Burn Injuries

Its not a Peds patient is it?!

CHI Health

St. Elizabeth
Regional Burn & Wound Center

Disclosures

- No commercial or financial gain from any equipment or medication discussed here.
- We have listed no financial interest/arrangement that would be considered a conflict of interest.
- Please remember HIPAA with case studies

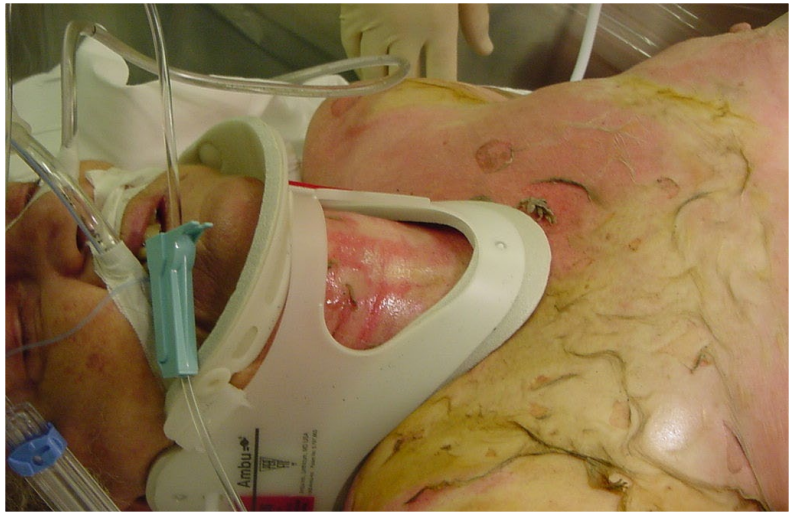
Objectives

- Identify differences in superficial, partial thickness and full thickness burns
- Review initial treatment strategies related to depth of burn injury
- Discuss appropriate immediate care of the patient who presents with a burn injury
- Define initial assessments, interventions and transport needs for a patient with burn injuries

- Recognize magnitude of burn injury to children
- Recognize types of burn injuries and their relationship to this population
- Recognize differences between the pediatric and adult population
- Identify appropriate care measures for children with burns

What is a BURN?

- Damage to the skin and underlying tissue causing interference with normal function.
- Increased mortality rates, extended rehabilitation, permanent disfigurement & physical disabilities.



Burn Depths

Superficial (first degree)

Epidermis only involved not destroyed

- Pink to red
- Painful
- Dry without blisters
- Heals within 3-5 days with no scarring
- Does not count in the TBSA calculation
- causes - sunburn, minor scalds, flash burns

Treatment:
Bacitracin, Neosporin
Tylenol +/- Ibuprofen for pain

Burn Depths

Partial (second degree)

- Epidermis layer destroyed
  Dermal layer damaged
- Moist, wet and weepy
- Blisters/sloughing present
- Bright pink to red
- Painful

Burn Depths

Full Thickness (third degree)

- Destroys all layers of the skin
- May involve fat, muscle or bone
- Will require skin grafts
- Dry with no blisters
- Waxy white, tan or brown
- No sensation
- Loss of tissue elasticity

Pediatric patients and Burns

The Problem

The Patient

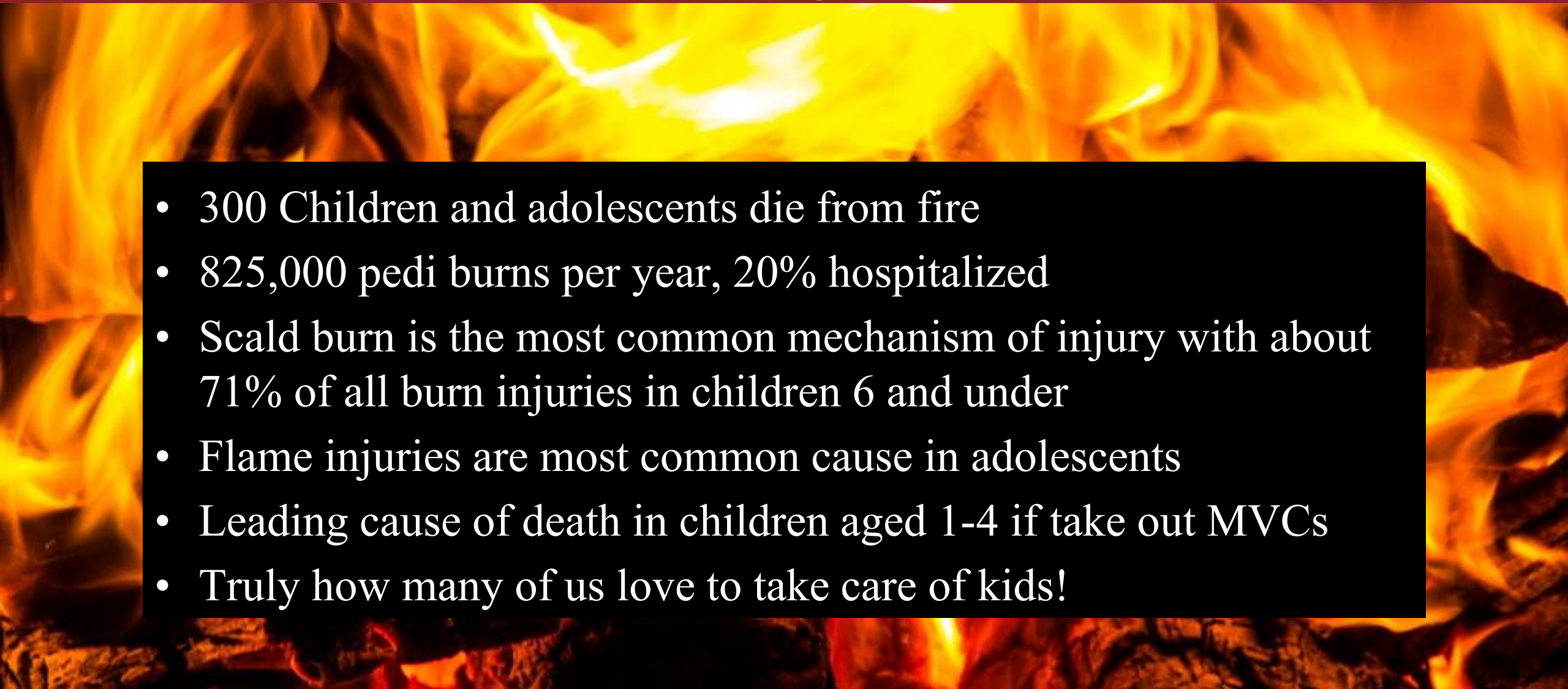
The Assessment

The Solutions

1. Airway
2. Breathing
3. Circulation
4. Disability
5. Expose and Examine
6. Fluids Foley
   How far down is W for wound care!

Disclaimer this is my son so he's super cute

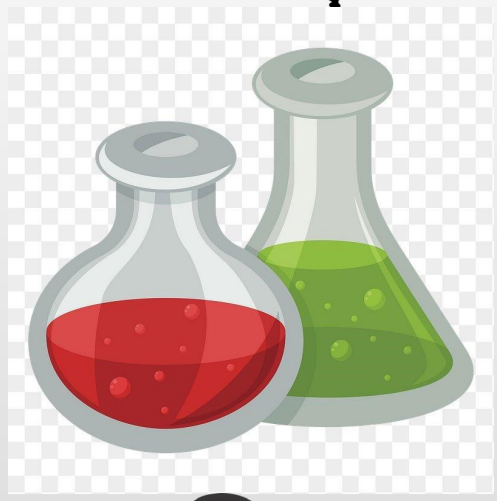
Magnitude of Problem



- 300 Children and adolescents die from fire
- 825,000 pedi burns per year, 20% hospitalized
- Scald burn is the most common mechanism of injury with about 71% of all burn injuries in children 6 and under
- Flame injuries are most common cause in adolescents
- Leading cause of death in children aged 1-4 if take out MVCs
- Truly how many of us love to take care of kids!

Types of burns

- Thermal
- Sun Exposure
- Chemical
- Electrical
- Friction
- Cold Exposure

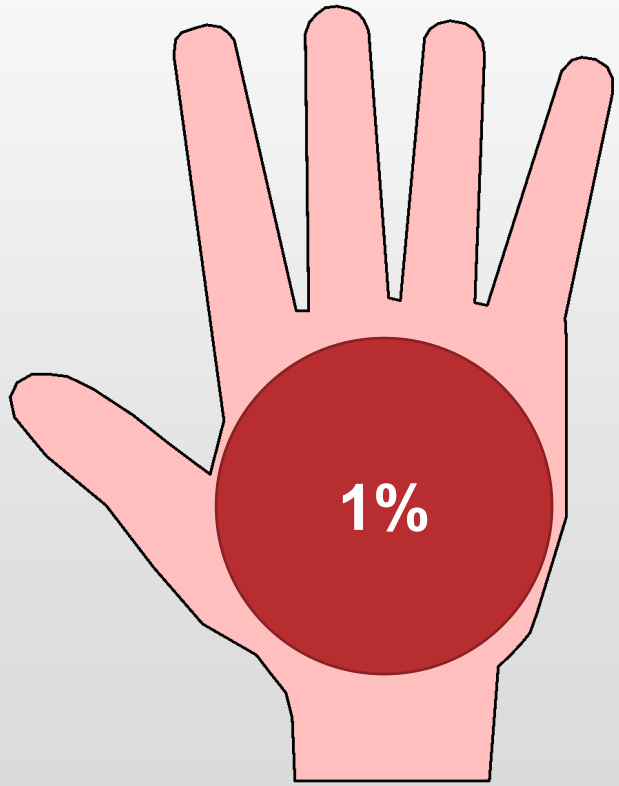


Adults Vs Peds

- Skin
  - Thinner skin with peds leading to deeper burns at same temperature with and adult. (Think hot tubs and the warnings for age ranges and use)
- Temperature Regulation
  - Surface area (skin) to body (size) allowing for quicker heat loss and the need for more energy to stay normothermic
- Airway
  - Consumption of oxygen at a higher rate (Min ventilation) 400 ml/min vs 150 ml/min
  - Airway is smaller and positioned more anterior and funnel shaped than adults
- Shock
  - bp is a very late sign. Capillary refill, skin color, temperature and moisture are early

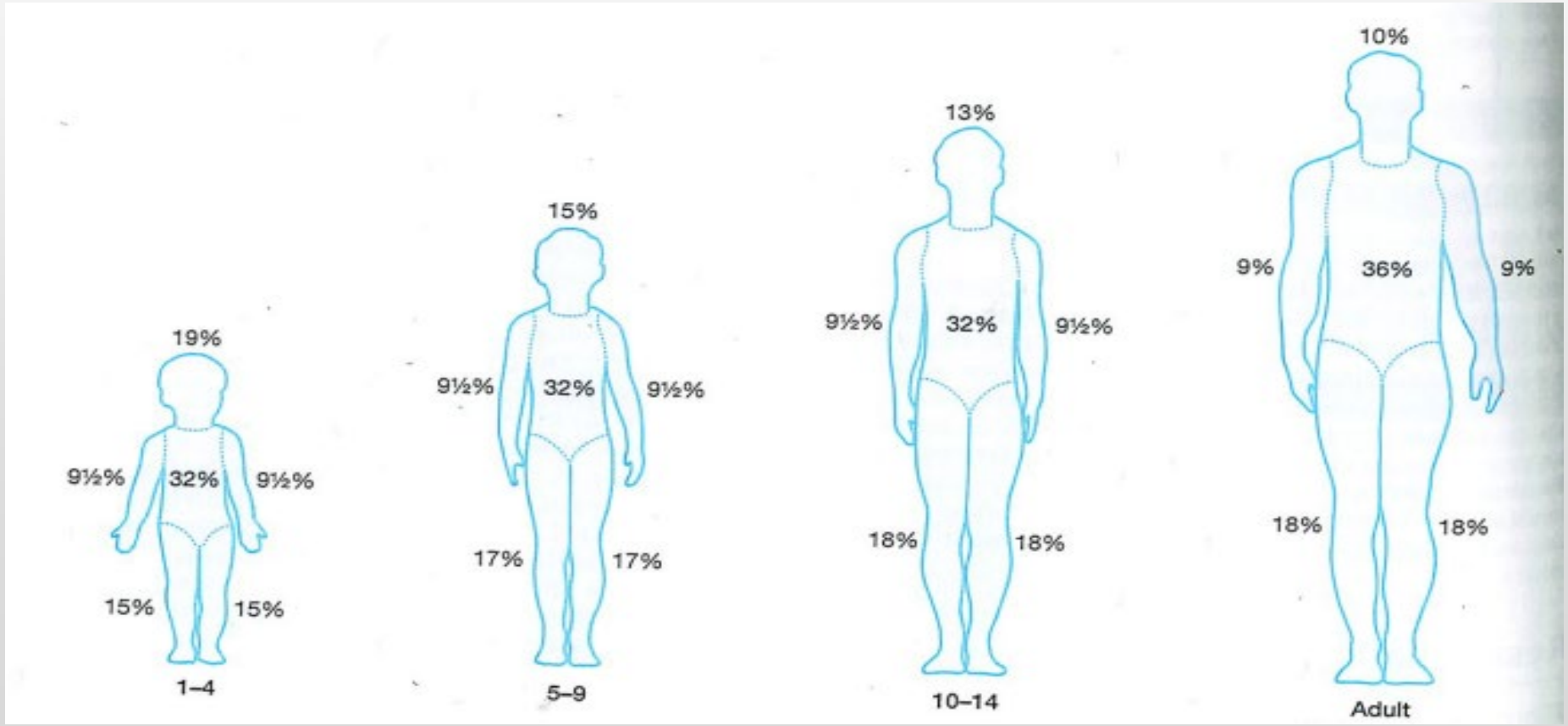
Calculating Total Burn Surface Area (TBSA)

- More Challenging with Pediatric patients
- Rule of Palm
  - Patients palm=1% BSA
  - Works perfect for Pediatric patients because its consistent
- Rule of 9 nines
  - Helpful to do large areas but where do we make the changes in tise



Calculating Total Burn Surface Area (TBSA)

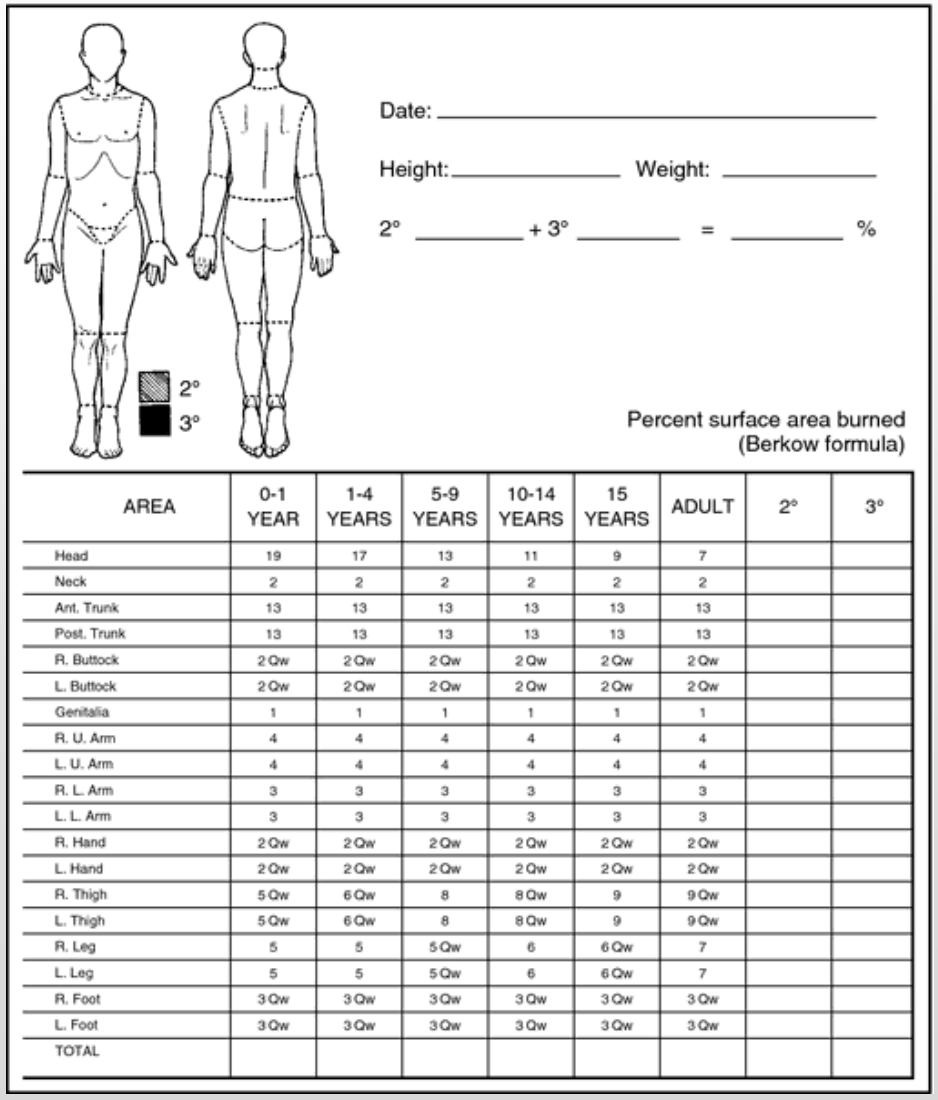
Rule of Nines



Calculating Total Burn Surface Area (TBSA)

- Lund and Browder Chart
  - Extremely Accurate
  - Still potential for problems with morbidly obese
  - Time consuming when trying to do first assessments

Apps are available but make sure you are using only the Partial and full thickness for fluid resuscitation



Date: _____

Height: _____ Weight: _____

2° _____ + 3° _____ = _____ %

Percent surface area burned
(Berkow formula)

AREA	0-1 YEAR	1-4 YEARS	5-9 YEARS	10-14 YEARS	15 YEARS	ADULT	2°	3°
Head	19	17	13	11	9	7		
Neck	2	2	2	2	2	2		
Ant. Trunk	13	13	13	13	13	13		
Post. Trunk	13	13	13	13	13	13		
R. Buttock	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw		
L. Buttock	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw		
Genitalia	1	1	1	1	1	1		
R. U. Arm	4	4	4	4	4	4		
L. U. Arm	4	4	4	4	4	4		
R. L. Arm	3	3	3	3	3	3		
L. L. Arm	3	3	3	3	3	3		
R. Hand	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw		
L. Hand	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw	2 Qw		
R. Thigh	5 Qw	6 Qw	8	8 Qw	9	9 Qw		
L. Thigh	5 Qw	6 Qw	8	8 Qw	9	9 Qw		
R. Leg	5	5	5 Qw	6	6 Qw	7		
L. Leg	5	5	5 Qw	6	6 Qw	7		
R. Foot	3 Qw	3 Qw	3 Qw	3 Qw	3 Qw	3 Qw		
L. Foot	3 Qw	3 Qw	3 Qw	3 Qw	3 Qw	3 Qw		
TOTAL								

Temperature Regulation and Assessment

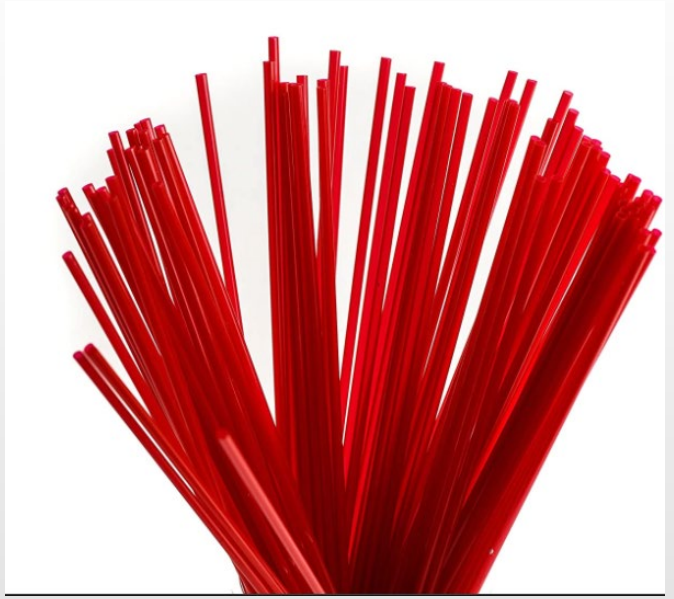
- **Expose and Examine**
  - Remove all clothing, jewelry, diapers, contact lenses, etc..
  - **Maintain warmth (Warm blankets, warm room, or warm fluids if needed)**
  - **Expose and look for possible other injuries**

Contact Lens

Airway Management

- Identify need for airway management early

  WHY?



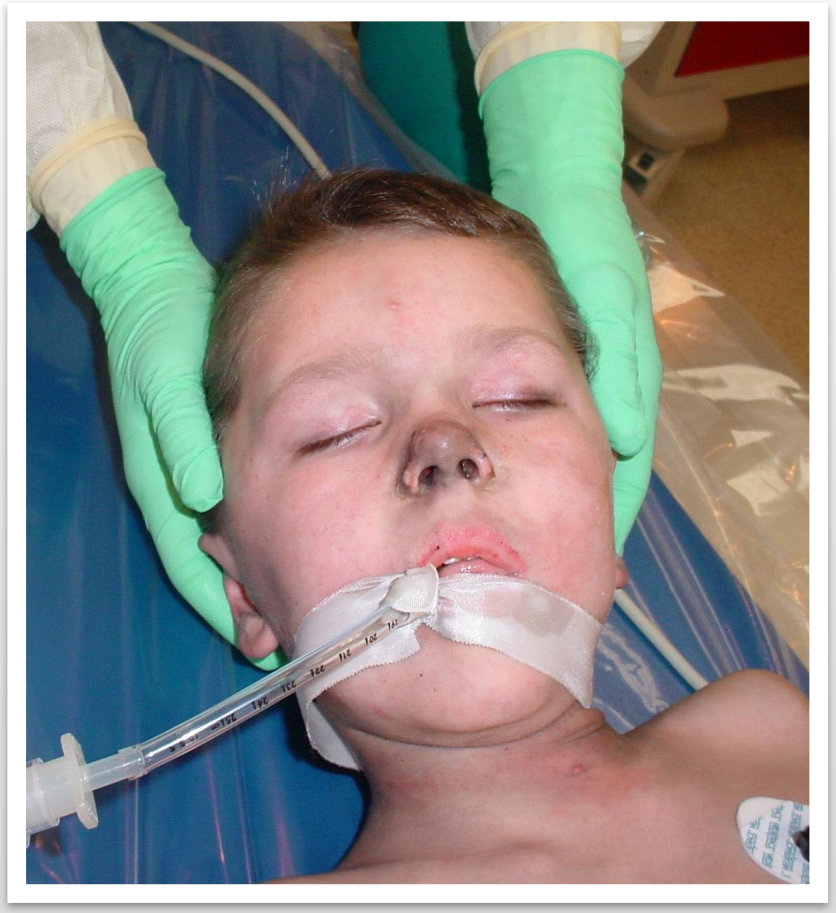
- Upper airway injury
  - irritation causing upper airway edema
- Lower airway injury
  - chemical injury from irritants found in smoke
- CO Poisoning

Initial Management of Inhalation Injury

★**Oxygen**: 100% O2 if suspected inhalation injury
- Assist with bag valve-mask if needed
- Intubation: Place as large a tube as possible to accommodate for airway sloughing potential
- Identify need for early intubation
- Monitor Capillary Refill
- Remember differences in airway location and positioning

★ Using a pulse oximetry may not give you an accurate view of Carbon Monoxide Status

★ Tachypnea, stridor and hoarseness indicate impending airway narrowing



Inhalation

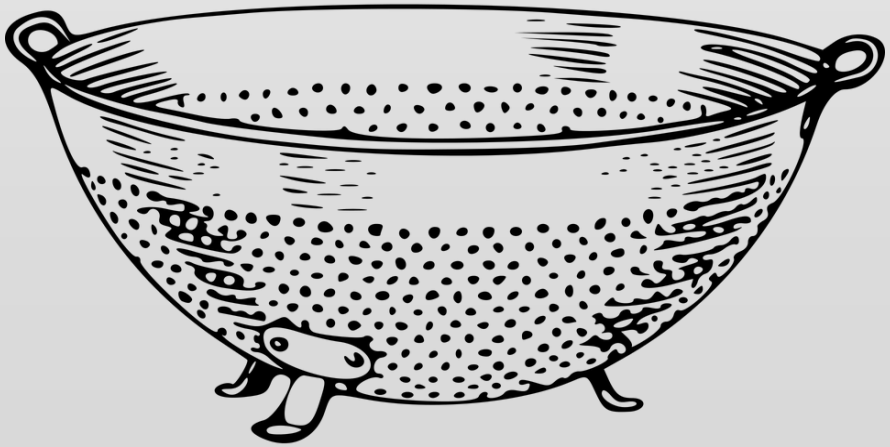
About ⅓ of burn injuries have an inhalation injury.

Increase mortality rate from 1-2% to as much as 40% with an inhalation injury and burn in pediatric patients

Appropriate interventions should be started early including O2 and intubation as needed

Fluid Resuscitation

- Part of the “Art” of medicine
- Starts at 20% TBSA
- Fluid Formulas
  - Parkland: 4cc/kg/%TBSA
  - Modified Brooke: 2cc/kg/%TBSA
  - ABA Consensus Statement
    - 2cc/kg/%TBSA (Adult)
    - 3cc/kg/%TBSA (Peds)
    - 4cc/kg/%TBSA (Electrical)



Fluid Resuscitation

Pre Hospital or

Pre Weight and accurate TBSA

- 5 years old and younger: LR @ 125ml/hr
- 6-14 years old: LR @ 250ml/hr
- 15 years and older: LR @ 500ml/hr

Fluid Resuscitation

Peds Burn Patients must add Maintenance Fluid and not adjusted

"4-2-1" Rule

4 ml/hour for each kg up to 10 kg (40 ml max)

2 ml/hour for each kg 11 - 20 kg (20 ml max)

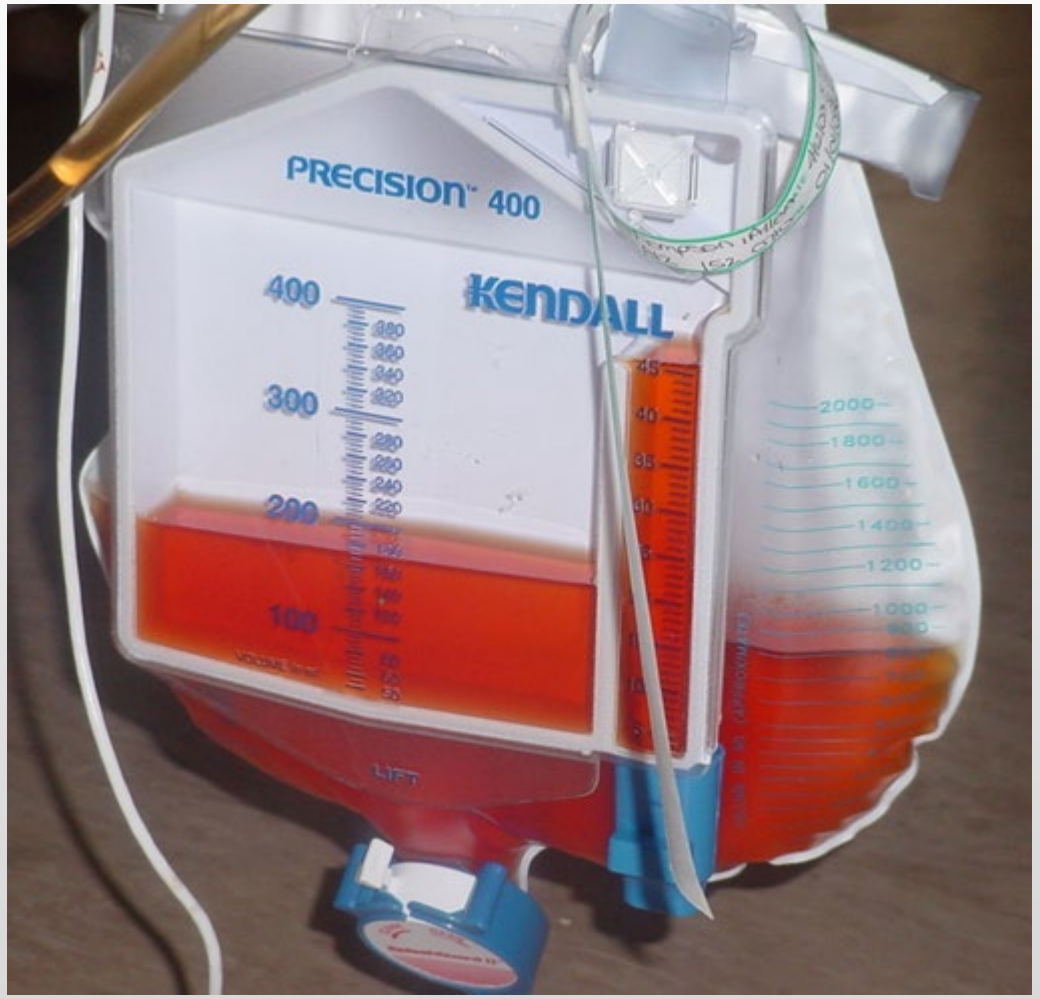
1 ml/hour for each kg > 20kg

Example: 30kg child

- 4 ml for each kg 1-10 = 40ml
- 2 ml for each kg 11-20 = 20ml
- 1ml for each kg above 20 kg (21-30) = 10 ml
- Total maintenance fluid rate = 40 + 20 + 10 = 70 ml/hr

Fluid Notes

- Foley catheter to monitor hourly outputs
- Desired UOP is 30-50cc/hr for adults
- 1 ml/kg/hr for children < 30kg older than infants
- 1.5 ml/kg/hr for infants
- Call for infants
- Fluids are adjusted based on response



Fluid Notes

- Great debate on Colloid use and when to use it.
- Inhalation injuries can increase the need for fluids by as much as 20-30%
- Monitoring can also include
  - HR
  - BP
  - CVP
  - Echo
- Fluid Bolus when is it needed

IV Access

- Based on Partial (2nd) and Full (3rd) thickness burns greater than 20%
- May use for pain management
- Establish peripheral IV if able
  - Through non-burned skin if possible
- Intraosseous route if delay in fluid resuscitation is noted

Pain Management

- Initial burn pain is intense many times medication alone may not help with the pain
- Cooling a small burn is appropriate but remember No ICE
- IV or IM medications in a small burn is also appropriate
- Ointment choice may help - Silvadene is more soothing
- If pain is uncontrollable this would be important to relay to
- Burn center for reason for admission.

Pain Management

- Morphine
- Versed
- Ketamine (Oral, IM,IV)
- Tylenol
- Caregiver comfort

Home Burn Care

- Address pain management
- Clean/Wash the burn
  - Wash soap and water
    - keep pink red and may bleed
    - remove loose skin or drainage
- Apply dressing

Home Burn Care Tips

- Keep the burn covered with the dressing
- Washing should not take a long time can be done quick and concise
- Have everything ready to wash wound and dress wound so it can be done in a timely manner
- Pain management for dressing changes is important and should start before the dressing change.

Pseudoeschar and Silvadene

The importance of cleaning the burn

Topical Antimicrobials
Bacitracin

- Advantages
  - Inexpensive, easy to apply
  - Broad spectrum of activity
  - Can see wound base through it
- Disadvantages
  - Does not penetrate eschar

ANTIMICROBIALS

- Silvadene *(silver sulfadiazine)*
- *effective against gram-posltive, gram-negative and fungus (broad coverage)*
- *Sulfa drug allergy is possible*
- *Appearance: pearly white cream*
- *Apply in fairly thick layer (1/4")-cover wound bed*
- *Can result in thick pseudoeschar layer that must be washed clean with dressing changes.*
- *MUST BE CHANGED BID*
- *Best for tender full thickness burns*

Antimicrobials

- Sulfamylon – Mafenide Acetate (no sulfa!!)
- penetrates thick eschar – does cause some transient pain because of this!
- Appearance- dull white cream
- Apply to cover wound bed
- Often results in layer of pseudoeschar that must be washed off with dressing changes!
- MUST BE CHANGED BID
- Best for full thickness burns without much sensation.

Topical Antimicrobials
TheraBond

- Advantages
  - Good spectrum of activity
  - Least tissue toxic of all antim
  - Can be kept on for longer per
- Disadvantages
  - Have to use a hypotonic solut
  - Requires frequent wet downs

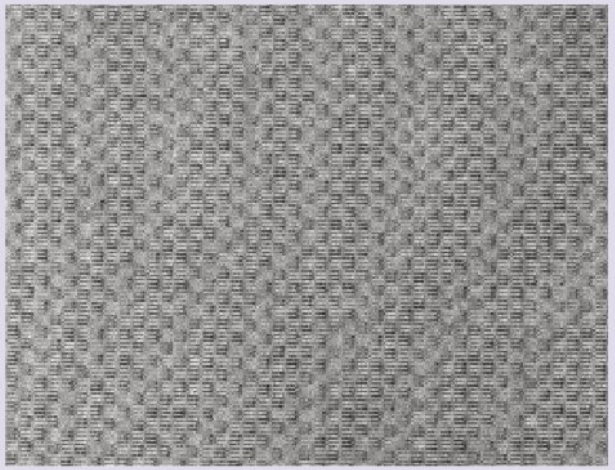


Figure 1. The dressing consists of a single piece of woven fabric.

Figure 2. The 3D delivery system is designed to maintain an ideal moist, but not wet, healing environment.

Xeroform

Xeroform Gauze Dressing is a fine mesh gauze occlusive dressing impregnated with petrolatum and 3% Xeroform (Bismuth Tribromophenate). Xeroform is made for use on low exudating wounds. Non-adherent primary dressing maintains a moist wound environment. Clings and conforms to all body contours.

External Dressings

Surgifix

Telfa

- Kerlix
- Telfa (non stick pad)
- Ace wraps
- Surgifix (net wrap)
- Unscented feminine pad
- Saran wrap
- Non latex glove

Biological Dressings

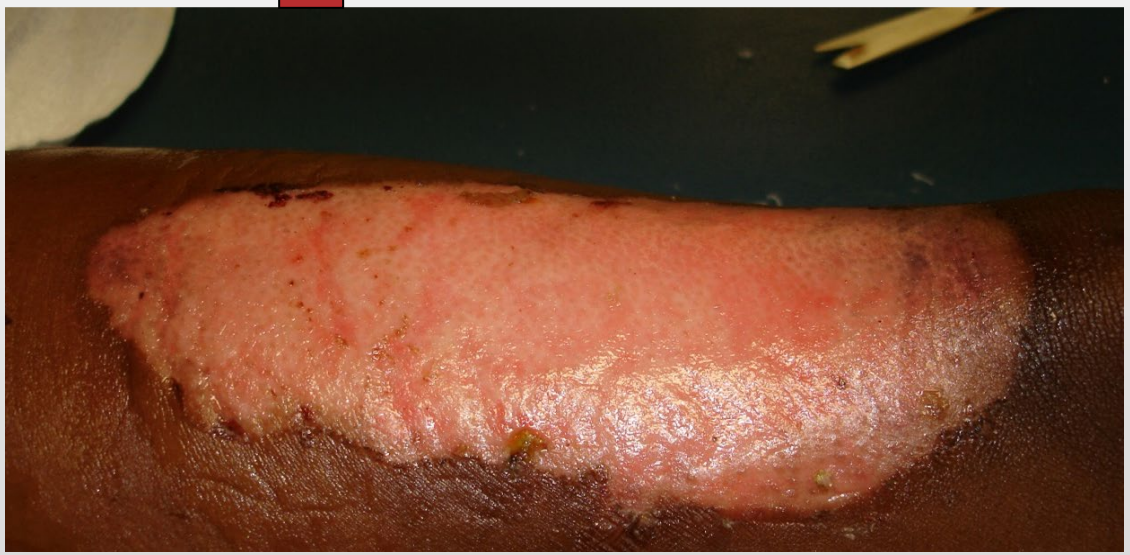
What are the benefits and when can they be used on the patient?

Oasis Burn

Scald injury

- Treated as an inpatient with Porcine
- Follow up in outpatient

Porcine Adheres



Healing

Burn extras

- Not all burns come to the burn center day one or maybe even at all.
- A full Thickness burn- Most often the burn will not be grafted for a few days to see what will heal on its own and reduce the amount of graft.
- Pain- If pain management is something that the patient can't tolerate this may lead to admission or change in treatment plans

What can we do to help?

- Help to figure TBSA
- Help with fluid calculation
- Help determine transfer of burn patient

St. Elizabeth Burn Management Algorithm

888-877-BURN (2876) or 402-219-5078

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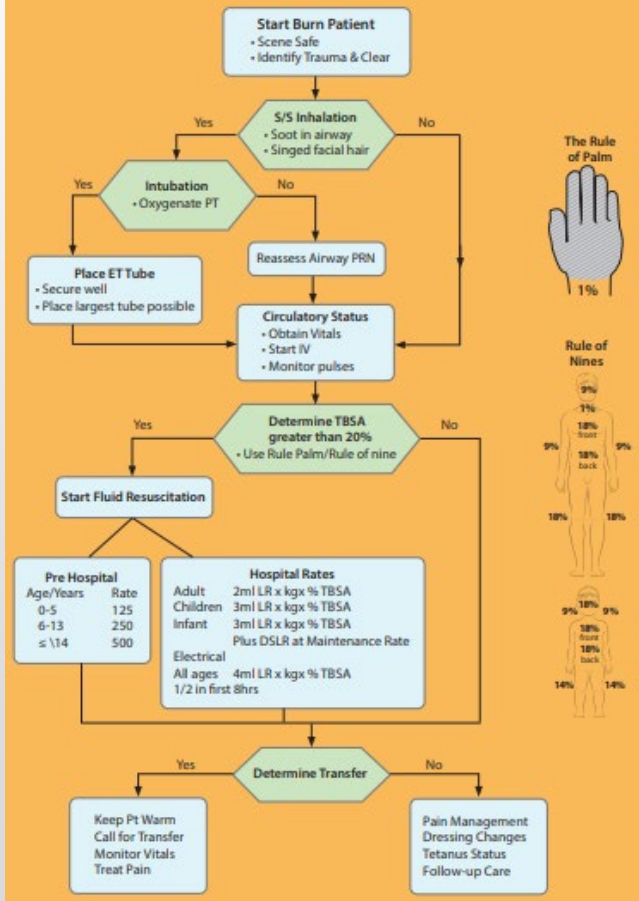

Burn Start

- Identify any Trauma and treat first, do not pass trauma center prior to going to burn center

Inhalation

- Upper airway: Blast hot air, damage above cord: Edema is emergency S/S singed hair strider or respiratory distress
- Lower airway: Enclosed space fire or prolonged extraction S/S facial burns soot on face carbonaceous sputum, hypoxia
- Tx: Early airway protection with intubation may be needed 100% oxygenation with non-rebreather or once intubated to remove CO poisoning

Cardiac/Circulatory Status

- Heart rate is elevated normally in a burn patient: EKG with electrical injuries
- Monitor for full thickness circumferential burns and evaluate extremity pulses

Determining TBSA

- Rule of Palm: The patients palm is equal to 1%
- Rule of Nine: Head/arms 9% Bil Legs, Chest, Back 18%
- **Superficial burns do not count in TBSA**

Fluid Resuscitation

- Use LR for fluid resuscitation if only have Normal saline switch to LR as soon as possible
- Formula calculated for 24hr estimates, give half the total volume in 1st 8 hrs. Remember to base on time of burn.
- Place Foley 30-50 cc/hr UOP Adult

Transfer/Outpatient

Call 800-877-BURN (2876) for transfer or burn related questions. Keep patient warm, cover w/ clean dry sheet.

A Burn Physician is on-call 24hr a day to consult with you on the assessment and management of a burn patient. We offer Telehealth, secure email or video link.

CHI Health St. Elizabeth Regional Burn & Wound Center

800-877-BURN (2876) or 402-219-5078

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Outpatient Care Guidelines

Superficial burns

- **Does not count in TBSA**
- Heals in 7-10 days
- Pink red NO Blisters
- Manage pain and keep ointment on burns.
- Ointments: Bacitracin, Aloe, lotions

Partial thickness

- Blistering or sloughing skin present
- Areas pink, red, moist, and blanches to touch
- Heals 10-21 days
- Must wash soap and water and keep covered.
- Treatments:Bacitracin, silvadene, Xeroform

Full thickness

- Dry, tan, white, charred
- Does not blanch
- Burn may be insensate
- Will require Grafting
- Wash burn keep covered and apply ointment
- Ointments:Bacitracin Silvadene, or Silver dressing

Outpatient Care: Cooling small burn <5% with water is appropriate. Wash burns 2x a day remove loose skin or yellow drainage. Apply ointment (select from above) keep burns covered and schedule appropriate follow up.

Burn Transfers: Keep burns free from ointments and creams. Keep patients warm for transport

ABA Burn Unit Referral Criteria

Not all referral criteria may require immediate admission. Discuss each case with the burn center.

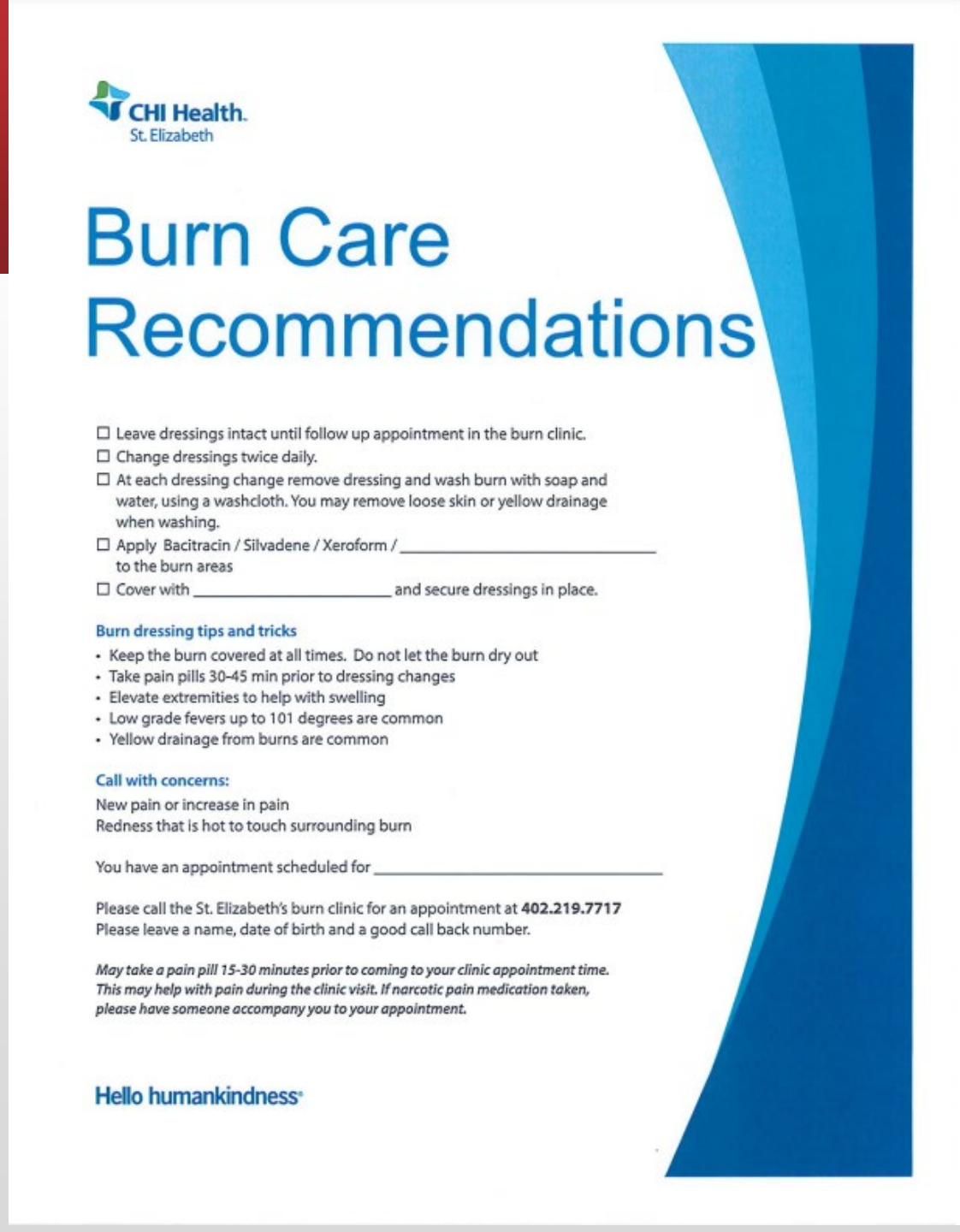
1. Second degree burns greater than 10% total body surface area (TBSA)
2. Burns involving the face, hands, feet, genitalia, perineum, and major joints.
3. Electrical burns including lighting injury.
4. Third degree burns in any age group.
5. Chemical burns.
6. Inhalation injury.
7. Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery or affect mortality.
8. Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient may be treated initially in a trauma center until stable before being transferred to a burn unit. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.
9. Hospitals without qualified personnel or equipment for the care of children should transfer children with burns to a burn unit with these capabilities.
10. Burn injury in patients who will be requiring special social/emotional and/or long-term rehabilitative support, such as cases involving suspected child abuse, substance abuse, etc.

A Burn Physician is on-call 24hr a day to consult with you on the assessment and management of a burn patient. We offer Telehealth, secure email or video link.

Scan QR Code for more burn information, education, and outpatient instructions.

Available through the QR code and to print as a way to help with discharge instructions.

This has wash instructions, options for dressing choices, signs of infections, and phone numbers to the burn clinic.



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Burn Care Recommendations

- ☐ Leave dressings intact until follow up appointment in the burn clinic.
- ☐ Change dressings twice daily.
- ☐ At each dressing change remove dressing and wash burn with soap and water, using a washcloth. You may remove loose skin or yellow drainage when washing.
- ☐ Apply Bacitracin / Silvadene / Xeroform / _____ to the burn areas
- ☐ Cover with _____ and secure dressings in place.

Burn dressing tips and tricks

- Keep the burn covered at all times. Do not let the burn dry out
- Take pain pills 30-45 min prior to dressing changes
- Elevate extremities to help with swelling
- Low grade fevers up to 101 degrees are common
- Yellow drainage from burns are common

Call with concerns:

New pain or increase in pain
Redness that is hot to touch surrounding burn

You have an appointment scheduled for _____

Please call the St. Elizabeth's burn clinic for an appointment at **402.219.7717**
Please leave a name, date of birth and a good call back number.

May take a pain pill 15-30 minutes prior to coming to your clinic appointment time. This may help with pain during the clinic visit. If narcotic pain medication taken, please have someone accompany you to your appointment.

Hello humankindness®

Thank you!

Also a special thanks to my friends at Children's for making sure I have my facts straight

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