early detection and adequate management of inhalation-related injury is important. Inhalation injuries occur in approximately one-third of major burn injuries and are related to significant morbidity and mortality. Airway protection in patients at risk of upper airway obstruction is critical.

11. Breathing and ventilation may be compromised due to hypoxia, carbon monoxide poisoning, smoke inhalation injury, circumferential full thickness burn eschar or thoracic trauma not related to the burn.

12. Accurate assessment of the circumstances and cause of the burn, burn size and depth and timely and appropriate intervention is crucial to the early care of the burn injured patient.

13. Severe pediatric burn injuries have a higher mortality than a similar burn in a nonelderly adult. Physiological and psychological differences in the pediatric population require the clinician to understand the differences in the management of the burn injury.

14. The complex pathophysiology of severe burns necessitates specialized care by multidisciplinary medical and surgical teams. Referral to specialized burn care is imperative in major burn trauma.

15. Prior to initiating care, pre-hospital and in-hospital personnel should take precautions to reduce risk of exposure and chemical contamination. Appropriate use of personal protective equipment (PPE) should be used to protect both the patient who is at higher risk of infection and care providers vulnerable to exposure of contaminants.

16. Assessment and management of pain in the burn injured patient is important and requires appropriate and judicious treatment.

RECOMMENDATIONS

PRIMARY SURVEY

AIRWAY MAINTENANCE WITH SPINAL MOTION RESTRICTION (SMR)

- Airway assessment is a critical first step in assessing the burn patient.
- Advanced airway management may be required for those who present with acute respiratory distress such as:
    - **Respiratory distress**

- **Stridor**
- **Accessory muscle use**
- **Sternal retraction**
- **Extent of the burn (TBSA ≥ 40 % - 50%)**
- **Extensive and deep facial burns**
- **Burns inside the mouth**
- **Upper airway trauma**
- **Altered mentation**
- **Decreased level of consciousness where airway protective reflexes are impaired**
- **Hypoxia/hypercarbia**
- **Hemodynamic instability**
- **Inability to clear secretions or respiratory fatigue**
- **Suspected inhalation injury, history of being burned in an enclosed space**
- **Swelling on laryngoscopy**

In the absence of acute respiratory distress early consultation with the Trauma Control Physician (TCP) is recommended.

BREATHING & VENTILATION

- The administration of oxygen at 15L/min via non-rebreather mask is essential at first point of care to optimize oxygenation and decrease half life of carbon monoxide.
- Auscultation of bilateral breath sounds.
- Monitoring respiratory rate, rhythm and depth.
- Circumferential chest or neck burns and /or chest trauma may compromise airway and ventilation.

The continued assessment and monitoring of breathing and ventilation includes:

- The application of pulse oximeter and capnography-**Caution** must be exercised when interpreting oxygenation in the patient with potential carbon monoxide poisoning.
- Maintain high index of suspicion for carbon monoxide exposure and cyanide toxicity for persons burned in an enclosed area.
- Symptoms of cyanide toxicity include shortness of breath, respiratory rate changes, chest tightness, headache, vertigo, confusion, irritation to eyes, mucous membranes and occasionally cherry red skin and bitter almond scent. In confirmed or suspected cyanide toxicity, the hydroxocobalamin (Cyanokit) should be administered.
- Cyanide toxicity should be suspected in patients who remain in shock refractory to resuscitative efforts, high-flow oxygen, with persistent metabolic acidosis and a serum lactate level of ≥ 8 mmol/L.

CIRCULATION WITH HEMORRHAGE CONTROL

Current American Burn Association (ABA) guidelines provide revised resuscitation formulas.
INITIAL fluid management during pre-hospital and primary survey for all major burns is based on age.

- TBSA burn percentage is determined by adding up **only** those body areas with 2nd and 3rd degree burn, also defined as superficial partial thickness, deep partial thickness, and full thickness burns respectively. Refer to Appendix A.
- Adults with ≥20% and children with ≥15% TBSA burn are considered to have a major burn that requires burn fluid resuscitation.
- Two large bore peripheral intravenous (IV) access sites are recommended; peripheral access through burned skin is acceptable if needed to achieve IV access.
- Complete baseline trauma bloodwork and should include carboxyhemoglobin.
- Intraosseous (IO) or central line insertion is recommended if unable to obtain peripheral intravenous access.
- Lactated Ringer's (warmed) is the preferred crystalloid used in fluid resuscitation.
- A urinary catheter is required to monitor the effectiveness of fluid resuscitation.

- Over and under resuscitation must be avoided by the continuous assessment of the hourly urine output and other physiologic parameters such as heart rate and blood pressure.
- Refer to local hospital policy if administering blood or blood products for other injuries sustained.

INITIAL FLUID RATE AS A STARTING POINT

Based on the patient's age and prior to calculating the exact TBSA, following are the **pre-hospital** and **during primary survey** initial fluid rate for major burns (≥15-20% as noted above). * ANB does not carry Lactated Ringers (LR) therefore it will need to be initiated on arrival to the Emergency Department (ED).

AGE	FLUID RATE
≤ 5 years of age	**125 mL LR per hour**
6-12 years old	**250 mL LR per hour**
≥ 13 years and older	**500 mL LR per hour**

DISABILITY (NEUROLOGIC EVALUATION)

- Establish level of consciousness, determine Glascow Coma Scale (GCS) and assess pupillary response.
- Assess and monitor blood glucose for all children and in all patients with an altered level of consciousness.
- Examination of the cornea should be completed with facial burns.
- Isolated burn trauma does not affect mentation or level of consciousness. It is prudent to suspect other issues such as head injury, inhalation injury, hemorrhage, toxic ingestion, etc. when altered mentation is present.

EXPOSURE AND ENVIRONMENTAL CONTROL

- **Stop the burning process!**
- Remove all clothing, footwear, diaper, jewelry and body piercing(s).
- Contact lenses should be removed with or without facial burns before the onset of facial and periorbital edema.
- Active rewarming is recommended for all moderate to severe burn injuries.
- Monitor and document patients' temperature regularly.
- Infuse warmed fluids -Lactated Ringers.
- Cover burns with dry sterile sheets (e.g. Medline sterile ¾ drape) or use clean dry sheets. Apply Bair Hugger or warm blankets to maintain normothermia.
- Maintenance of normothermia is more important than dressing application in the acute phase of care.
- Dressings should **NOT** be applied in the ED before consultation with Trauma Line and/or prior to consult with the burn care provider.

SECONDARY SURVEY

BURN SIZE ESTIMATION

- TBSA calculation **only occurs in the secondary survey** and is not needed in the initial fluid management of major burns. Only 2nd and 3rd degree burns are included in the TBSA calculation.
- Accurate TBSA calculation can be difficult in the early burn setting even for experienced providers.
- Refer to the Burn Resuscitation Worksheet, a physician documentation tool created to aid in the calculation of the extent and depth of burn injury and fluid resuscitation requirements. Refer to Appendices B & C.

- Digital photo documentation and consultation with a burn care provider through the Trauma Line will facilitate TBSA calculation and communication with team members. Digital photo sharing should be conducted via MBMD or PETAL.

TBSA CALCULATION - THREE METHODS WIDELY ACCEPTED:

- **Lund-Browder Chart:** Provides the highest accuracy and consistency among clinicians and is the preferred method of calculation for the pediatric patient. Refer to Appendices D & E.
- **Rule of Nines**: Calculated based on partial and full thickness burn areas. The adult body is divided into anatomical surface areas of 9% or multiples of 9%. Refer to Appendix F.
- **Palmar Method:** uses palmar surface of the patients' **palm and fingers** which represents 1% of the TBSA burned. This method is preferred when calculating **patchy and non-continuous burn** areas. Refer to Appendix G.

ADJUSTED FLUID RATE

During the **secondary survey**, the patient's weight in kg is confirmed and the TBSA burn is determined.
The ABA recommends the following formulas to calculate an estimation of the fluid requirements in the first 24 hours post burn. It is referred to as the **ADJUSTED FLUID RATE.**

ADULT & TEENAGERS (≥ 13 YRS)	*FLAME & SCALD*	*2 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16=* ***mL/hour STARTING RATE****. Subsequent hourly rate see CRITICAL POINTS below*
	ELECTRICAL	*4 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16=* ***mL/hour STARTING RATE*** *Subsequent hourly rate see CRITICAL POINTS below.*
PEDIATRIC (≤ 12 YRS)	*FLAME & SCALD*	*3 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16=* ***mL/hour STARTING RATE****.* *+ Maintenance Fluid = D*5W Lactated Ringers (D5LR) at maintenance rate *ABA recommends D5LR *Subsequent hourly rate see CRITICAL POINTS below*
	ELECTRICAL	*4 mL LR x patient's body weight in kg x % TBSA 2nd & 3rd burns = Estimated 24-hour total mLs ÷16=* ***mL/hour STARTING RATE.*** *+ Maintenance Fluid=* D5LR at maintenance rate *ABA recommends D5LR *Subsequent hourly rate see CRITICAL POINTS below*

CRITICAL POINTS

1. The ABA emphasizes that burn fluid resuscitation should follow critical care principles and be monitored **continuously** to ensure the best outcomes.

2. **Hourly urine output monitoring is essential** to guide and adjust fluid resuscitation rates effectively. This must be accompanied with circulatory and respiratory monitoring.

3. As per the ABA "If initial fluid resuscitation is delayed there is no "catching up". The hourly rate should be started and adjusted regardless of time since the injury."

4. **Warmed Lactated Ringers** is the fluid recommended for fluid resuscitation.

5. Because patients respond differently depending on the specifics of their burn injuries, fluid needs vary.

6. A significant delay in initiating resuscitation from time of burn injury should signal physician to contact burn care provider and/or plastic surgeon.

7. In the **pediatric patient**, the management of fluid involves adjusting resuscitation based on perfusion factors such as urine output, mentation, capillary refill, pulses, and venous blood gas/pH.

MONITORING OF URINE OUTPUT

- Urinary output parameters: urine volumes less than or greater than the parameters listed in the table below require adjustments in fluid resuscitation rates.
- Fluid infusion rate should be increased or decreased by up to one-third if the urinary output falls below or exceeds the desired level by more than one-third every hour. Consultation recommended with TCP until definitive care has been established.

Age/weight	Hourly urine output
Adult	30-50 mL/hour
Children > 30kg	0.5mL/kg/hour up to maximum of 50mL/hr
Child ≤ 30kg	1 mL/kg/hour
Electrical Injury-with myoglobinuria Adults & teenagers ≥ 13 years	75-100mL/hour until urine clears
Electrical Injury-with myoglobinuria Children ≤ 30 kg	1-1.5 mL/kg/hour until urine clears

PEDIATRIC MAINTENANCE FLUID RATES ≤12 YEARS OLD

- Blood glucose should be closely monitored due to limited glycogen stores in children.

- **Children ≤ 12 years old require maintenance fluids in addition to resuscitation fluid**. The fluid of choice is **D5LR** and is calculated and infused using the "4-2-1" formula. D5W-Normal Saline may be used if D5LR is not available.

4-2-1 Formula
4 mL/kg per hour for the 1st 10 kg body weight
+ 2 mL/kg per hour for the 2nd 10 kg body weight
+ 1 mL/kg per hour for each additional kg over 20 kilograms

UNIQUE BURN INJURIES-SPECIAL CONSIDERATIONS

Electrical Injuries

- Determine type of electricity: High voltage ≥1000 V or low voltage <1000V and direct or alternating current (DC or AC).
- Remain vigilant for associated injuries with high voltage contact – the tetanic contraction of muscles or an unprotected fall (even from standing height) is sufficient to produce bony fracture including spinal injuries.
- At risk for cardiac arrhythmias - 12 Lead ECG and 24 hr cardiac monitoring is indicated after high voltage contact.
- Internal damage exceeds that seen from contact points on the skin – muscle swelling and breakdown may cause compartment syndrome and rhabdomyolysis – increase frequency of compartment checks and follow increased urine output guidelines.
- Trauma bloodwork should include serial creatinine, electrolytes, CK and urine myoglobin.

Chemical Burns

- Care providers must assess and ensure safety prior to initiating decontamination of the patient with a chemical injury.
- Personal protective equipment is essential prior to contact with patient.
- Remove **ALL** clothing, underwear, diaper, footwear, jewelry, body piercing(s), and all belongings.
- Brush all powdered chemical from skin prior to beginning irrigation. Initiate continuous irrigation with water.
- The following chemicals will react with water and MUST be removed by brushing off and by removing any contaminated clothing and belongings prior to irrigation with water: Dry lime, phenols, certain elemental metals such as sodium, potassium, magnesium, phosphorous, lithium and titanium tetrachloride.
- When large body surface area contaminated it is imperative to avoid hypothermia by using warm water and keeping environment warm.
- Identify causative agent via **Atlantic Canada Poison Centre (1-902-470-8161)** or Safety Data Sheets to identify any potential toxicities after initial intervention has begun.

Specific Chemical Burns

Hydrofluoric Acid (HF)

- HF rapidly penetrates tissue where the toxic fluoride ion binds with calcium and magnesium resulting in severe pain and progressive tissue necrosis.
- The fluoride ion is readily absorbed into the blood binding with free calcium and magnesium which may lead to cardiac dysrhythmias and death from hypocalcaemia.
- Industrial uses of HF: oil refinery to improve gasoline/crude oil yields, paper/pulp industry, glass/metal etching, rust/cleaning products, organic chemical production, Polyvinyl production, semiconductor manufacturing.
- Patient must be completely disrobed with all garments worn disposed of appropriately.
- Any clothes or items contaminated with HF should be disposed of as **hazardous waste**.
- Decontamination must begin at the scene; all affected areas must be irrigated with water for at least 30 minutes. Caution must be taken to avoid hypothermia.
- Once patient is in the emergency department, application of the commercially prepared Calcium Gluconate 2.5% gel may be used to neutralize the fluoride (approved as stock for all NB EDs). The gel must be applied using a gloved hand to avoid spreading the toxic fluoride as well as to ensure the protection of medical personnel. When treating a hand that was injured with this chemical, this calcium mixture can be placed in a surgical glove and worn by the patient. ***Attention: this is the rare instance of a direct neutralizing substance being utilized to acutely treat a chemical exposure.***
- In the event this supply is unavailable or insufficient, the following is the compounding directions approved by the Atlantic Canada Poison Control Centre: - “Calcium gluconate 2.5% jelly can be prepared by combining 20 mL of 10% calcium gluconate injection with 56 g of K-Y Jelly or Muko lubricating jelly. (NOTE: Only KY Jelly or Muko brand lubricating gels are compatible with Calcium Gluconate in the preparation of Calcium Gluconate gel.)”

Tar and Asphalt Burn

- Irrigate with **cool** water until product is completely cooled – ***Attention***: ***this differs from guidance for other causes of burn.***
- After cooling, next goal is to emulsify the tar with petrolatum-based ointment (e.g. Vaseline or Polysporin).
- **DO NOT** peel tar off – emulsification for tar removal often requires several days.
- Underlying burn is often deep due to the initial temperatures – follow consultation criteria and be suspicious of likely deep burn hidden by the tar product.

Cold Injuries

- Transport to safe environment before attempts at rewarming are initiated as partial rewarming and refreezing can be harmful.
- Remove damp clothing and apply warm blankets.
- Provide hot fluids by mouth if patient alert and able to drink and no contraindications/other injuries.
- Affected areas are rewarmed by immersion in gently circulating water at a constant 38-40°C for 30-40 minutes. The temperature of the water may be determined using a temperature probe-tape the probe to inside of basin/tub.
- If no circulating water baths available- place limb in clean bucket with warm water running in.

- Fingers may be immersed in sterile bowl in hand washing sink with warm running water with cooled water allowed to trickle out.
- Feet/ legs: if patient able and accompanied - a shower stall with warm running water.
- Do not rub or massage injured areas as this may cause further injury.
- Patient with frostbitten feet should not be walking whenever avoidable.
- Excessive dry heat can cause a burn injury.
- The extremity should be elevated **above heart level** once rewarmed to minimize edema.
- Rewarming can be very painful- assess and provide adequate analgesia. Oral Ibuprofen may be used and may limit injury by blocking prostaglandin production. Stronger analgesics may be required to treat pain.
- Edema and blisters may develop over 12-24 hours. Cold injuries may progress for the first 72 hours making it difficult to determine the extent of injury on early examination.
- Edema and bullae do not appear until **after** rewarming.
- Clinical classification of frostbite injuries should be done **after** rewarming procedure.

Signs and Symptoms of Mild and Deep Injury:

MILD INJURY	DEEP INJURY
Brief cold exposure, early rewarming	Prolonged exposure, delayed warming
Bright red or normal skin colour	Mottled or purple skin
Warm digits	Cool digits
Sensation present	No sensation
Clear blisters	Hemorrhagic blisters
Blisters to digit tips	Proximal blisters only

Cauchy Developed A Clinical Prediction Tool Incorporating Imaging Studies For Frostbite Injury To Hands And Feet That Can Be Used After Rewarming:

Grade 1	No cyanosis on the extremity; no risk of amputation or sequelae predicted
Grade 2	Cyanosis isolated to distal phalanx; amputation to soft tissue and sequelae of fingernail/toenail sequelae predicted
Grade 3	Cyanosis on intermediate and proximal phalanges; amputation to the bone of the digit and functional sequelae predicted
Grade 4	Cyanosis over carpal/tarsal bones; amputation to limb and functional sequelae predicted.

***Refer to grading system images in Appendix H.**

Pharmacologic Treatment in Cold Injury:

- Iloprost may be considered in Grade 2-4 frostbite injury within 48-72 hours of rewarming.
- Thrombolytics, mainly alteplase have been used for Grade 4 frostbite injury if less than 24 hours since rewarming. Early consultation via Trauma Line to ensure access to necessary treatment vital.
- Aloe Vera may decrease thromboxane release and can be applied to the affected tissue every 6 hours for the initial five days post injury. It is recommended at every dressing.

RECOMMENDED GUIDELINES FOR TRANSFER AND CONSULTATION:

Burn injured patients should be assessed by the local plastics service if present or available. If no Plastic Surgeon on site or transfer being considered immediate consultation through the Trauma Line is recommended for the following:

- Full-thickness burns

- Partial-thickness burns (second degree) ≥ 10% TBSA
- Any deep partial /2nd degree or full thickness /3rd degree burns to critical anatomic area burns: face, hands, feet, genitalia, perineum or over any joints
- Circumferential burn injuries
- Poorly controlled pain
- Inhalation injury
- High voltage ≥1000 V electrical injury including lightening injury
- All chemical burns
- Pediatric patient with partial thickness burn injury ≥ 10% TBSA or any full thickness component
- Burn injury in patients with pre-existing medical diagnoses/illnesses that could complicate management, prolong recovery, or affect mortality (e.g. diabetes, renal failure)
- Burns and concomitant trauma in which the burn poses the greatest risk of morbidity and mortality
- Burn injury in patients who will require special social, emotional, or rehabilitative care
- Suspected non-accidental burn injury

BURN CARE CAPACITY:

- **Level 1 & Level 2:** Consult with Plastic Surgeon on call. If transfer may be required, contact Trauma Line.

- **Level 3:** When on call, the local Plastics service should be consulted upon initial assessment.

- Early contact with the Trauma Line is encouraged when it is determined the facility's capacity for care is exceeded or when local plastic surgeon is not on call.

- **Level 5:** Facilities are strongly encouraged to contact the Trauma Line in patients assessed as having any of the previously noted criteria.

- The TCP will determine the most appropriate destination for pediatric patients. Pediatric patients whose care exceeds that available in New Brunswick will be transferred to the IWK.

FIELD TRAUMA TRIAGE GUIDELINES (FTTG):

- FTTG should continue to reflect preferential transport to Level III, II and I designated centres for burn trauma.

COMMUNICATION:

- Advice shared between emergency medicine physicians, consulting plastic surgeons, and other consulting physician specialist should be documented and readily available to health care providers within the patient's circle of care.

- **Digital images:** the secure transfer of digital images via MBMD or PETAL may facilitate the sharing of information on degree, depth and complexity of the burn injury with the TCP and/or plastic surgeon. It is an important component of contemporary burn care management and is strongly advised.

PAIN MANAGEMENT

- Ongoing pain assessment is essential to the management of the major burn patient.
- When needed, opiate pain control is delivered via the IV route in major burns. Small increments of IV analgesics should be initiated as early as possible.
- Intubated patients who require frequent dosing - consider infusion to provide consistent pain relief.
- Opiate IM injections **should not be** given in burns ≥ 10% TBSA due to peripheral shutdown which will delay drug absorption and impede effective pain relief. IV or IO administration is recommended.
- Critical Care Pain Observation Tool (CPOT) and the Richmond Agitation Sedation Scale (RASS) may serve to assess pain and sedation.

- Anxiety may increase the perception of pain; use of anxiolytics may be beneficial but should be used judiciously and only after the completion of the secondary survey and discussion with the TCP or plastic surgeon.
- Oral analgesia may be administered to patients with superficial burns (i.e. sunburn).
- In patients being discharged with follow up on an outpatient basis, provide pain management advice.

WOUND CARE MANAGEMENT

- Cooling a burn using cool tap water up to 30 minutes for burns ≤ 5 % TBSA is acceptable.
- The risk of hypothermia and delay in transfer by taking the time to dress a large burn outweighs any benefit and is not recommended and may increase patient mortality.
- Prior to transfer the patient must be kept warm and dry. Normothermia is essential in all trauma patients. Cover with dry sterile sheets (e.g. Medline sterile ¾ drape) otherwise, use clean dry sheets and rewarm in accordance with exposure/environment recommendations.
- Patients being transferred for definitive care **should NOT** have any ointments or creams applied.
- Burn injuries are considered tetanus prone-tetanus prophylaxis should be provided when applicable. Tetanus is considered current if within the last five years and is the only medication that may be given intramuscularly to a burn patient.
- There are no indications for prophylactic antibiotics in burns.
- Burn care and appropriate dressing for burn patients not meeting criteria for transfer and able to be discharged and consulted by plastics later should be guided by local plastics or consulting plastic surgeon.

CLINICAL MANAGEMENT ISSUES

- A major burn may present practical clinical management issues rarely encountered otherwise. Examples of this include securing critical lines or endotracheal tube in the presence of surrounding burned tissue:

    - In all cases, securing these lines and tubes takes precedence over dressings to the surrounding skin.
    - In the case of the endotracheal tube, trach ties are acceptable even with burned facial skin.
    - With respect to peripheral and central lines through burned tissue (only when necessary), it is prudent to **suture secure** these as standard taping and adhesives are often ineffective on burned tissue, particularly if wet.
    - Standard sterile technique and precautions are appropriate as with any patient. No special barriers need to be placed between facial skin and a non-rebreather mask in the acute phase of management.

GRADE LEVEL OF EVIDENCE:

Grade B Practice Recommendations

Generally, clinicians should follow a recommendation but should remain alert to new information and sensitive to patient's wishes. These recommendations are based on the scientific evidence currently available and are not intended to be absolute nor are they intended to limit individual practice.

CHANGE LOG:

1. **April 2026**- Burn Resuscitation Worksheet Revised– Original Burn Worksheet dated December 2020 removed and the revised version now dated April 2026 was added as Appendix B and C.
   Author responsible- Leisa Ouellet

Appendix A

Burn Depth

Burn Depth	Colour	Blanching	Blisters	Sensate	Pain
1st degree/ Superficial	Red	√	Ø	√	√
2nd degree/ Superficial Partial	Pale pink/Red	√	√	√	√
2nd degree/Deep Partial	Mottled or Cherry Red	Reduced	√/Unlikely	Unlikely	Unlikely
3rd degree/Full thickness	White, Leathery or Black Eschar	Ø	Ø	Ø	Ø
4th degree	Involves muscle/ bone	Ø	Ø	Ø	Ø

ADULT
≥13 years

Trauma NB

BURN RESUSCITATION FLUIDS GREATER THAN 20% 2ND AND 3RD DEGREE TBSA BURN WORKSHEET

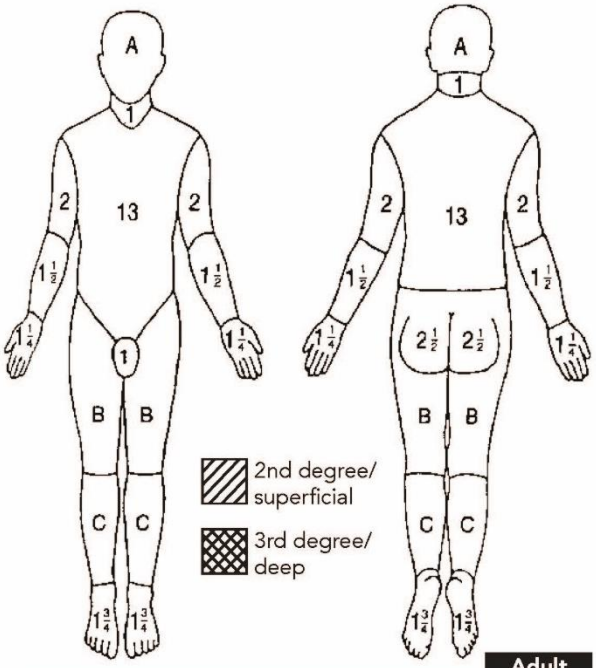
PATIENT LABEL

Date of burn: Month_____ / DD_____ / YYYY_____

Time of burn: _____ **Weight in kg:** _____
Estimated/Actual

LUND & BROWDER CHART

REGION - 2nd and 3rd degree ONLY	Total %	Sub total %
Head	7	
Neck	2	
Anterior trunk	13	
Posterior Trunk	13	
Right buttock	2.5	
Left buttock	2.5	
Genitalia	1	
Right upper arm	4	
Left upper arm	4	
Right lower arm	3	
Left lower arm	3	
Right hand	2.5	
Left hand	2.5	
Right thigh	9.5	
Left thigh	9.5	
Right lower leg	7	
Left lower leg	7	
Right foot	3.5	
Left foot	3.5	
Total Burn Surface Area % (TBSA)		



	Adult
A - 1/2 of head	3.5
B - 1/2 of one thigh	4.75
C - 1/2 of one lower leg	3.5

Date: Month / DD / YYYY / /	Time of assessment:
Name and Signature of Physician:	

THIS IS NOT A PHYSICIAN ORDER RECORD

Fluid of choice: Warmed Lactated Ringers (LR). No adjustment for fluid initially given. If fluid resuscitation is delayed there is "no catching up". If significantly delayed ≥ 6 hours post burn contact Trauma Line for guidance.

THERMAL & CHEMICAL:

Step A: Total Fluid Calculation
2 mL LR x _____ kg x _____% TBSA =_____Total mL

Step B: Infusion Starting Rate
Total mL _____÷16 = _____ mL/hr

ELECTRICAL INJURY:

Step A: Total Fluid Calculation
4 mL LR x _____ kg x_____% TBSA =_____Total mL

Step B: Infusion Starting Rate
Total mL _____÷16 = _____mL/hr

CRITICAL EVALUATION: ADJUST IV RATE ACCORDING TO HOURLY URINE OUTPUT & CLINICAL RESPONSE.

Expected hourly urinary output – Thermal & Chemical: 30-50mL/hr / Electrical injury: 75-100mL/hr

Tetanus given? ☐ **Yes** ☐ **Up to date** (Tetanus considered UTD if within last 5 years)

Burn consultation criteria met? ☐ **Yes** ☐ **No** **Trauma Line called?** ☐ **Yes** ☐ **No**
(Refer to Burn Consensus Statement)

Date: _____ **Time:** _____ **Signature:** _____

PERMANENT RECORD

HHN-1130 (04/26)

PEDIATRIC
≤12 years

Trauma NB

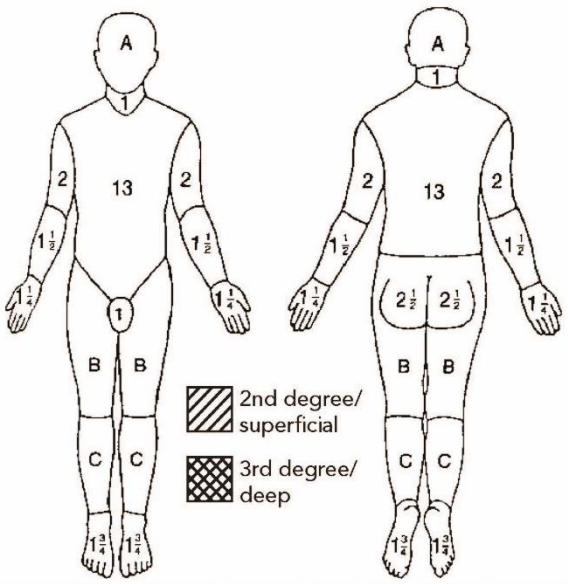
BURN RESUSCITATION FLUIDS GREATER THAN 15% 2ND AND 3RD DEGREE TBSA BURN WORKSHEET

PATIENT LABEL

Date of burn: Month____ / DD_____ / YYYY_____

Time of burn: _____ **Weight in kg:** _____
Estimated/Actual

REGION - 2nd and 3rd degree ONLY	Total %					Sub total %
	Birth-1	1-4	5-9	10-14	15	
Head	19	17	13	11	9	
Neck	2	2	2	2	2	
Anterior trunk	13	13	13	13	13	
Posterior Trunk	13	13	13	13	13	
Right buttock	2.5	2.5	2.5	2.5	2.5	
Left buttock	2.5	2.5	2.5	2.5	2.5	
Genitalia	1	1	1	1	1	
Right upper arm	4	4	4	4	4	
Left upper arm	4	4	4	4	4	
Right lower arm	3	3	3	3	3	
Left lower arm	3	3	3	3	3	
Right hand	2.5	2.5	2.5	2.5	2.5	
Left hand	2.5	2.5	2.5	2.5	2.5	
Right thigh	5.5	6.5	8	8.5	9	
Left thigh	5.5	6.5	8	8.5	9	
Right lower leg	5	5	5.5	6	6.5	
Left lower leg	5	5	5.5	6	6.5	
Right foot	3.5	3.5	3.5	3.5	3.5	
Left foot	3.5	3.5	3.5	3.5	3.5	
Total Burn Surface Area % (TBSA)						



Age (years)	Birth-1	1-4	5-9	10-14	15
A - 1/2 of head	9.5	8.5	6.5	5.5	4.5
B - 1/2 of one thigh	2.75	3.25	4	4.25	4.5
C - 1/2 of one lower leg	2.5	2.5	2.75	3	3.25

Date: Month / DD / YYYY ___ / ___ / ___ **Time of assessment:**

Name and Signature of Physician:

Fluid of choice: Warmed Lactated Ringers (LR). No adjustment for fluid initially given. If fluid resuscitation is delayed there is "no catching up". If significantly delayed ≥ 6 hours post burn contact Trauma Line for guidance.

THERMAL & CHEMICAL:

Step A: Total Fluid Calculation
3 mL LR x _____ kg x _____% TBSA =_____Total mL

Step B: Infusion Starting Rate
Total mL _____÷16 = _____ mL/hr

ELECTRICAL INJURY:

Step A: Total Fluid Calculation
4 mL LR x _____ kg x_____% TBSA =_____Total mL

Step B: Infusion Starting Rate
Total mL _____÷16 = _____mL/hr

CRITICAL EVALUATION: ADJUST IV RATE ACCORDING TO HOURLY URINE OUTPUT & CLINICAL RESPONSE.

Expected hourly urinary output: ≤ 30kg 1 mL/kg/hr / > 30kg 0.5mL/kg/hr up to 50mL/hr / Electrical injury > 30kg: 75-100mL/hr

Tetanus given? ☐ **Yes** ☐ **Up to date** (Tetanus considered UTD if within last 5 years)

Burn consultation criteria met? *(Refer to Burn Consensus Statement)* ☐ **Yes** ☐ **No** **Trauma Line called?** ☐ **Yes** ☐ **No**

≤ 12 years Add maintenance fluid: D5W Lactated Ringers or D5W NaCl 4-2-1 Formula Volume calculated Total mL/hr	Volume calculated	Total mL/hr
4 mL/kg per hour for the 1st 10 kg body weight		
+ 2 mL/kg per hour for the 2nd 10kg body weight		
+ 1 mL/kg per hour for each additional kg over 20 kilograms		

Date: _____ **Time:** _____ **Signature:** _____

HHN-1130 (04/26)

PERMANENT RECORD

LUND & BROWDER CHART

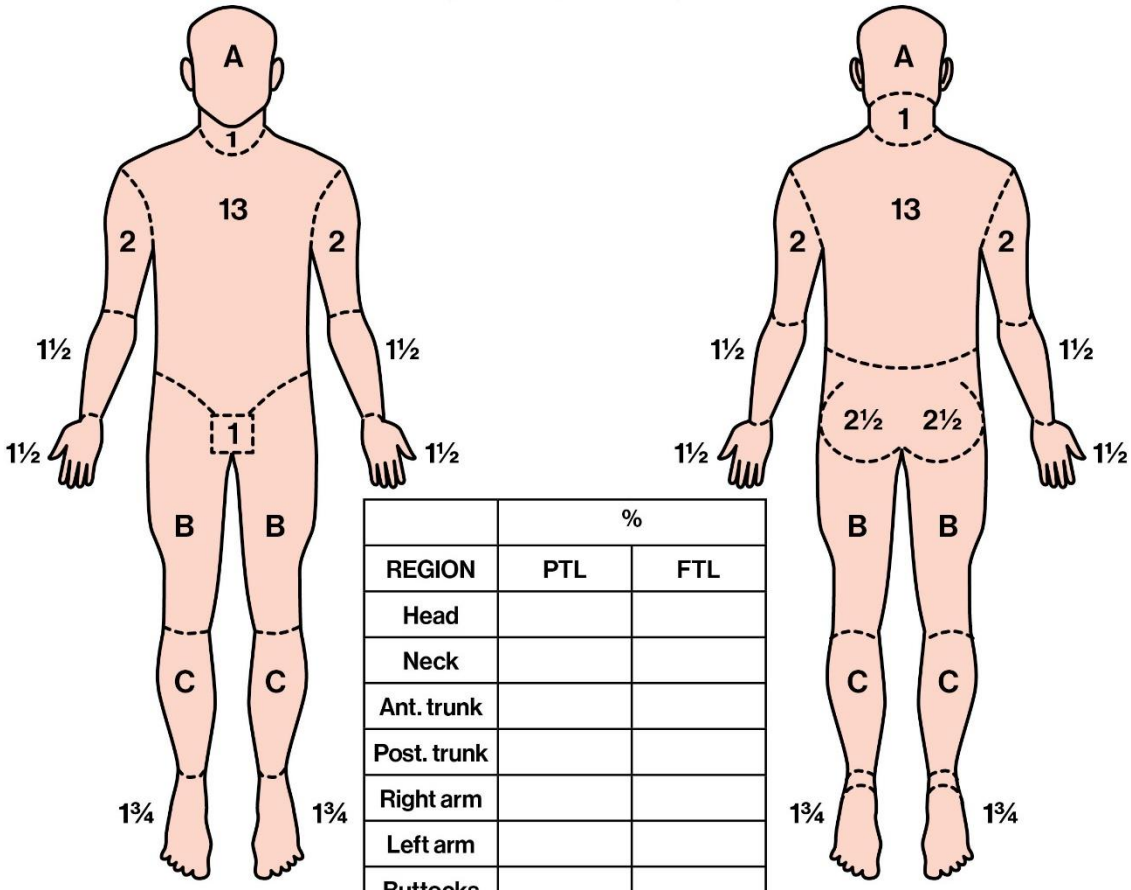
THIS IS NOT A PHYSICIAN ORDER RECORD

Appendix D

Lund & Browder Chart

% Total Body Surface Area Burn

Be clear and accurate, and do not include erythema
(Lund and Browder)

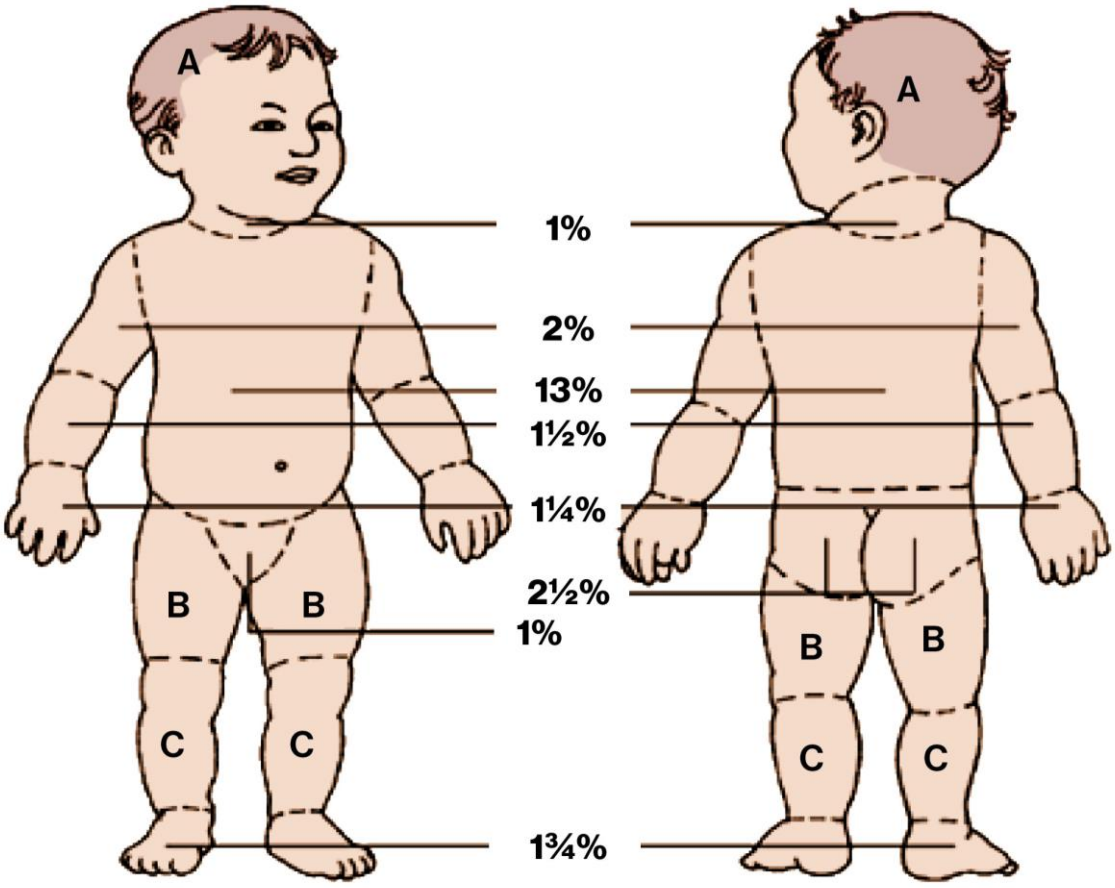


	%	
REGION	PTL	FTL
Head		
Neck		
Ant. trunk		
Post. trunk		
Right arm		
Left arm		
Buttocks		
Genitalia		
Right leg		
Left leg		
Total burn		

AREA	AT BIRTH	0 TO 1 YR	1 TO 4 YR	5 TO 9 YR	10 TO 15 YR	ADULT
A = ½ HALF OF HEAD	9½%	8½%	6½%	5½%	4½%	3½%
B = ½ HALF OF ONE THIGH	2¾%	3¼%	4%	4¼%	4½%	4¾%
C = ½ HALF OF LEG	2½%	2½%	2¾%	3%	3¼%	3½%

Appendix E
Lund & Browder Chart

To determine the extent of an infant's or child's burns, use the Lund and Browder Chart shown here.

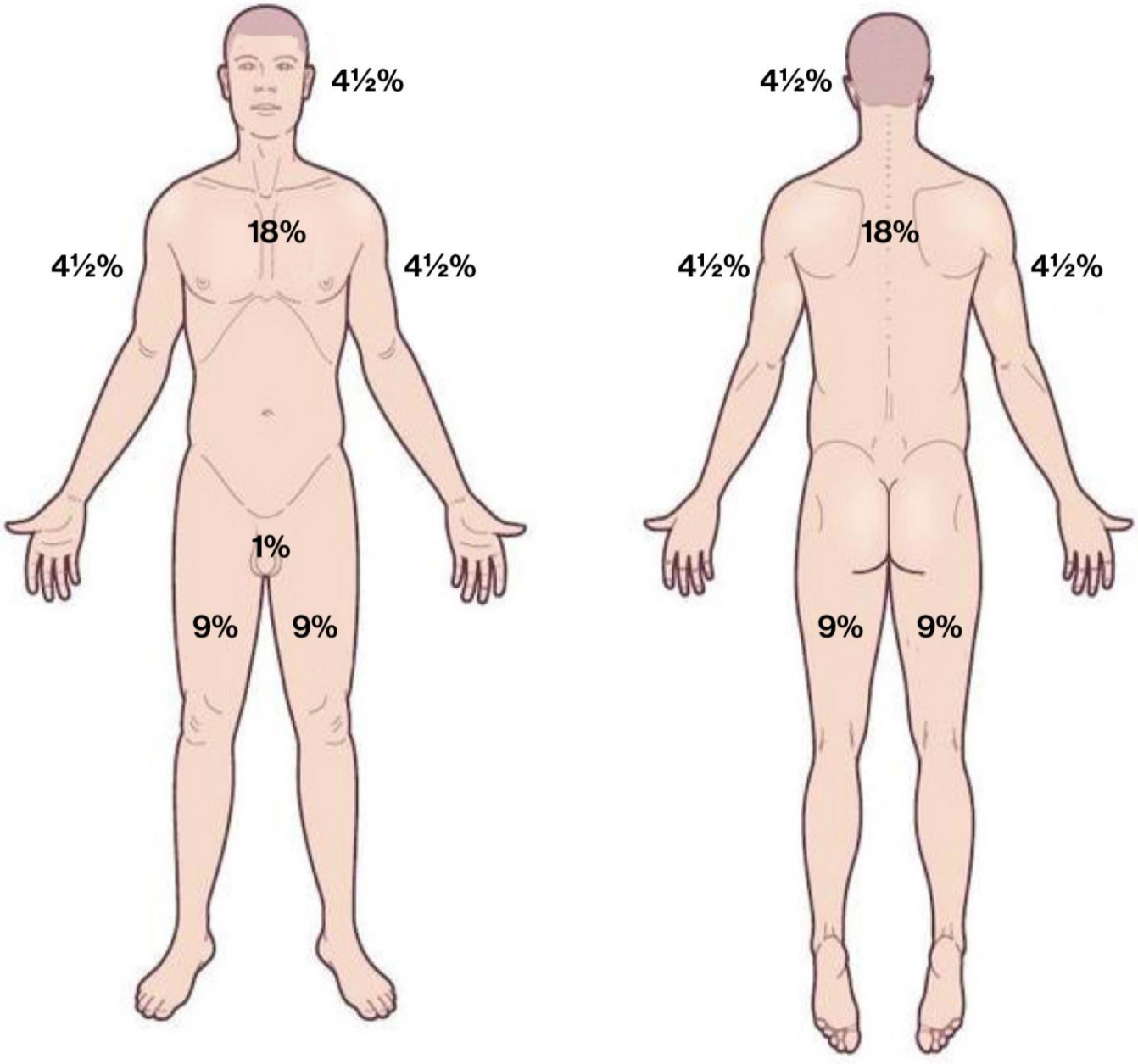


RELATIVE PERCENTAGES OF AREAS AFFECTED BY GROWTH

	AT BIRTH	0 TO 1 YR	1 TO 4 YR	5 TO 9 YR	10 TO 15 YR	ADULT
A: Half of head	9½%	8½%	6½%	5½%	4½%	3½%
B: Half of thigh	2¾%	3¼%	4%	4¼%	4½%	4¾%
C: Half of leg	2½%	2½%	2¾%	3%	3¼%	3½%

Appendix F

RULE OF NINES (Adults)

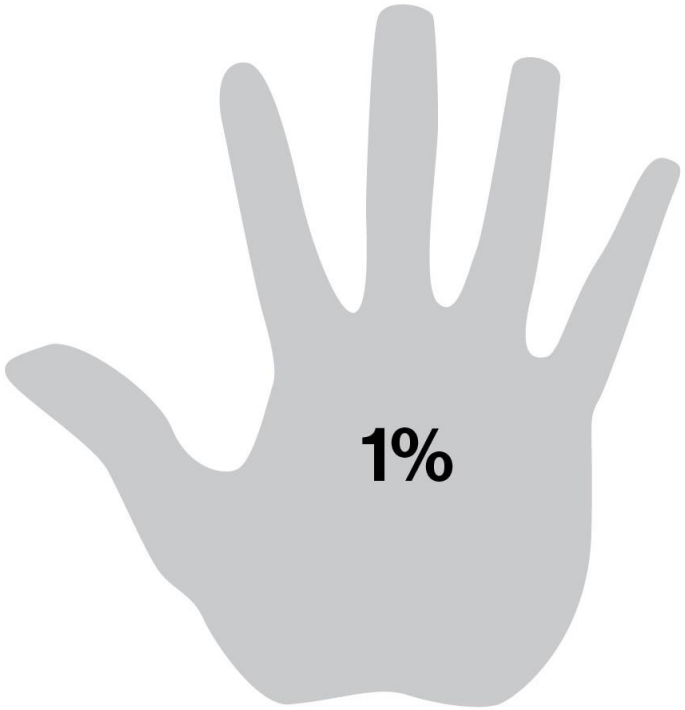


Appendix G

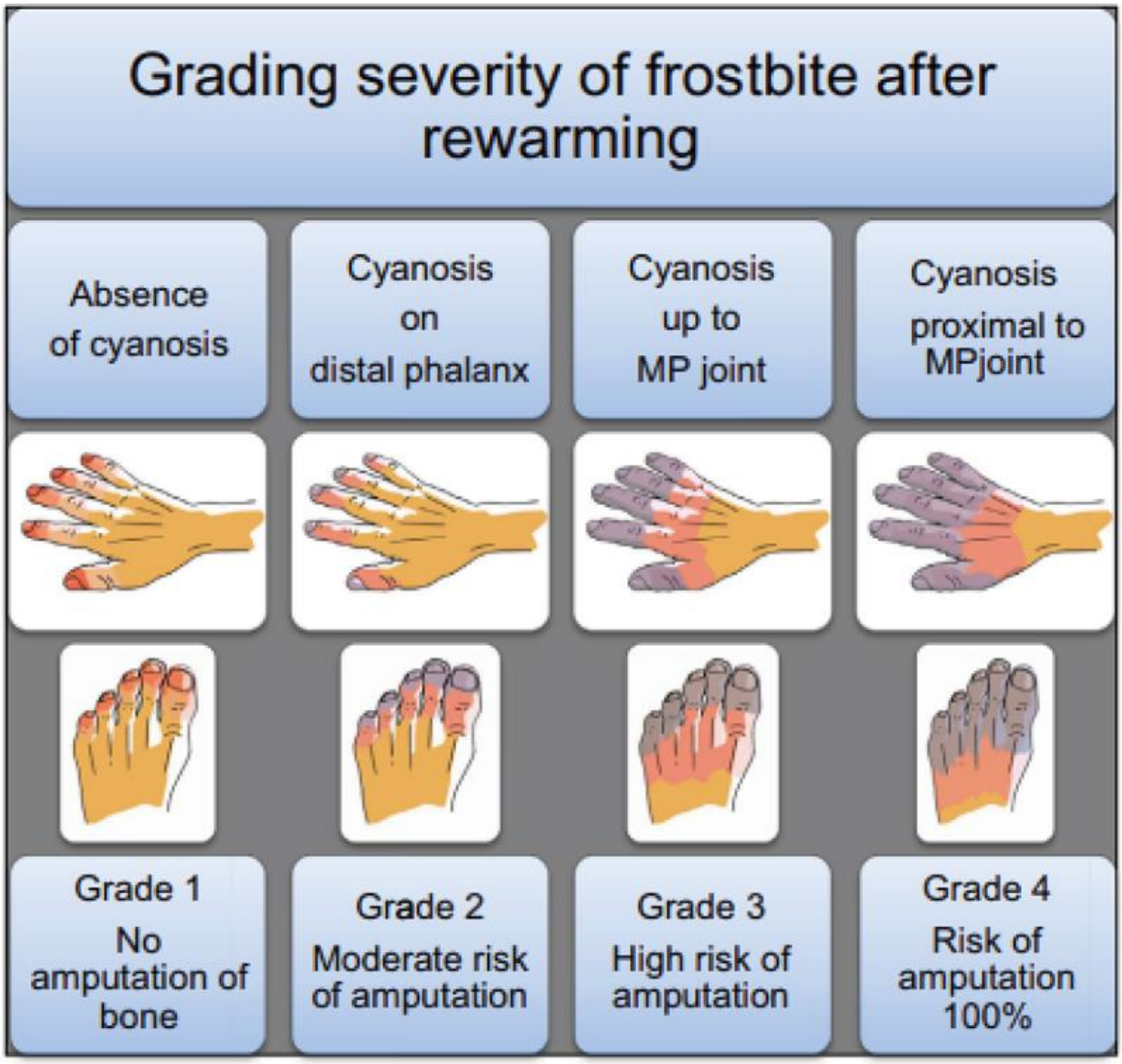
PALMAR METHOD
ESTIMATE IRREGULARLY SCATTERED BURNS

PATIENT'S PALM & FINGERS=1%

PALMAR METHOD FOR BURN SIZE CALCULATION



Appendix H
Cauchy Classification Scheme



Cauchy E, Chetaille E, Marchand V, Marsigny B. Retrospective study of 70 cases of severe frostbite lesions: a proposed new classification scheme. *Wilderness & Environmental Medicine*. 2001;12(4):248-255. doi:10.1580/1080-6032(2001)012[0248: RSOCOS]2.0.CO;2