

University of Colorado Hospital Burn Unit Rotation Orientation

Topics

Life on the Burn Service

The Interprofessional Team

Burn Alerts and Activations

Acute Burn Resuscitation

Frostbite- t-PA

General Burn Service admission/ discharge criteria

- Photos
- Lund&Browders

Level of Care Considerations

Wound Care Procedures- infection control, sedation (ketamine, premedex)

Nutritional Support- general, OR

Lidocaine infusion for acute pain management

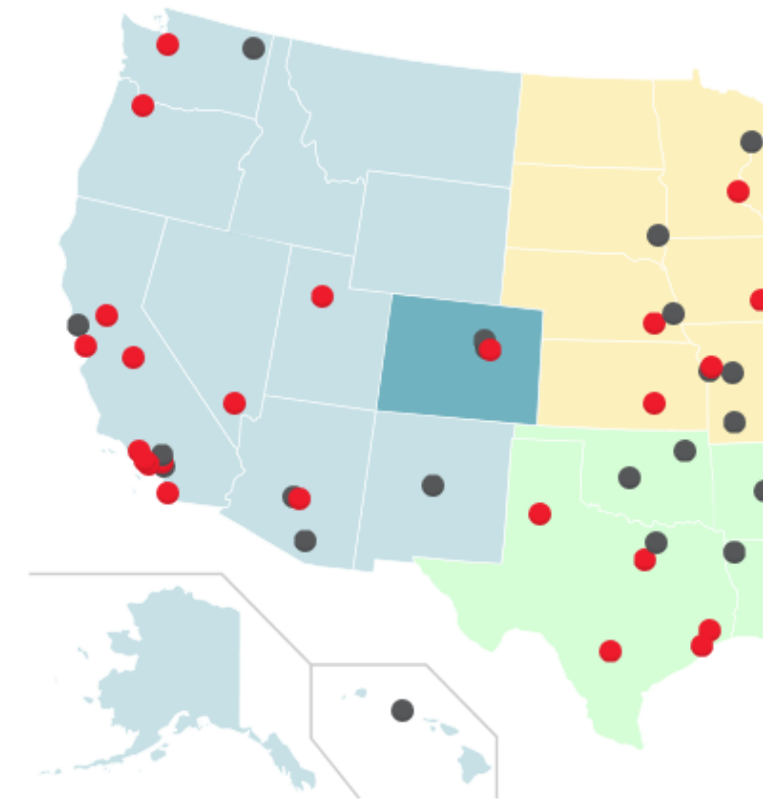
ASD/PTSD

When to call the Attending

Pall Care collaboration

UCH Burn Center

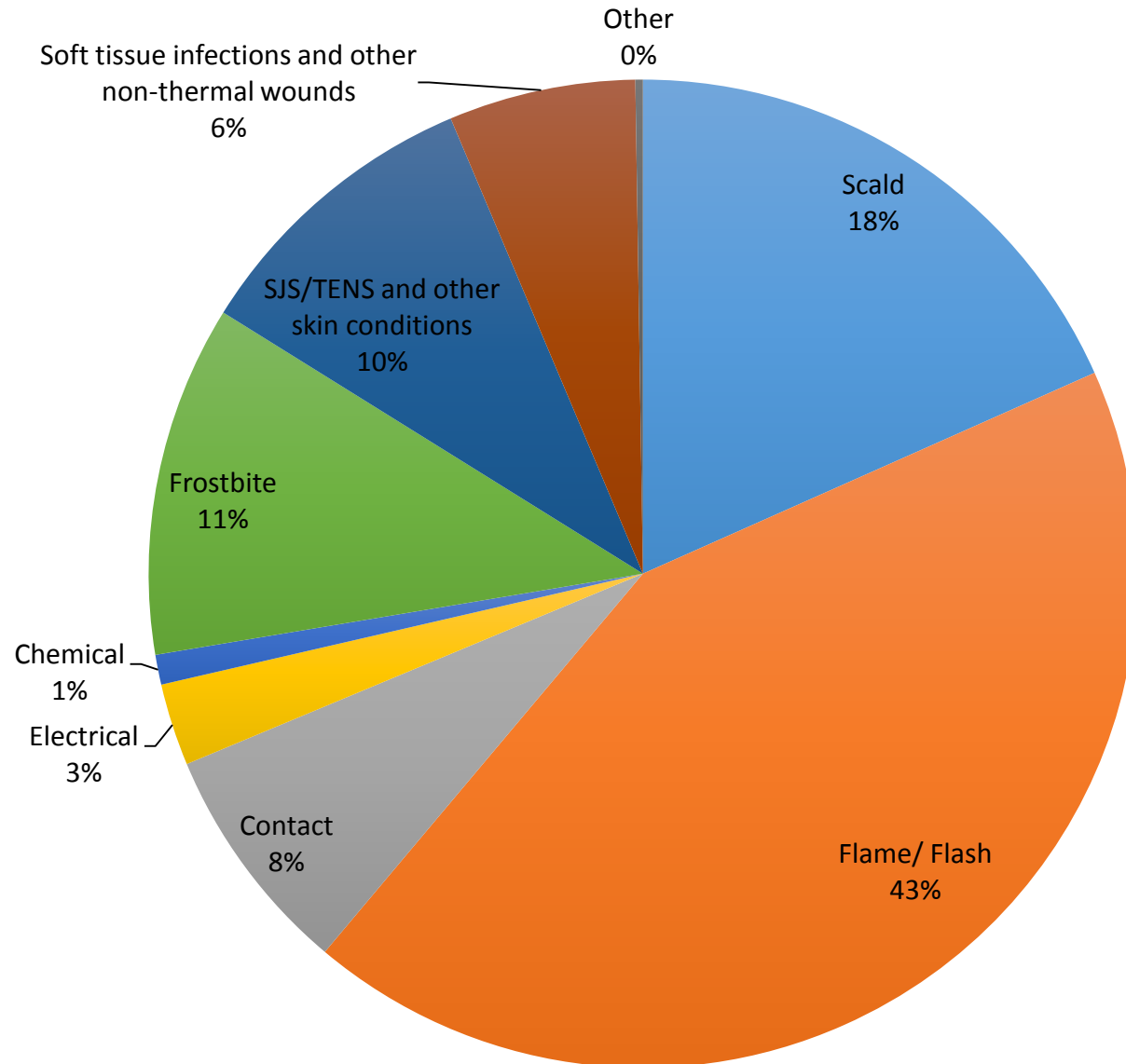
- Regional Burn Center verified by the American College of Surgeons/ American Burn Association (ACS/ABA)
 - Serves the State of Colorado and the surrounding region (Wyoming, New Mexico, Montana, North & South Dakota, Nebraska & Kansas).
- Consists of inpatient and outpatient settings
- Types of patients include:
 - Burn injuries- flame/flash, scald, contact, chemical, electrical, radiation
 - Inhalation injury- smoke inhalation and poisons such as CO and cyanide
 - Cold injuries/ Frostbite
 - Other cutaneous injuries/ diseases that involve loss of epidermal and/or dermal tissue
 - SJS/ TENS
 - Friction and degloving injuries
 - NSTI
 - Purpura Fulminans, Pemphigus...



Red dots represent locations with [ABA Verified Burn Centers](#)

- Northeast Region
- Southern Region
- Eastern Great Lakes Region
- Midwest Region
- Western Region

FY 2017 Mechanism of Injury



FY 2017 admissions

409 new patient admissions

448 total admissions

Multidisciplinary Team

Attendings and APPs

Care Coordinators: SW/Case Manager

Chaplain

Clinical Coordinator

Infection Control

Nursing / Nursing Leadership

- Nurse Manager, Nurse Educator, Charge RNs

Nutrition

Outreach Manager

Pharmacy

Psychology

Research Assistant

Respiratory Therapy

Therapy- PT/OT/ SLP



Day to Day Operations

Workflow: Weekly Schedule

Daily:

- Meet with APPs on the ICU side to split up patients and get overnight sign out
- Rounds start at 08:30am (except Thursday- see below)
- Progress note/ consult note daily
- Flash Dispo Rounds with Case Management, Social Work, Charge RNs, APPs, and Residents at 2:45pm – meet by Charge RN desk on ICU side.
- Afternoon rounds and sign out from APPs to Resident at 3:30pm daily

Monday:

- Grand Rounds in auditorium from 7:00am-8:00am. Surgical Residents should attend, this is optional for ER Residents.
- Order wound screening cultures – to evaluate for colonization in case of cellulitis
- Surgical Residents overnight call shift.

Tuesday:

- M&M Conference in Leprino, 6th floor from 6:30am-7:30am - Surgical Residents should attend, this is optional for ER Residents.
- Dispo Rounds in Burn Conference Room at 11:00am.
- ER resident overnight call shift and ER Resident day off.

Wednesday:

- ER Residents have conference and this will be there day off. Surgical Residents will help to cover the unit.

Thursday:

- Multidisciplinary Rounds/Quality Improvement Committee in Burn Conference Room 8:00am-10:00am.

Weekends:

- One APP will be on over the weekends. The patients will be split appropriately to ensure one person is not carrying the majority of the load.

Admission Paperwork



- Contact Attending on call to accept the patient
- Complete the Admission tab on the left of Epic to update Problems, Meds, Allergies, PMH, PSH, Social Hx, and Fam Hx.
- Perform Med-Rec.
 - If the patient does not know home medication or has complicated Hx, call the PAS team (34055) to perform med-rec.
- Use burn admission order sets: UCH Burn Injury Non-ICU Admission; UCH Burn Injury ICU Admission.
 - The order sets are being revised, please pay careful attention to what you are ordering. (DO NOT order iron studies, there should not be ranges for meds)
 - Admission labs to be ordered: CBC, BMP, Mag, Phos, LFT, pre-albumin, CRP, UTox, Pregnancy for women of child-bearing age
 - Enter acute pain orders and wound care pain med orders prior to initial debridement. (DO NOT order IV pain meds outside of wound care needs)
 - Enter Wound care orders
- Use the template ADMISSION H&P UCH IP for the note.
- Lund and Browder: Fill in picture of burns, total all percentages, place label on form and sign, take a picture using Haiku and label Lund and Browder.
- Take initial admission pictures of wounds using Haiku and label.
- Start a Discharge summary and update major events daily.
- Burns 20% or greater and inhalation injuries will require the nurse driven resuscitation protocol.

General Tips

- Central Lines:
 - Need to be changed every 7 days (unless otherwise discussed).
 - The first line will be a new stick, then 2 re-wires can occur.
 - After 2 re-wires the patient will need another new stick.
- Midlines:
 - <30 days
 - Inserted by the PICC team. We DO NOT insert PICC Lines on our burn patients.
- Labs should be drawn every Monday as required: pre-albumin, CRP, Mag, Phos, LFTs, anti-Xa (timed 4 hours after Lovenox is given)
- Screening Cultures
 - q Monday
 - Screening culture, specimen source is Burn, screening for BUSC.
 - Check for colonization- if pt develops cellulitis, we know what to cover
 - DOES NOT allow for sensitivities.

*If a specific wound needs cultured (ie. concern for infection) Aerobic culture, swab, and the body part which is being cultured. This will allow for sensitivities.

Surgical Resident Responsibilities

Pre-op:

- Add cases to the OR schedule as discussed with Burn Surgeon
- The night prior to Surgery: ensure each patient has NPO, T&C, and prepare PRBC orders, as well as a signed consent
 - **If the patient has an established airway, DO NOT stop tube feeds as we feed through the OR**
 - If no established airway, enter NPO at 0130 except medication order and place nursing communication order to stop tube feeds at 0130

Morning of OR:

- Assess all patients going to the OR
- Ensure consent and marking site forms are signed
- Complete progress note on all patients going to the OR

Post-op:

- Send text to all Attendings, APPs, and Residents with OR procedures and post-op dressings
- Update Wound Care orders with specific dressings and dates for scheduled takedowns and donor site dressings
 - Enter Wound vac orders if needed
- Update diet order
- Update Activity Orders
- Complete Brief Op note

*After all surgeries are complete for the day, please return to the floor to check in with the ER Resident and APPs and help with notes or procedures needing completed.

Progress / Consult Notes

Each patient should have a progress note for each day they are on the service and each consult patient should have a consult note each day they are seen.

We are in the process of getting a Burn Progress Note Approved. Until then, you may steal the smart phrase from Amber Kohler entitled .akprogressnote.

- Each progress note must have the following components:
 - HPI
 - Active problem list (.prob)
 - Procedures list
 - Location, depth, and TBSA % of the burns
 - When referring to burns label the depth and degree as follows: superficial thickness (first degree), partial thickness (2nd degree), full thickness (third degree)
 - Be specific when describing the location of the burn: right vs left, head, neck, chest, abdomen, upper back, lower back, upper arm, forearm, hand including/not including fingers, thigh, lower leg, foot including/not including toes
 - 24 hour updates/new plans
 - Assessment and plan by systems
 - New subjective by patient
 - New physical assessment

Discharge Paperwork

Discharge tab at left:

- Complete Med-Rec. Prescribe and sign medication and discharge order. Opiates must be e-prescribed or printed and signed by the resident and attending.
- New pain meds to last until follow up appointment, ABx, DMEs, ambulatory referrals, and home health orders are to be entered in med-rec portion of discharge under Other Orders for Discharge.
- Home health order is titled: Home Health Care Transfer Discharge
- Complete discharge instructions: Steal smart phrase from Amber Kohler entitled .akdischarge
- Cristopher Cloney (case management) will need a Prism form filled out and given back to him to allow for supplies to be mailed to the patient - please leave at his desk on the weekend

Please schedule a Burn Clinic follow up appointment

- If it is the weekend, do not promise a specific date/time for the appointment. Place the label on a sticky note and desired date/time and leave on clinic desk. Clinic will call the patient on Monday morning.

Complete a discharge summary:

- This must be completed within 24 hours of discharge.
- Please focus on pain meds and wound care at discharge and major events throughout hospitalization, ie: infections and antibiotics, procedures, intubations, lines, post-op bleeding, complications, etc

Admissions

New Admissions

- We are never closed and never decline referrals!
- Admit patients ≥ 14 years old and ≥ 40 kg.
- **Burn Surgeon Attending is available for consultation and triage 24hrs/ day.**
 - **All patient's will be accepted by a Burn ATTENDING**
- Referral Process:
 - Admissions from other facilities/ burn clinic- DocLine process
 - Admission from UCH ED- Burn Team Notification: Activation, Alert and Consult

	Number of new patient admissions	% of new patient admissions
Admissions from Burn Center Outpatient Office/Clinic	38	9
Direct from Scene of Injury	100	24
Transfer from an Emergency Department or Ambulatory Care Center	254	62
Transfer from Another Acute Care Facility	5	1
Unknown / Other / NA	12	3

Burn Team Notification: Activation/ Alerts/ Consults

Response

Activation:

- Provider response to ED should be immediate.
- Attending communicates directly with ED.
- Burn Provider to call Attending following assessment.

Alert:

- Provider response to ED within 10 min.
- Following evaluation, call Burn Surgery Attending.

Consult:

- Burn Provider consult.
- Documentation should include H&P and when consulted with Burn Surgery Attending.

	Burn Activation		Burn Alert		Burn Consult	
Mechanism of Injury:		✓		✓		✓
Thermal burns (Contact, Flame, Flash, Scald) or Friction burns	20% or more TBSA of partial and/ or full thickness (2 nd and 3 rd degree) burns		5-19% TBSA of partial and/ or full thickness (2 nd and 3 rd degree) burns		Any burn injury (that does not meet Burn Activation/ Alert criteria)	
Inhalation Injury	Intubated inhalation injuries OR concern for secure airway		Non-intubated inhalation injuries			
Electrical Injury	High voltage electrical (1000V or more) or lightning injuries		Low voltage electrical injury (less than 1000V) with burn or neuropathy			
Chemical Burns	Chemical burns 20% or more TBSA		Chemical burns less than 20% TBSA			
	**Hydrofluoric acid burn 5% or more TBSA		**Hydrofluoric acid burn less than 5% TBSA		Frostbite injury with thawed extremities more than 24 hours	
Frostbite	Extremities: frozen or thawed within the last 24 hours, and Body temp: moderate (core body temp 30 – 34°C/ 86 – 93°F) to severe (core body temp less than 30°C / 86°F) hypothermia		Extremities: frozen or thawed within the last 24 hours, and Body temp: mild hypothermia (core body temp 34 – 35.9°C (93.2- 96.6°F) or normothermia			
Blast/ Explosion Injury	Blast or explosion with burn injuries					
Other/ "Non-thermal" Mechanisms					Soft tissue disorders or injuries such as TENs, SJS, Purpura Fulminans, Necrotizing Soft Tissue Infection, soft tissue degloving, and crush injury	
Other Factors:						
Multiple Mechanisms	2 or more concurrent mechanisms of injury that meet Burn Alert Criteria (i.e. low voltage electrical injury with 15% TBSA burn)					
# of Burn Patients	Arrival of 3 or more patients from the same incident regardless of acuity					
Attending Discretion	Emergency Department Attending, Trauma Surgery Attending or Burn Surgery Attending, or Burn Charge Nurse may upgrade the level of notification at their discretion					

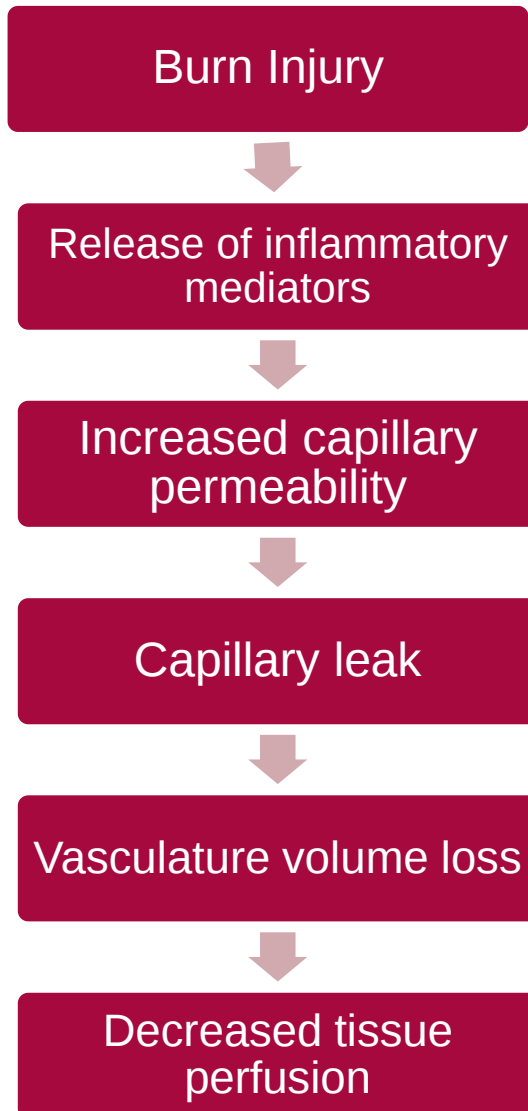
***Note: If the patient has concomitant traumatic injury, follow:**

- Burn Team Notification Activation/ Alert Criteria AND
- Trauma Activation/ Alert Criteria

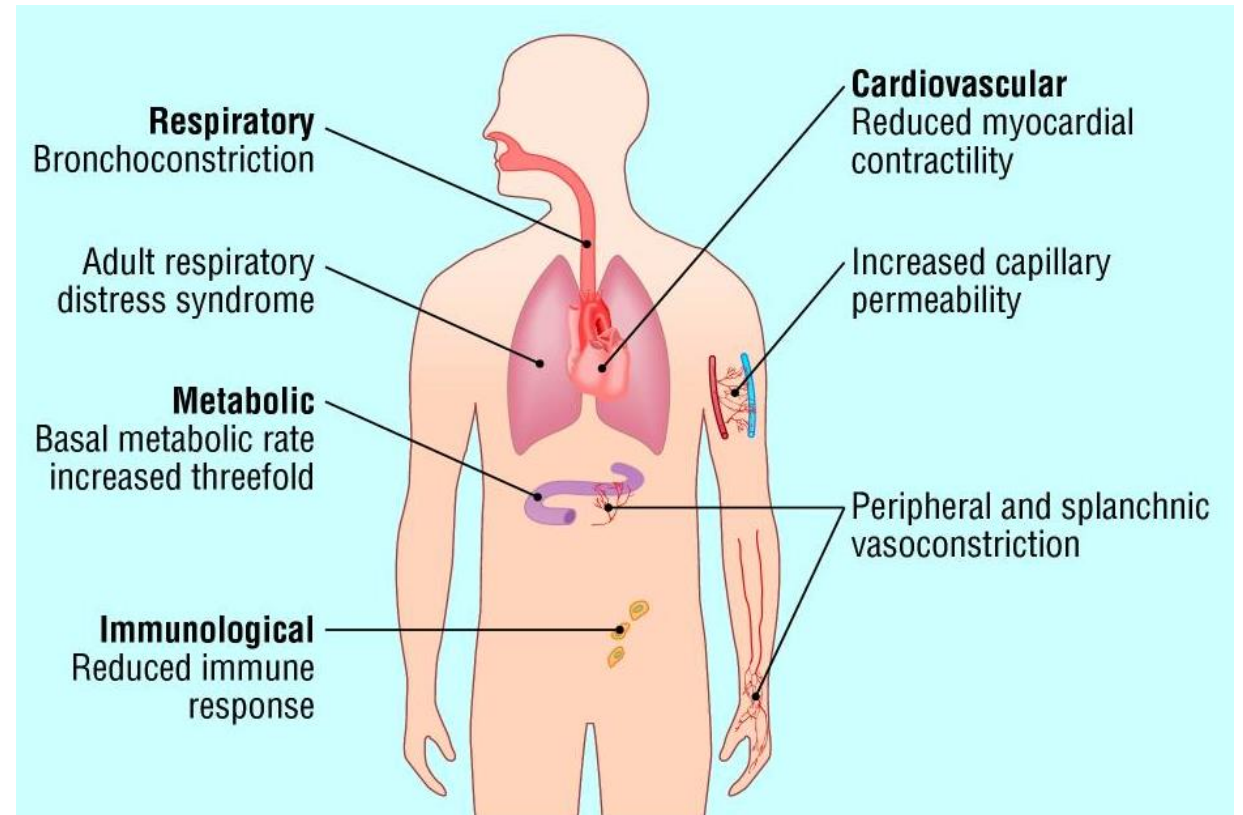
**** Hydrofluoric acid burn: also consult Toxicology**

***All burn patients in ED require burn team response/ consultation and associated documentation!**

Admitting > 20% TBSA Burn: Burn Resuscitation



Systemic response at ~ 30% TBSA burn



Resuscitation Board

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Burn Resuscitation:

> 20% TBSA, inhalation injury and electrical injury

During the Secondary Survey: **TAKE A TEAM TIME OUT**

Attending MD, 2nd year resident, primary RN, and burn tech present to discuss and confirm:

1. Accurate Weight, Height

2. TBSA-only to be measured once patient is completely debrided, use Lund and Browder chart

***Perform independent double check with RN and provider*

3. Resuscitative Fluid Start Rate

4. Need for Bladder Pressures (usually not needed)

5. FFP Start Criteria

1. To be given or not (based on TBSA)

2. Start time based on IVY score of 100ml/kg or 8 hours post burn injury

6. Fill out resuscitation Board

Burn Resuscitation:

> 20% TBSA, inhalation injury and electrical injury

Crystalloid Resuscitation:

- Fluid Starting Rate: Rule of Tens
 - < 80kg: $10 \times \text{(\%TBSA)} = \text{mL/hr}$
 - > 80kg: $10 \times \text{(\%TBSA)} + \text{(100mL for every 10kg over 80kg)} = \text{mL/hr}$
 - Electrical or inhalation injury: Add 20% to %TBSA then use above “Rule of 10s” calculation.
- Monitoring fluid resuscitation: Urine Output goals

Weight (kg)	UOP Range (mL/hr)
≥100	50-70
85-99	45-50
75-84	40-45
65-74	35-40

Weight (kg)	UOP Range (mL/hr)
55-64	30-35
45-54	25-30
40-44	20-25
Electrical Injury	1-2mL/kg/hr

- Crystalloid resuscitation fluid titrated hourly
 - If UOP > goal → ↓ fluid by 10%
 - If UOP < goal and
 - MAP > 65 → ↑ fluid by 10%
 - MAP < 65 → consider vasopressor

Colloid Resuscitation

- $\geq 30\%$ TBSA- start at 8 hours post injury
- $< 30\%$ TBSA- Healthcare provider discretion based on overall fluid status, UOP etc.
 - Start at 8 hours post injury or when IVY score reaches 100 (100mL/kg of resuscitation fluid administered)

*If any chance FFP will be administered, order 8-10units for T&S *on admission*

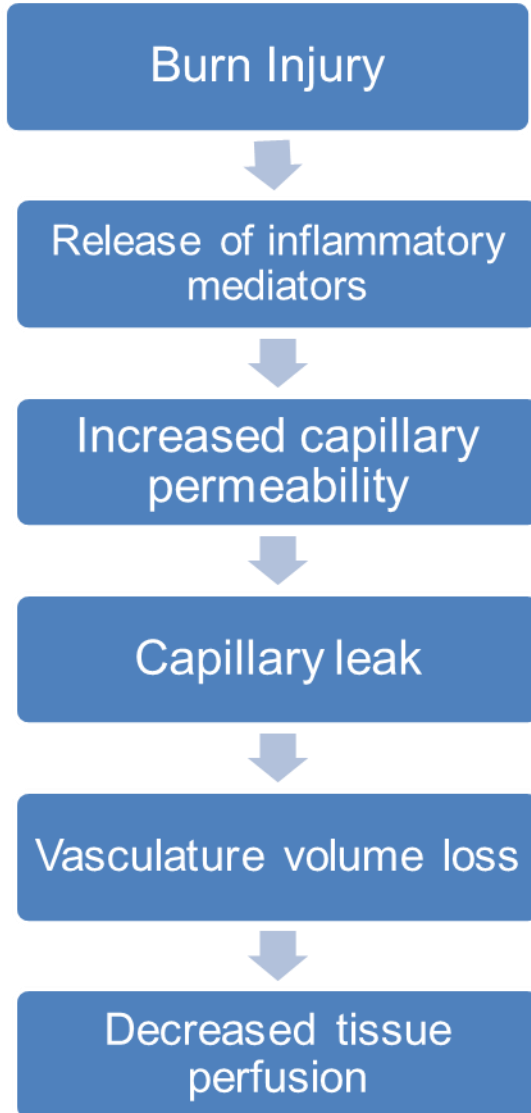
FFP volume/ rate:

- **Total FFP Volume:** $0.5\text{mL} \times \text{_____} (\text{kg}) \times \text{_____} (\% \text{TBSA}) = \text{_____} \text{mL}$
- **FFP Rate:** $\text{_____} (\text{Total FFP Volume}) / 8\text{hrs} = \text{_____} \text{mL/hr}$

If additional colloid needed after FFP volume infused, consider 25% Albumin drip @ 10mL/hr



Resuscitation Pearls



- Goal: core organ perfusion and oxygen delivery
- UOP goals of 0.5 to 1.0ml/kg/hour
- If loose UOP as monitoring parameter (AKI, CKD...) consider trending labs (lactate and BD) and IVC ultrasound
- Do NOT bolus – increases third spacing
- Do NOT use a diuretic
 - *Exception:* Continue diuretic only if on home dose to maintain baseline
- Antibiotics unlikely needed acute resuscitation.
 - Patient will have initial leukocytosis.
- Do not decrease resuscitation fluid below minimum hourly infusion rate/ burn maintenance fluid rate:

$$\begin{aligned} \text{Maintenance rate: } & (\text{_____ (kg)} + 40 \text{ mL}) + \\ \text{Insensible loss: } & [(25 + \text{_____ \%TBSA})] \times \text{_____ (BSA)} \\ & = \text{_____ mL/hr} \end{aligned}$$

Triggers to Call the Burn Attending During a Resuscitation

- UOP < goal x 2 consecutive hours
- Hypotension with MAP < 65mmHg / prior to initiating a vasopressor
- Bladder pressure > 15mmHg
- Prior to initiation of any diuretics or additional colloid
- Unable to wean resuscitation fluid x 4 hours



Inhalation Injury Considerations

- Increase mortality and morbidity
- Diagnosed by bronch
- High Frequency Percussive Ventilation (HFPV) (often referred to as IPV/IPPV at UCH)/ Medinebs q 4 hours
- Heparin 5,000 units in NS; 3mL inhaled q 4 hours (alternate with albuterol nebs)
 - Breaks down fibrin casts; prevents coagulation
- Albuterol 0.5%; 2.5mg inhaled q 4 hours (alternate with heparin nebs)
- CONSIDER- N-acetylcysteine 20% 3ml inhaled q 4 hours
 - Mucous portions of casts from sloughed mucosa are fragmented by N-acetylcysteine → mucolytic agent permitting expectoration
 - If administered, must be administered with Albuterol due to the potent respiratory profile of N-acetylcysteine
- Carbon monoxide- 100% O2 reduces half life from 4hrs→1 hr
- Cyanide- hydroxocobalamin (rarely actually needed)



Initial Assessment and Management of the Burn Patient: Primary and Secondary Survey

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Initial Assessment and Management of the Burn Injured Patient

Body Substance Isolation

Primary Survey: A through E

Assess and manage life- and limb-threatening conditions

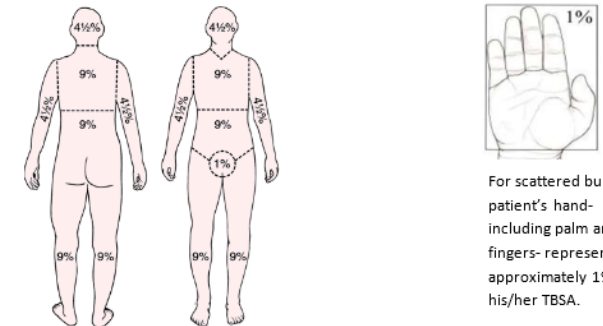
- **Airway** maintenance with cervical spine protection
 - **Breathing** and ventilation
 - o 100% oxygen per nonbreather mask if indicated or for suspected carbon monoxide poisoning
 - o If you are going to intubate – **get history here**
 - AMPLET: Allergies, Medications, Past history, Last meal, Events leading to injury, Tetanus
 - o Intubate if indicated
 - * Prophylactic intubation is no longer recommended. Call the Burn Team ASAP if suspecting need to intubate.
 - **Circulation** with hemorrhage control, Cardiac Status, Cardiac Monitor
 - * Burns do not bleed! If there is bleeding, identify and treat the cause
 - o Obtain EKG if there is an electrical injury, concurrent trauma or positive cardiac history
 - o Assess peripheral perfusion ("6P's") HOURLY in any extremity with circumferential cutaneous burn or an electrical injury contact site
- Fluid Management for Burns >20% TBSA**

 - IV/ IO – insert large bore IV/ IO and initiate fluid resuscitation using Lactated Ringer's (LR)
 - Rates during pre-hospital management and primary survey in the hospital
 - 14 years and older: 500 ml LR per hour
 - * Resuscitation rates will be fine-tuned during the secondary survey when the weight and accurate %TBSA burn has been determined at the Burn Center.
- **Disability**, Neurological Deficit, Gross Deformity
 - o Assess level of consciousness using AVPU (Alert; Responds to verbal stimuli; Responds to painful stimuli; Unresponsive)
 - If not alert and oriented, determine cause. Consider:
 - Loss of consciousness at scene?
 - Associated injury
 - CO poisoning
 - Hypoxia
 - Pre-existing medical condition (i.e. seizures, hypoglycemia...)
 - o Identify any gross deformity/serious associated injuries
 - **Exposure** / Examine / Environment Control
 - o Remove all clothing, jewelry, metal, diapers, shoes
 - o Log roll patient to remove clothing from back, check for burns and associated injuries
 - o Keep warm – apply clean dry sheet and blankets, maintain warm environment

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Secondary Survey

1. **History**
 - a. Circumstances surrounding the incident
 - b. AMPLET if not already obtained prior to intubation
 AMPLET: Allergies, Medications, Past history, Last meal, Events leading to injury, Tetanus
2. Obtain an **accurate height and weight** of the patient
3. **Complete head-to-toe evaluation** of the patient
 - a. If eye involvement, consult ophthalmology
4. Determination of percent and depth of **Total Body Surface Area (TBSA) burned**
 - a. Superficial (1st degree) burns are not calculated in the TBSA
 - b. Superficial partial thickness (2nd degree)
 - i. Involves the epidermis and a variable portion of the dermis
 - ii. Red, blistered, edematous, blanches
 - c. Full thickness (3rd degree)
 - i. Involves the destruction of the entire epidermis and dermis (including epidermal appendages)
 - ii. Whitish, charred or leathery appearance with possible coagulated vessels



For scattered burns, the patient's hand-including palm and fingers- represents approximately 1% of his/her TBSA.

5. **Fine tune resuscitation for patients with > 20% TBSA, inhalation injury and/or electrical injury -- see resuscitation protocol**
 Rule of 10's (fluid starting rate):
 ☐ < 80kg: 10 x _____ (%TBSA) = _____ mL/hr
 ☐ > 80kg: 10 x _____ (%TBSA) + _____ (100mL for every 10kg over 80kg) = _____ mL/hr
 ☐ Electrical or inhalation injury: Add 20% to %TBSA then use above "Rule of 10s" calculation.

6. Monitoring fluid resuscitation

Urine Output goals:

Weight (kg)	UOP Range (mL/hr)
≥100	50-70
85-99	45-50
75-84	40-45
65-74	35-40

Weight (kg)	UOP Range (mL/hr)
55-64	30-35
45-54	25-30
40-44	20-25
Electrical Injury	1-2mL/kg/hr

Lund & Browder

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BURN AREA CHART

Mark images accordingly: ☒ 2nd Degree/ Partial Thickness ☐ 3rd Degree/ Full Thickness

Area	% 2nd	% 3rd	Area	% 2nd	% 3rd	Area	% 2nd	% 3rd
Head (7%)			R buttock (2.5%)			RL arm (3%)		
Neck (2%)			L buttock (2.5%)			LL arm (3%)		
Ant trunk (13%)			Genitalia (1%)			R hand (2.5%)		
Post trunk (13%)			RU arm (4%)			L hand (2.5%)		
			LU arm (4%)			L thigh (9.5%)		
						R thigh (9.5%)		
						L foot (3.5%)		
						R foot (3.5%)		

Total % 2nd _____ + Total % 3rd _____ = Total % Burn _____

Please complete a new Burn Area Chart as the wound progresses.

Physician Signature / Title / GME # / UPI # _____ Date 4/20/18 Time 18:33

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BURN AREA CHART

MRN: [REDACTED] CSN: [REDACTED]
DOB: [REDACTED] Date: [REDACTED]
FSC: MEDICARE
Class: Inpatient
Att: Wiktor, Arek Jac

Mark images accordingly: ☒ 2nd Degree/ Partial Thickness ☐ 3rd Degree/ Full Thickness

Area	% 2nd	% 3rd	Area	% 2nd	% 3rd	Area	% 2nd	% 3rd	Area	% 2nd	% 3rd
Head (7%)			R buttock (2.5%)			RL arm (3%)			L thigh (9.5%)		
Neck (2%)			L buttock (2.5%)			LL arm (3%)			R leg (7%)	1.5%	0.5%
Ant trunk (13%)			Genitalia (1%)			R hand (2.5%)			L leg (7%)		
Post trunk (13%)			RU arm (4%)			L hand (2.5%)			R foot (3.5%)		
			LU arm (4%)			R thigh (9.5%)	1%	1%	L foot (3.5%)		

Total % 2nd 1.5% + Total % 3rd 1.5% = Total % Burn 3%

Please complete a new Burn Area Chart as the wound progresses.

Physician Signature / Title / GME # / UPI # _____ Date _____ Time _____

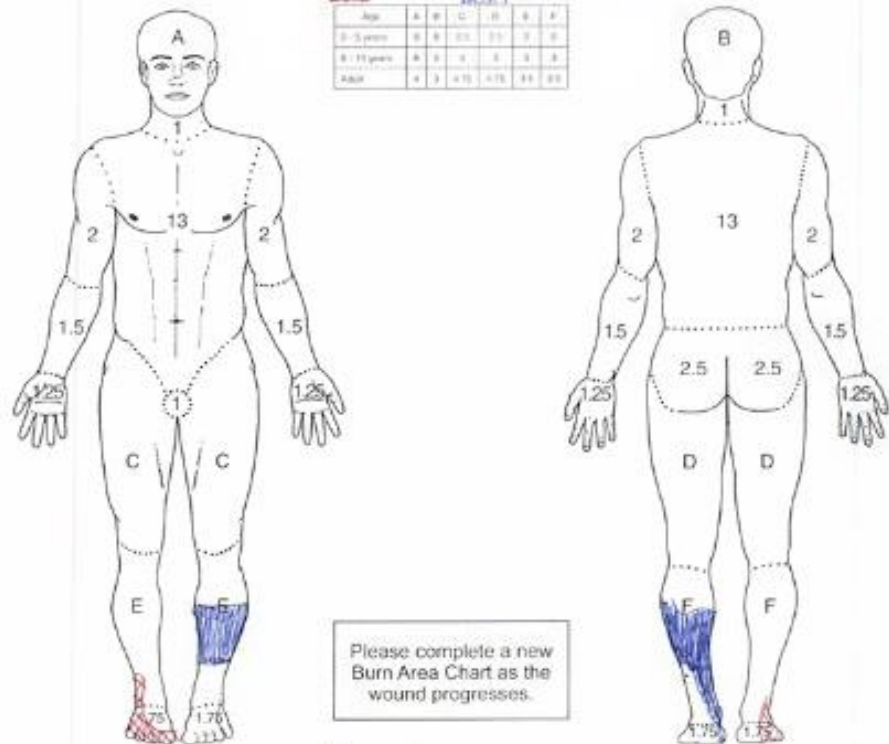
BURN AREA CHART

UPDATED LUND & BROWDER

MRN: [REDACTED] CSN: [REDACTED]
DOB: [REDACTED] Date: [REDACTED]
FSC: [REDACTED]
Class: Inpatient
Alt: [REDACTED]

Mark images accordingly: ☒ 2nd Degree/Partial Thickness ☐ 3rd Degree/Full Thickness

Lund & Browder Chart											
Area	% 2nd	% 3rd	Area	% 2nd	% 3rd	Area	% 2nd	% 3rd	Area	% 2nd	% 3rd
Head (9%)			Right Arm (9%)			Left Arm (9%)			Right Leg (13%)		
Neck (3%)			Left Arm (9%)			Right Leg (13%)			Left Leg (13%)	1%	
Ant. Trunk (13%)			Right Arm (9%)			Left Leg (13%)			Ant. Trunk (13%)	0.6%	3.5%
Post. Trunk (13%)			Left Arm (9%)			Ant. Trunk (13%)			Post. Trunk (13%)	1%	
			Right Arm (9%)			Left Leg (13%)			Left Leg (13%)		0.5%
Total % 2nd: 2.5% + Total % 3rd: 4% = Total % Burn: 6.5%											



Please complete a new Burn Area Chart as the wound progresses.

Frostbite

Injury to the skin and underlying tissues as a result of environmental cold exposure. 2 Components: 1. damage to the tissue (ice crystal formation, microvascular occlusion and tissue anoxia) and 2. Reperfusion injury.

- Incidence of digit amputation without effective treatment = 40%
- Incidence of digit amputation since standard of care includes IV t-PA = ~10%

T-PA

Indications:

- Evidence of frozen extremities/skin – 3rd & 4th degree frostbite & absent/ weak doppler pulses

Contraindications:

- Repeated freeze-thaw cycles.
- Concurrent or recent (within 1 month) intracranial hemorrhage, subarachnoid hemorrhage or trauma with active bleeding.
- Recent intracranial or intraspinal surgery, or serious head trauma (within 3 months).
- History of gastro-intestinal bleeding.
- Current severe uncontrolled hypertension (systolic blood pressure greater than 180 mmHg and/or diastolic blood pressure greater than 105 mmHg).
- Pregnancy.
- INR greater than 1.7, PT >50, PTT >40.
- Thrombocytopenia (platelets less than $50 \times 10^9/L$).

Frostbite: T-PA

- Determine the severity of the frostbite and/or hypothermia by completing a full physical examination including Doppler pulses in the affected extremity.
- Examine for any associated injuries or illnesses. If indicated complete a full trauma work-up including:
 - Chest x-ray
 - Head, neck, chest and abdominal CT scan
 - Any further indicated radiological exams
- Obtain admission photographs of all affected areas.
- Draw blood for labs including:
 - CBC with platelets
 - Basic metabolic panel
 - PT, PTT, INR
 - Blood alcohol
 - Ionized calcium, magnesium and phosphorus
 - Liver function tests

	Stroke	PE	Frostbite
Bolus Dose	0.09mg/kg	10mg	0.15mg/kg
Continuous Dose	0.81mg/kg over 1 hour	90mg over 2 hours	0.15mg/kg over 6 hours
Total/ Maximum (mg)	90mg	100mg	100mg
Total Admin Time	1 hour	2 hours	6 hours

Initiating t-PA at outside hospital prior to transport

Reduce delay in initiating t-PA.

Continue t-PA after arrival to Burn Center

Frostbite Management (continued)

Wound Management

- Debride clear blisters
 - Rich in TXA_2 & $\text{PGF}_{2\alpha}$ (Vasoconstrictive metabolites)
- Hemorrhagic blisters – aspirate– Attending discretion
- Aloe vera TID
 - Counteracts effects of O_2 radicals & Arachadonic acid breakdown products

Other Tips:

- Rapid rewarming with running water
- Pain Management
- Lovenox 1mg/kg q 12 hours (consider heparin if $\text{CrCl} < 30$)
- **Activity:**
 - Frostbite on toes/ feet: ambulation on frostbitten toes can cause tissue chipping and prolonged bedrest may be indicated in these cases for this reason (not because of t-PA administration). Need Darko boot prior to ambulation.
 - Frostbite on fingers/ hands: 1 hour after the administration of t-PA is complete (if the patient receives t-PA), the patient may ambulate and active ROM and functional use of their hands/ fingers should be encouraged.
 - Teach the patient to avoid tapping or bumping their fingers as this will cause further injury.
- **Bone scans:**
 - Bone scans are important to objectively measure the progress or improvement of the frostbitten digits. They are important for the Physicians to plan long-term care and explain expectations to the patients.
 - The decision to administer t-PA will often be made prior to bone scanning.



Continued Stay

Level of Care Considerations

		ICU Status	Progressive Care Status	Floor Status
Medication administration during dressing change	Fentanyl (IVP)	✓	✓	✓
	Versed (IVP)	✓	✓	✓
	Ketamine (IVP)	Up to 1mg/kg to a max of 100mg per Burn/Trauma Intensive Care Unit: Administration of Low-Dose (subanesthetic) Guideline	0.25-0.5mg/kg IVP	x
Maximum length of dressing change * includes ambulation time to and from dressing change		No limit	90 minutes	60 minutes
Active burn resuscitation/ Nurse Driven Burn resuscitation protocol		✓	x	x
t-PA for frostbite		✓	x	x
Co-morbidities		Patient would benefit from intensive monitoring and is at risk of needing immediate intensive treatment	Patient is moderately stable, requires moderate resources and requires intermittent nursing vigilance or is stable with a high potential for becoming unstable and requires increased intensity of care and vigilance	

Other considerations:

- Patient should tolerate these guidelines at least once prior to changing patient's status. For example, patient should tolerate a dressing change without ketamine and should be completed in less than 60 minutes prior to changing patient to floor status.

Medications for Wound Care

Premedicate orders: 10mg or 20mg oxycodone and 1mg or 2mg po Ativan if needed

Standard:

- Fentanyl (for pain)
 - Dose 25mcg or 50mcg IV every 5 minutes prn pain during dressing changes
- Midazolam (for anxiety)
 - Dose 0.5mg or 1mg IV every 5 minutes prn anxiety during dressing changes only

Administration instructions: For burn care only; do not exceed *** mcg/mg per treatment session

Wound Care Medications

Ketamine

	1 st dose	2 nd dose	3 rd dose
ICU	1mg/kg	0.5mg/kg	0.25mg/kg
Stepdown	0.5mg/kg	0.25mg/kg	

Note: Doses must be given at least 10 minutes apart. Burn Attending must be notified if all doses administered and patient still requires additional medication to adequately complete wound care

Precedex- ICU patients only

Dose: 0.2-1 mcg/kg/hr x ***kg

Admin Instructions: For Burn Care Only. Initiate at ***mcg/kg/hr (recommended 0.2-0.5) 60 minutes prior to dressing change, titrate every 15 mins by 0.2mcg/kg/hr to achieve a RASS of -1 to -2 prior to burn care; once achieved, do not continue to titrate up. If unable to achieve RASS goal with a dose of 1 mcg/kg/hr, notify MD to increase max dose (absolute max 1.5mcg/kg/hr).

Hold and notify MD for a MAP < ***, HR < ***, RASS -3 or lower.

Stop infusion at the completion of burn care. Monitor vital signs every 15 minutes x 1 hour, then every 30 minutes x 1 hour post discontinuation or until patient returns to baseline.

Photos and Wound Documentation

Photos should be taken:

- on admission
- on day of discharge
- every other day and with any change in wound appearance

Photos should include:

- **all** areas of non-intact skin
- bony prominences (on admission and prn)

Lund & Browder's should be completed during every OR and q Monday

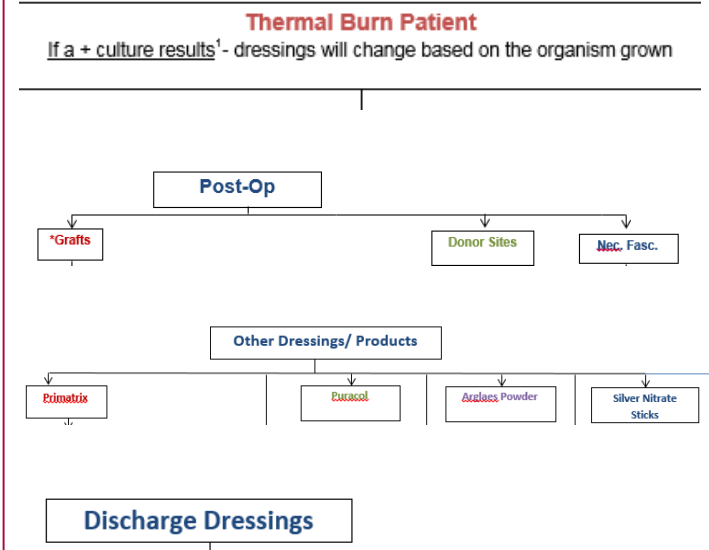
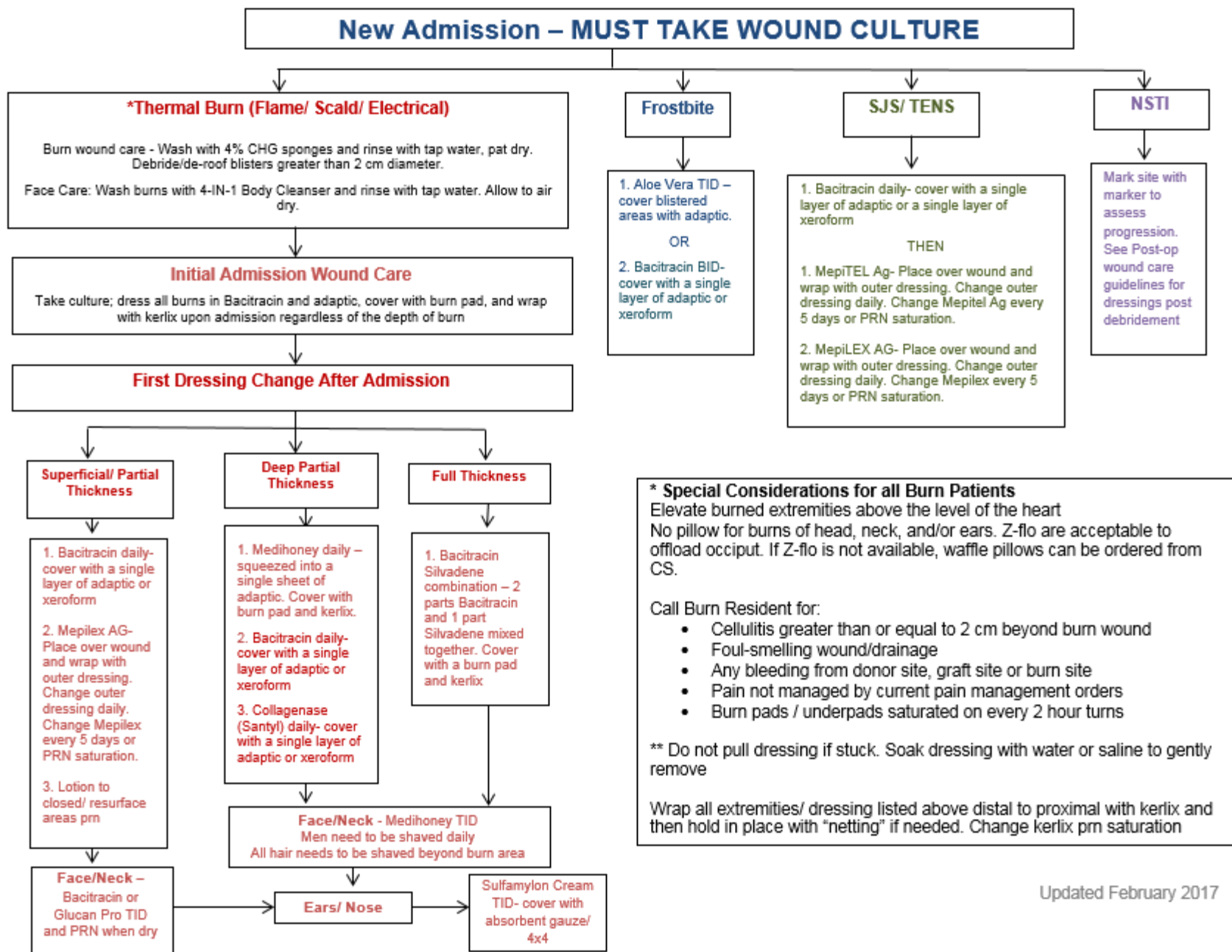
- Evaluate wound progress and closure

Wound assessments should be documented

- When referring to burns label the depth and degree as follows: Superficial thickness (1st degree), Partial thickness (2nd degree), Full thickness (3rd degree)
- Be specific when describing the location of the burn: right vs left, head, neck, chest, abdomen, upper back, lower back, upper arm, forearm, hand including/not including fingers, thigh, lower leg, foot including/not including toes

Wound Care

- Ever changing!
- There is a wound care *guide*
- Make sure orders are appropriate and updated daily
 - Post-op- discontinue old orders and enter new orders to ensure orders are not contradictory
- Wound care orders: Please be specific. Label each body part burned/autografted/donor site separately and the medication/dressing to be used on that specific burn.



Infection Control During Wound Care

All staff who enter the room during wound care should wear appropriate attire:

- Gown
- Gloves
- Bouffant
- Mask

Staff applying clean dressings are in sterile attire



Sterile water

- Used for all wound care- tubrooms and ICU rooms equipped with sterile water filters on showers/ sinks.

Wound Cultures

- Screening cultures should be obtained on all patients every Monday.
- Aerobic wound cultures should be obtained:
 - o On admission
 - o With every OR takedown
 - o When infection is suspected

Pre-Op Management

- Pre-op
 - Complete orders day prior to surgery.
 - Include a T&C and Prepare PRBCs orders.
 - If the patient has an established airway (prone or not) - tube feeds DO NOT need to be held
 - We feed through the OR!
 - If the patient does not have an established airway- needs to be NPO at 0130
 - Enter an “NPO at midnight except medications” order AND place a nursing communication order to hold tube feeds at 0130

Therapy

- Therapy team makes splints and associated schedules
- Must be updated regarding any restrictions, or lack thereof, following OR- consider dot phrase in brief post-op note!
- Weekend patient prioritization:
 - Post-op autograft take downs that cross a joint or impact function
 - Patients who have been autografted over a joint and have a decrease in ROM that requires skilled interventions in addition to positioning and exercise program
 - Any patient deemed a high risk of losing ROM
 - New burn evaluations that require immediate intervention/evaluation
 - D/C pending burn patients, requiring DME, orthotics for discharge, teaching that will be discharging over the weekend

Nutrition

- Burns cause a dramatic (up to 3-fold) increase in metabolic rates that can continue 1-2 years after injury
- Protein requirements are increased with a possible decrease in muscle mass
- Calorie counts are frequently ordered to ensure nutritional needs are met prior to removing dobhoff
- Burn > 20% TBSA:
 - * Isosource HN - start at 20 mL/hr advance by 20 mL q 4 hrs (estimated goal rate is close to BW in kg)
 - * Patient's with a BMI >35- use Nutren Replete
 - Dietician will adjust as necessary the following day.

Propranolol and Oxandrolone may be considered to decrease resting metabolic rates and increase muscle mass

- Propranolol - Non-selective Beta blocker
 - Alleviates hypermetabolic symptoms by decreasing HR, cardiac output, skeletal muscle breakdown, improves wound healing time
- Oxandrolone - Anabolic steroid, testosterone analog
 - Decreases muscle wasting, improves retention of lean muscle mass, reduces weight loss, improves wound healing time

Other unique pain medication: Continuous Lidocaine Infusion for Acute Pain

Relative Contraindications

Unstable coronary disease

Recent MI

Heart failure

Electrolyte disturbances

End-stage liver disease (Child's C Cirrhosis)

Cardiac arrhythmia disorders (including but not limited to WPW, severe SA, AV or intraventricular heart block)

Seizure disorders

Renal impairment

- In patients with suspected renal impairment, consider waiting for BMP results prior to starting infusion and no more than 0.5 mg/kg/hr.

Hepatic impairment

- In patients with suspected liver impairment, consider waiting for INR and LFT results prior to starting infusion.

Continuous IV Infusion

Takes 4–8 h to achieve a steady-state plasma concentration.

Dose: The dose for continuous i.v. lidocaine infusion is 0.5–3 mg/kg/hr.

- The most widely reported and clinically effective dose range is 1 to 2 mg/kg/hr.
- Although dose may be higher in select cases, the recommended dose is not to exceed 2mg/kg/hr or 120mg/hr.

Lidocaine Infusion (continued)

Toxicity:

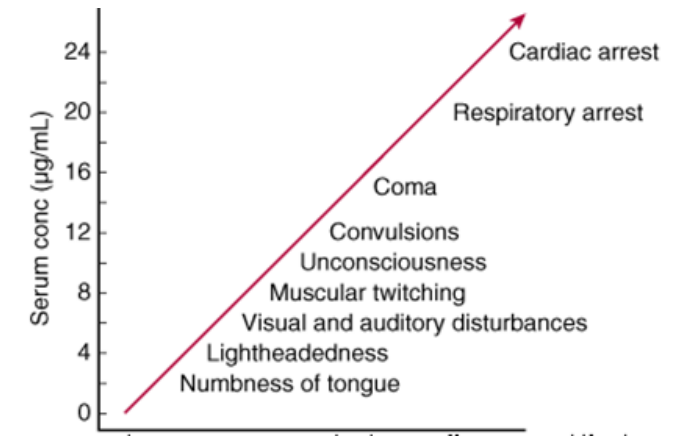
Systemic lidocaine has a very narrow therapeutic index.

- Central nervous system (CNS) toxicity occurs ($>5 \mu\text{g/ml}$).
 - This is only slightly above the therapeutic plasma level (2.5–3.5 $\mu\text{g/ml}$).

The factors that influence the plasma concentration of free lidocaine include:

- Dose and rate of infusion
- Acid–base status- especially hypercapnia and hypoxia
- Low plasma protein levels- especially consider our patient population nutrition status and needs
- Diminished hepatic or renal function
- Elderly

The progression of clinical presentation in lidocaine toxicity often follows a well-described course and closely mirrors the increasing plasma concentration. As long as the patient is awake (or are easily aroused from sleep) and remain communicative, it is the subtle CNS symptoms and signs that precede major complications and they should therefore be carefully assessed.



Monitoring Toxicity and Interventions

•If any of the following signs/ symptoms of lidocaine toxicity are assessed, 1) stop the infusion, 2) notify the Provider and 3) obtain an order and send a lidocaine level to the lab.

•New onset:

- Dizziness
- Light-headedness
- Circumoral numbness
- Tinnitus
- Metallic taste in mouth
- Confusion
- Slurred speech
- Blurred vision
- Myoclonic jerking
- Pulse rate less than 50 or greater than 120
- Decrease in BP greater than 30mmHg

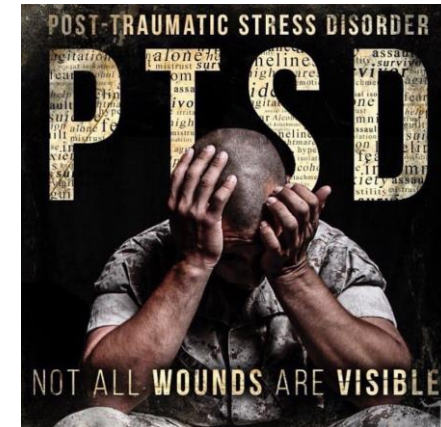
Symptoms of toxicity usually disappear with cessation of the infusion for a defined period of time (as ordered by the Provider- usually 12-24 hours) and resumption of the infusion at a decreased rate

PTSD/ ASD Symptom Screening (not a diagnosis)

- The incidence of post-traumatic stress disorder (PTSD) in burn patients is as high as 45% (Giannoni-Pastor, et. al., 2016).
- PTSD severity 1 month after hospital discharge is associated with poorer physical and social functioning and greater physical and psychosocial disability up to 2 years later (Corry, Klick & Fauerbach, 2010).
- A diagnosis of Acute Stress Disorder (ASD), in the absence of treatment, appears to be an accurate predictor of subsequent PTSD (Gibson, 2016).

Screening Tools (screening completed on HD#2 and every Monday)

- Acute Stress Disorder Scale (ASDS): A self-report inventory used to screen patients who may have ASD (used as a screening tool and not to diagnose).
 - Days 2-30 post traumatic event
- PTSD: PCL-5 is a 20-item self-report measure; used to screen patients for PTSD and monitor symptom severity overtime
 - Days 31+ after traumatic event



Positive PTSD/ASD Symptom Management

Additional Resources

- Addiction Medicine consult.
- Psychology consult.
- Chaplain support.
- Arrange for a SOAR (Survivors Offering Assistance in Recovery) visit.
- Encourage participation in our burn survivor support group.
- Introduce patient to Phoenix Society for Burn Survivors (provides many resources for both survivors and family and personal stories). <https://www.phoenix-society.org>
- Assist patient in setting up the “PTSD Coach” app: free mobile app created by the US Department of Veteran Affairs. Provides many different tools to help with the management of PTSD symptoms.
- Provide Rocky Mountain Crisis Partners contact: 1-844-493-TALK (8255) for crisis management and information on referrals.

“Positive” scores

- ASD screening score ≥ 56
- PCL screening score ≥ 33
- Assess for suicidal ideation (if positive, follow hospital policies)
- Refer to Psychiatry consult
- Develop multidisciplinary treatment plan
 - Treatment recommendations for ASD symptoms:
 - Provide patient and family with education
 - Provide non-pharmacologic and pharmacologic symptom management (sleep disturbances, pain, nightmares)
 - Use benzodiazepines with caution, as chronic use has been found to worsen outcomes
 - Treatment recommendations for PTSD symptoms: (Same as ASD plus:)
 - May consider starting a SSRI or a SNRI. Sertraline and paroxetine are the only medications FDA approved to treat PTSD
 - Sertraline starting dose of 25-50mg daily. Increase dose by 50-100mg daily as tolerated up to a maximum dose of 200mg as tolerated. Dose increases should take place no more frequently than every 7 days. Full therapeutic effect may take up to 6-8 weeks.
 - Prazosin may be prescribed for nightmares (off-label use)
 - initiated at 1mg every night and titrated by 1mg increments every 2-3 day to max dose of 16mg
 - Trazadone for insomnia

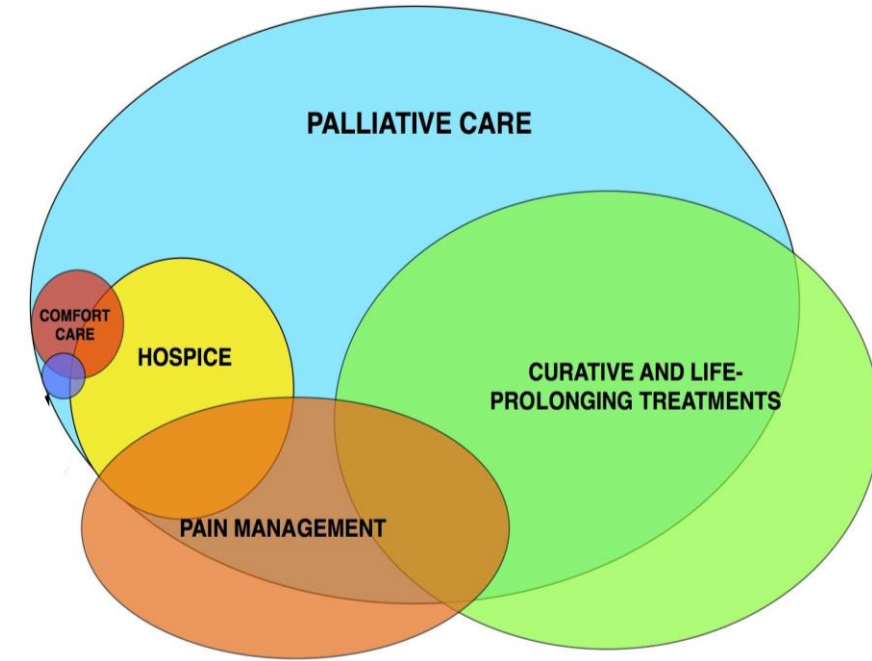
Palliative Care Consultations

Consider a Palliative Care consult on admission if the Baux score (%TBSA + age) is ≥ 100 .

- This is the P50 for Burn Centers according to the National Burn Repository (UCH Burn Center P50 Baux score is ~110)

The IOM report (2014) recommends that all patients and families with advanced serious illness have access to palliative care, and that screening for unmet palliative needs should begin early in the course of treatment.

Intent is to discuss patient goals of care from admission! After initial meeting, Palliative Care may sign off and re-consult if necessary.



Palliative care + curative care
OR

*Palliative care **alone**, when curative care is no longer the goal of care.*

Center to Advanced Palliative Care (2014). Umbrella of Palliative Care- a conceptual model. Retrieved from: <https://www.capc.org/seminar/2014/umbrella-palliative-care-conceptual-model/>

When to Call the Attending

Patient conditions/ Δs that require ATTENDING MD notification:

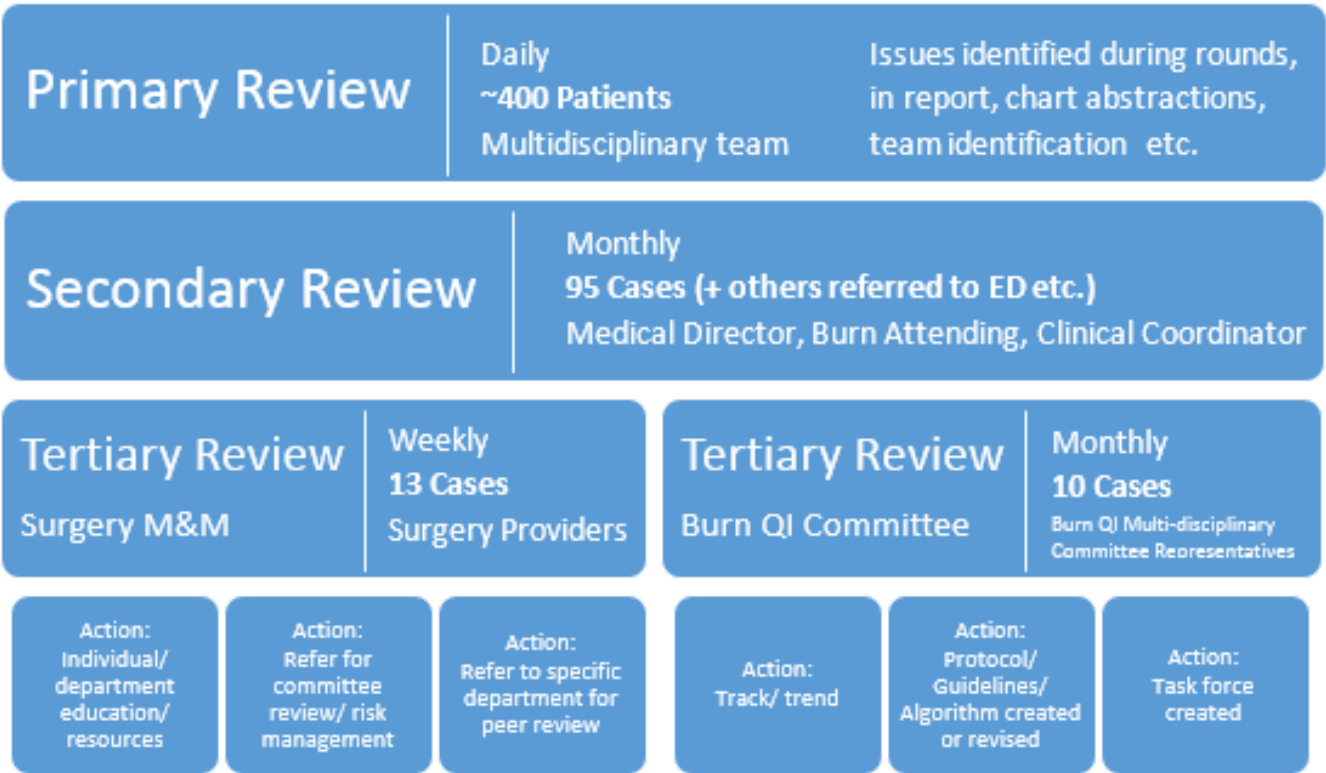
- Death (unplanned) / CODE
- STAT or Urgent CT
- Stroke alert or other significant neurological change (seizure, new onset paralysis, acute ↓ in LOC or GCS)
- Bleeding complications with t-PA
- Starting a pressor
- Pt decline in 12 hours prior to scheduled OR (i.e. ↑ temp, new pressor requirement)
- > 2 calls to the resident about the same issue
- Persistent hypotension with 2 failed interventions or fluid boluses
- Unanticipated intubation, or sig escalation in O2 delivery device (i.e. nasal cannula → non-rebreather/ biPAP)
- Self-extubation
- ↑ in wound vac output (sanguineous) with concern for needing removal
- Blood product administration without prior Attending knowledge
- Prior to starting Abx
- Pharmaceutical restraints or sig increase in sedation
- Development of clinical problem requiring an invasive procedure/ OR (i.e. Chest tube, central line...)
- ***Post-op bleeding of autograft**
- **1st removal of surgical dressing of autograft**

*= notify surgical Attending (all other notifications should be directed to the Rounding Attending)

Mobile App Registration

Laura Madsen, Outreach Manager

CQI process



Send all cases/ presentations to
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