

THE ARIZONA BURN CENTER

at Maricopa Medical Center



Guidelines for Early Care and Transfer of Burn Patients

Second Edition



The Arizona Burn Center

The Arizona Burn Center at Maricopa Medical Center is the tertiary care center for burn patients in Arizona and also receives burn patients from surrounding states and northern Mexico. In 2004, The Arizona Burn Center cared for a record setting 803 in-patients, and 2,500 out-patients, with over 5,000 burn clinic visits, making the Arizona Burn Center the 2nd largest Burn Center in the United States.

The center of excellence is a 19-bed facility, all of which can be dedicated intensive care beds, and if needed, the Arizona Burn Center often expands its bed capacity throughout Maricopa Medical Center. The Arizona Burn Center also has its own operating room, physical and occupational therapy room, conference room, admission rooms, and out-patient clinic rooms. The Arizona Burn Center is a center of excellence dedicated to the total treatment and rehabilitation of acute, chronic, and convalescing burn patients. All patients are initially taken to the admission room where their wounds are cleansed, debrided and bandaged. The patients are then taken to their rooms which are equipped with therapeutic and monitoring equipment especially designed for the burn patient. The burn patient is then treated with dressing changes, pain medications, antibiotics, nutritional supplementation and, if required, surgical debridement and grafting of their burn wounds.

Primary Survey

Airway Control

Chin lift or jaw thrust

Insert oropharyngeal/nasopharyngeal airway

Assess need for endotracheal intubation

Maintain in-line cervical immobilization in patients at risk

Breathing & Ventilation

Listen: verify breath sounds

Assess rate & depth

Administer humidified 100% oxygen –
DO NOT DECREASE!

Monitor chest wall excursion in presence of deep torso burns

Circulation

Monitor blood pressure, pulse rate, skin color

Establish IV access where ever you can, through burn skin if necessary, and start infusions (2 IV's, Warm Lactated Ringers)

Assess circulatory status of circumferentially burned extremities

Disability, Neurological Deficit

Typically alert & oriented. If not, consider:

- Associated injuries?
- Carbon Monoxide (CO) poisoning?
- Inhalation injury?
- Substance abuse?
- Hypoxia?
- Pre-existing medical condition?

Exposure / Environment

Remove all clothing & jewelry – especially rings

Remove wet dressings or wet clothing/linen

Maintain patient's temperature

- Warm room
- Warm IV fluids
- Keep patient covered; dry sheets, warm blankets
- Wrap head
- Eliminate drafts
- Covered heat packs
- Moisture retainer on endotracheal tube
- Mylar blankets

It is the patient's body temperature that is most important, not the comfort of the health care professionals.

Succinylcholine can be used to aid in the intubation of the acute burn patient for approximately 8 hours after the injury. Extreme caution should be used if succinylcholine is used after 8 hours or if there are very deep burns and/or crush injury also involved.

Secondary Survey

Complete Head-to-Toe Evaluation

Circumstances of Injury & Time of Injury:

Flame
Flash
Scald
Chemical
Electrical
Radiation
Explosion
Contact

Determine Burn Severity

Percentage body surface area involved (TBSA)

Depth of injury

Does patient meet burn center transfer criteria?

Extent of Burn

Initial estimate use “Rules of Nine” for 2nd & 3rd degree burns only

Rules of nine not completely accurate for infants/children due to larger body surface area of head & smaller surface area of legs

Burn diagrams “Lund & Browder” illustrate adult-child differences

Patient’s palmar surface (hand + fingers) = 1 % TBSA

Burns to the eyes – EMERGENCY!

Medical History & Physical Exam

Pre-existing or associated disease

Medications, ETOH, drugs

Allergies

Tetanus status



Radiographic & Laboratory Studies

Chest x-ray should be obtained

Carboxyhemoglobin (very important with suspicion of inhalation injury)

Other indicated x-rays for associated injuries

ECG (electrical injury, cardiac history)

CBC

Pregnancy test in all females of childbearing age

Electrolytes

Urinalysis

Blood urea nitrogen/creatinine

Arterial blood gases

Blood glucose (pediatrics, diabetics)

Urine Drug screen

Serum alcohol level

Physical Findings Suggestive of Inhalation Injury

History of enclosed space

Carbonaceous sputum, soot on face

Extensive facial burns, singed nasal hairs

Agitation, anxiety, cyanosis, stupor, or other signs of hypoxia

Rapid respiratory rate, nasal flaring, intercostal retractions

Hoarse voice, brassy cough, change in voice

Rales, rhonchi or distant breath sounds

Erythema or swelling of oropharynx or nasopharynx

Inability to swallow or protect airway

Large burns > 20% TBSA

Labs: carboxyhemoglobin > 10%

Examination

Agitation, decreased LOC

Cherry red skin color (unusual to see)

Cyanosis & tachypnea unlikely
(CO₂ removal is unaffected)

PaO₂ and SaO₂ likely to be normal

Only carboxyhemoglobin level may be abnormal

Pulse oximeter not always accurate.
Keep on 100% oxygen

The pulse oximeter does not differentiate between hemoglobin that is saturated with oxygen or carbon monoxide, thus the pulse oximeter may read 100% when in fact the oxygen saturation is much lower

Treatment

High flow 100% oxygen to all burn patients—DO NOT DECREASE!

Treat according to BLS/ACLS/ATLS/ABLS protocols

Early oral intubation is preferred. Large tube at least 7.5 in adults.

Initiate fluid resuscitation with Lactated Ringers if indicated

Aggressive suctioning

Consider bronchodilators

Meets American Burn Association Referral Criteria for transfer

Contact Arizona Burn Center for transfer
602-344-5726

Carbon Monoxide Half-Life

240-360 minutes breathing room air

30-60 minutes breathing 100% oxygen

Do not bypass

**The Arizona Burn Center
for Hyperbaric treatment.**

**Keep the patient on 100%
oxygen.**

Thermal

Stop the burning process.

Cool the burn with room temperature water or saline for a few minutes only

Universal precautions

Airway and C-spine precautions

Treat according to BLS/ACLS/ATLS/ABLS protocols

Remove all clothing and jewelry
– especially rings

Initiate fluid resuscitation Lactated Ringers

Cover the burn area with clean, dry sheet

No prophylactic antibiotics

Ice or wet dressings should never be applied

Monitor distal pulses (palpable) in circumferentially burned extremities

Does patient meet American Burn Association Referral Criteria?

If meets criteria contact Arizona Burn Center 602-344-5726 and arrange transfer

Electrical/Lightning

Turn off power source, scene safety

Don't get injured yourself in effort to rescue victim

Universal precautions

Start CPR if indicated

Treat according to BLS/ACLS/ATLS/ABLS protocols

Remove clothing and jewelry
–especially rings

Assess for occult injuries

Monitor for cardiac arrhythmias

Monitor neurological status

Assess and document pulse of affected extremities

Initiate fluid resuscitation Lactated Ringers if indicated

Meets American Burn Association Referral Criteria

Contact Arizona Burn Center 602-344-5726 and arrange transfer

Chemical

Protect yourself – full personal protective equipment

Remove all clothing and jewelry which can trap chemicals

If dry powder is present brush away before irrigating with water

Neutralization is contraindicated

Certain chemicals require special considerations (e.g. hydrofluoric acid)

Flush with copious warm water (minimum several liters) on scene and continue irrigation enroute to Arizona Burn Center

Irrigation of chemical injury is necessary prior to patient transfer

Identification of agent after institution of therapy may provide additional medical considerations. **DO NOT** delay treatment to identify agent involved

Chemical injuries to eyes are an **EMERGENCY**. Remove contacts and irrigate continuously with normal saline – **DO NOT STOP!**

Meets American Burn Association Referral Criteria

Contact Arizona Burn Center 602-344-5726 and arrange transfer

Pediatric Thermal

Stop the burning process

Cool the burn with room temperature or saline for a few minutes only

Universal precautions

Remove all clothing and jewelry
–especially rings

Maintain temperature prevent hypothermia
–kids get cold very easily

Initial care is directed at airway, breathing and circulation

Evaluate for possible child abuse

Meets American Burn Association Referral Criteria

Contact Arizona Burn Center
602-344-5726 and arrange transfer

Pediatric Fluid Management

Initiate fluid resuscitation Lactated Ringers

Very important to administer maintenance fluid with resuscitation due to limited glycogen stores in young children

Plus maintenance fluid with D5LR

- 4 ml/kg/hr or 100 ml/kg/day for first 10 kg, plus
- 2 ml/kg/hr or 50 ml/kg/day for second 10 kg, plus
- 1 ml/kg/hr or 20 ml/kg/day for all further kg

Elderly Thermal

Treat aggressively – hydrate like a younger adult if needed

COPD – Do not intubate unless necessary

Example of initial fluid requirements for a 24 kg child with a 20% burn

Parkland Formula

Resuscitative fluid:

$$4 \times 24 \times 20 (\%BSA) = 1920 \text{ ml (LR)} / 2 = 960 \text{ ml} / 8 \text{ hours} \\ = 120 \text{ ml/hr (LR)}$$

Maintenance fluid:

$$4 \text{ ml} \times 10 \text{ kg} = 40 \text{ ml} \\ 2 \text{ ml} \times 10 \text{ kg} = 20 \text{ ml} \\ 1 \text{ ml} \times 4 \text{ kg} = 4 \text{ ml} \\ = 64 \text{ ml/hr (D5LR)}$$

Total hourly fluid requirements = 184 ml/hr

Fluid Resuscitation

Proper fluid management is critical to the survival of patients with extensive burns. Fluid resuscitation needs are related to the extent of the burn and body size.

Use the Rule of Nines, to estimate body surface area of second or third degree burns.

Fluid resuscitation needs to supplement circulating volume and treat hypovolemic shock.

Place two large bore IVs in a nonburned extremity or through burned tissue if necessary.

Calculation starts from the time of injury.

Calculate the Fluid Rate Using the Following Formula (Parkland Formula):

Adults:

2-4 ml/Ringers Lactate x kg body weight x percent burn. Give the first half over the first 8 hours and the remainder over the next 16 hours. Consult Arizona Burn Center Surgeon.

Children > 10 years old:

Use the same formula as for adults. Consult Arizona Burn Center Surgeon.

Children < 10 years old:

Start with 3-4 ml/Ringers Lactate x kg body weight x percent burn. Consult Arizona Burn Center Surgeon.

Young children and infants should have both maintenance fluids with D5LR dextrose and glucose-free resuscitation fluids.

In infants and pediatric patients hypoglycemia may develop due to limited glycogen reserves; therefore, blood glucose levels must be monitored.

Place a Foley bladder catheter to accurately measure urine.

Monitor hourly urine output as indication of treatment of hypovolemic/burn shock.

Discard the urine obtained with initial placement of foley.



Titrate Ringers Lactate Based on Urine Output:

Adult or young adolescent:
30 to 50 cc/hr (0.5 cc/kg/hr)

Children under 30 kg:
1cc/kg/hr of urine

High voltage electrical injury:
75 to 100 cc/hr (1-2cc/kg/hr)

Diuretics (e.g. lasix) are never indicated during initial resuscitation.

If there is no urine output, increase the rate of fluids. If there is only a scant amount of dark or concentrated urine, pigments, myoglobin, and/or hemoglobin may be blocking the kidney-especially in a high voltage electrical injury. If urine output and pigment clearing do not respond to several liters of fluid administration, 12.5 to 25 grams of mannitol plus 1 amp of sodium bicarbonate should be added to each liter of Lactated Ringers.

Consult with Arizona Burn Center Surgeon prior to starting mannitol infusion.



Burn Situations that Require Special Fluid Management are:

Electrical injury

Inhalation injury

Patients in whom fluid resuscitation was delayed

Patients burned while intoxicated

Children and infants

Dehydrated patients

Elderly

Patients with preexisting cardiac or renal disease

Actual volume of fluid infused can be different from calculated volume. Monitor patient's physiological response.

Monitor lung sounds during resuscitation for overload, however patient must have adequate urinary output (0.5 to 1.0 cc/kg/hr) before decreasing fluids.

Elevate head and burned extremities as soon as possible.

Assessment of mental status should be done frequently.

Anxiety and restlessness are early signs of hypovolemia and hypoxia.

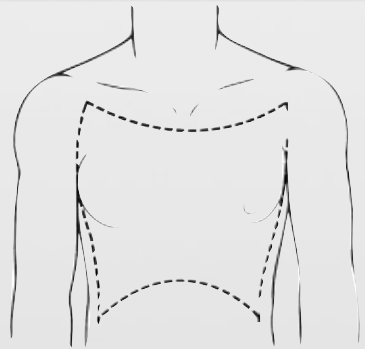
Anxiety and Restlessness are early signs of hypovolemia and hypoxia.

Nasogastric Tube Placement

Place nasogastric tube (or oral gastric tube if indicated) and then connect to suction and decompress stomach if nausea and/or vomiting are present, or if major burn TBSA is greater than 20%, patient is intubated or to be transported by air. Keep patient NPO.

Circumferential Chest Burns

Deep circumferential burns of the chest may impair or prevent mechanical ventilation of the burn victim. The adequacy of respirations must be monitored continuously throughout the resuscitation period. If early respiratory distress is present, it may be related to a deep circumferential burn wound of the chest, making it impossible for the chest to expand adequately with each ventilation attempt. Rule out other causes of respiratory distress such as obstruction prior to relief by escharotomy, which may be life-saving. Escharotomies for circumferential chest wall burns are performed in the anterior axillary line bilaterally. If there is significant extension of the burn onto the adjacent abdominal wall, escharotomy incisions should then be extended to this area and should be connected by a transverse incision along the costal margin (see diagram).



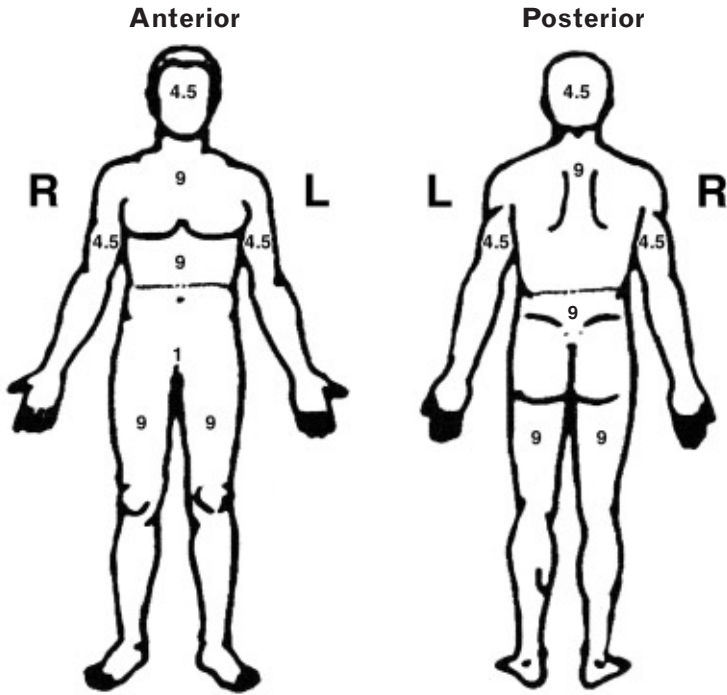
chest escharotomy sites

Circumferential Extremity Burns

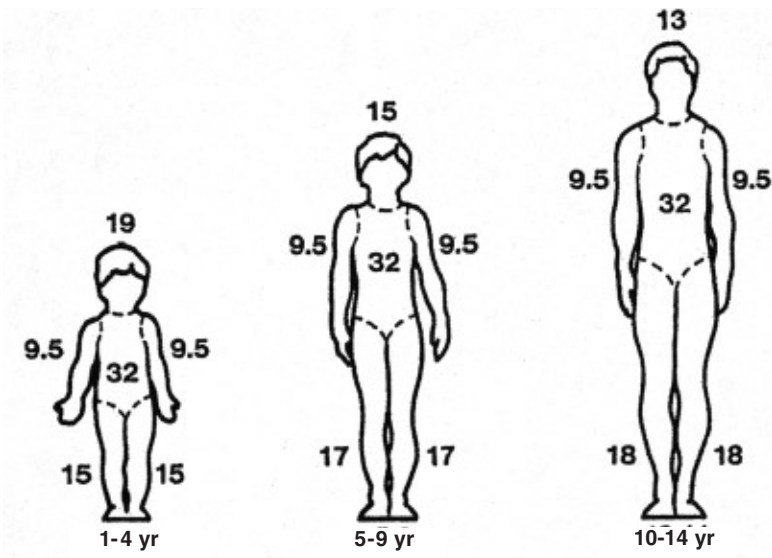
Edema formation in the underlying tissues is often caused from deep burns. Circumferential burns especially in the extremities may produce significant vascular and neurologic compromise if not recognized and treated in a timely manner. The first sign of compromise is pain upon passive stretch of the involved extremity. Other indications of decreased blood flow are slowing of capillary refill, diminished pulses, numbness, tingling, pain, paralysis, and coolness. Repeat pulse checks are essential and if unable to palpate, use Doppler ultrasound device.

If unable to detect either pulses or doppler signals,
Consult Arizona Burn Center surgeon immediately!

Adult Rule of Nines

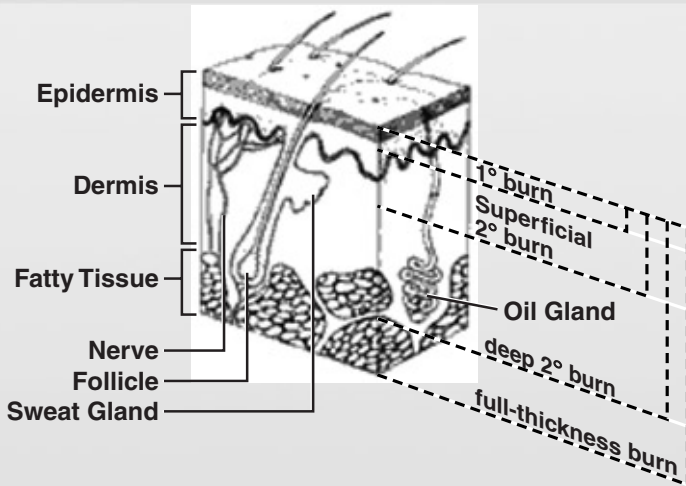


Total Body Surface Area: By Age Group (In Percent)



The Degrees of Burns

<p><u>Superficial: First Degree</u></p> <p>Red, dry, painful without blisters, blanches w/pressure •Do not include in BSA % estimate</p>	<p>Epithelium injured but intact (Sunburn or propane flash)</p>
<p><u>Partial Thickness: Second Degree</u></p> <p>Red, blisters, weepy, shiny, blanches w/pressure, painful</p>	<p>Epithelium and varying layers of dermis are destroyed (Scald)</p>
<p><u>Full Thickness: Third Degree</u></p> <p>Red, dry, white, charred, leathery in appearance Hair follicle removes easily, diminished pain.</p>	<p>Epidermis and dermis are destroyed. Extends to subcutaneous layers, muscle and bones (Flame)</p>



For scattered burns:
the patients palm
including fingers are
equal to 1% TBSA

Patient History

Obtain the following patient information: how victim was burned, time of injury, concomitant injuries, allergies, medical history, current meds, last meal, drug and/or alcohol history.

Provide **tetanus toxoid** prophylaxis as indicated.

Pain Management

Morphine sulfate is indicated for control of the pain associated with burns. Give all pain medication intravenously; changes in fluid volume and tissue blood flow make absorption of any drug given intramuscularly or subcutaneously unpredictable. Only give morphine after IV fluids infusing and when 2 blood pressures measurements have been obtained that trend towards normal for the patient's age/size etc.

Consider anxiolysis in addition to pain medication (especially in children!)

Do not use ice or iced normal saline as a comfort measure!

Family Support

Provide the family opportunity to see the patient prior to transfer. It may be several hours before the family is able to see the patient again. There is always the chance the patient's condition can deteriorate. Explain to the family the method of transfer; the time it will take to reach destination; the name, address and telephone number of The Arizona Burn Center. Provide family with directions to The Arizona Burn Center.

Treating for Hypothermia

Wet dressings cause evaporative heat loss and hypothermia, which is detrimental. Wet dressings or wet sheets should never be applied to a burn patient.

Wrap patient in clean or sterile, dry sheet. Place warmed blankets over patient. Cover head with extra layer. Utilize thermal insulation blanket if available

Maintain body temperature between 38-39 degrees Celsius (100 – 102°F)

The American Burn Association and The Arizona Burn Center have identified the following injuries as those requiring referral to a Burn Center.

1. Partial thickness burns greater than 5% total body surface area (TBSA)
2. Burns that involve the face, hands, feet, genitalia, perineum, or major joints
3. Third-degree burns of any size and any age group
4. Electrical burns, including lightning injury
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 initially stabilized in a trauma center 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. Burned children in hospitals without qualified personnel or equipment for the care of children
10. Burn injury in patients who will require special social, emotional and/or long-term rehabilitative interventions.

Transfer Process

Physician-to-physician contact is essential to ensure that the patient's needs are met throughout every aspect of the transfer. The referring physician should provide both demographic and historical data, as well as the results of his/her primary and secondary assessment. Provide copies of all paper work; flow sheet of resuscitation, treatments, medications administered labs, and x-rays. The Arizona Burn Center and the referring physician, working in collaboration should make the decision as to the mode of transportation and the required stabilization measures. Communication and teamwork are crucial to an effective transport and optimal patient outcome.

If hospital is on diversion for trauma please call The Arizona Burn Center directly at 602-344-5726 to speak to Dr. Daniel Caruso, Dr. Kevin Foster, or Dr. Marc Mathews our Medical Directors.

The Arizona Burn Center is NEVER on diversion. We are always available to accept patients.

What Makes Burns Suspicious for Abuse

Unexplained BURN-TRAUMA

Implausible history

Inconsistent history

Delay in seeking medical care

Frequent injuries, illnesses

Child accuses an adult

One parent accuses the other

Alleged self-infliction

Pattern of burn

Immersion burns

Rigid contact burns

Other signs of abuse/neglect

Prior Child Protective Services (CPS) involvement

Multiple emergency department visits to multiple hospitals

Multiple injuries in various stages of healing

The responsibility to recognize and report suspected child abuse rests with every member of the health team. The ultimate goal in the management of child abuse is the protection of the child from further injury and the initiation of therapeutic measures to restore the family to a stable, healthy environment.

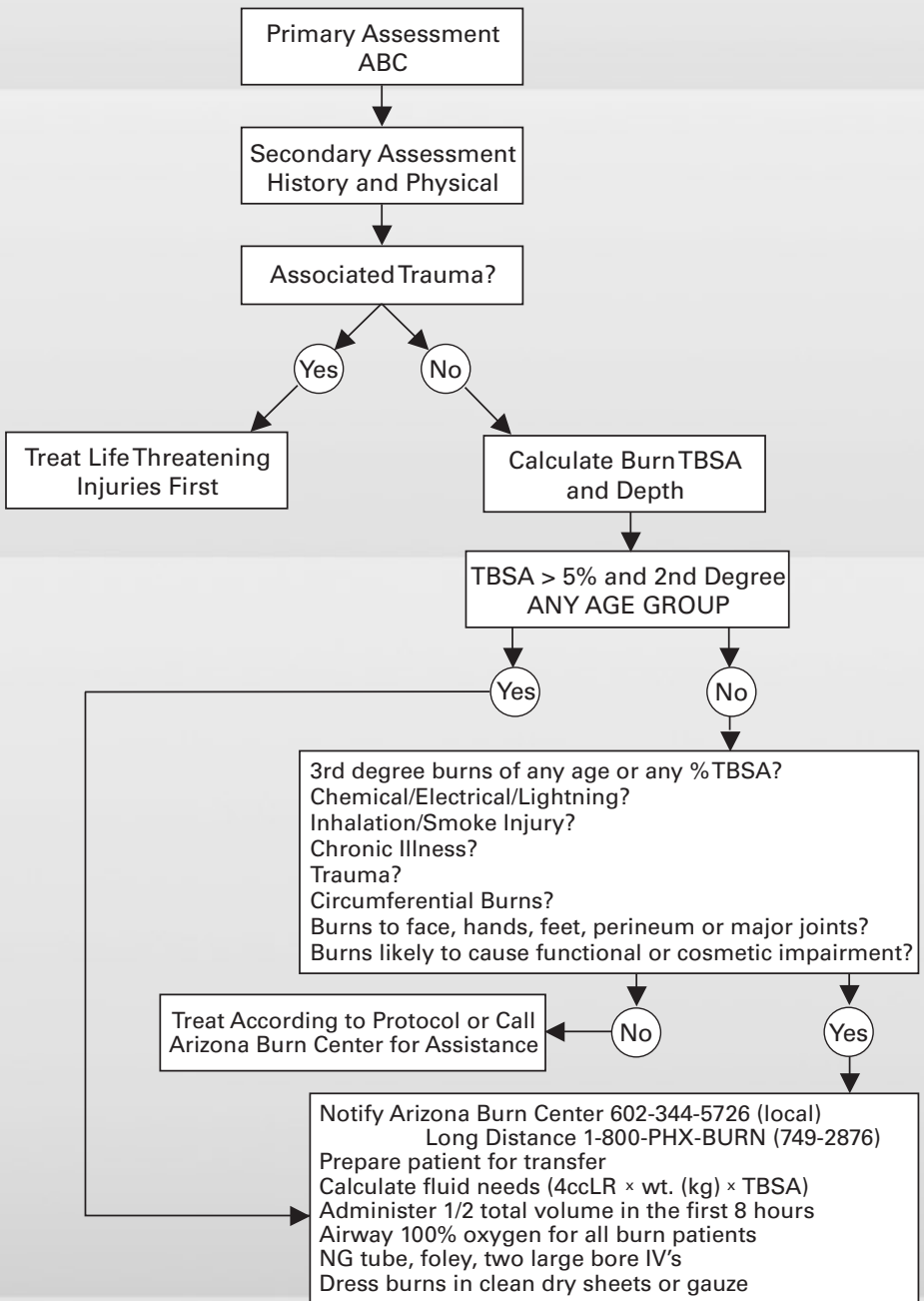


It is not our job to prove child abuse/neglect, but it is our job to report it!

Please contact the county Child Protective Services!

Remember abuse can occur in the elderly. If concerned contact Adult Protective Services.

Emergency Burn Care Decision Tree





Prevention • Treatment • Rehabilitation • Research
333 East Virginia Avenue, Suite 218
Phoenix, Arizona 85004
Mike Merucci Executive Director
Phone 602-230-2041 www.azburn.org

History & Mission

The Foundation for Burns & Trauma, Inc. is a non-profit 501(c)(3) organization, that was founded and incorporated in Phoenix, Arizona in 1967 by MacDonald Wood, MD, William Price, MD and by attorney George F. Randolph.

The mission: The Foundation for Burns & Trauma is dedicated to assisting burn victims and their families in becoming burn survivors through rehabilitation, treatment and research; the reduction of death and injury from burns and fire through prevention education, and serving as an advocacy partner for the prevention of trauma associated with other injuries.

Supporting Burn Survivors

The Foundation for Burns & Trauma assists burn and trauma victims and their families by:

- Forever Courage House (sponsored in part by Forever Living Products International and The Lennar Family of Builders (Greystone/US Home) is a shelter for family members of critical burn or trauma patients who are being treated at The Arizona Burn Center. Forever Courage House 2623 N. 7th Street, Phoenix, AZ 85006.
- Ashes to Life Support Group helps burn victims and their families adjust to the physical and emotional ramifications of a burn injury. The group meets twice a month and provides socialization, support and companionship to burn survivors.
- Teen Support Group (ages 13-19) meets monthly to discuss issues, enjoy companionship and to participate in recreational activities.
- School Re-Entry Program educates the public, community, teachers, and peers on the burn survivors experience. A successful return and reintegration to school is one of the biggest milestones a child will face following their burn injuries.
- Camp Courage is a week-long rehabilitative camping experience designed to help child burn victims become survivors. Camp combines summer camp with life skills that allow kids the freedom from the rejection, isolation and frustration often experienced by burn victims.
- Partners in Prevention offers burn prevention education and awareness programs through health fairs, presentations to community groups and school with multi-cultural partnerships in a language and culturally competent manner.

If the family of a burn patient you are transporting may need temporary shelter in Phoenix, please have them contact the Forever Courage House at: 602-230-2052

How to Obtain Patient Transport Information

If you are interested in learning more about how to properly prepare a burn patient for transfer, call The Arizona Burn Center at Maricopa Medical Center. Our burn care specialist will guide you step-by-step through the process. Thank you for your referral.

The Arizona Burn Center is committed to educating health care professionals on initial stabilization, management and transfer of burn patients. Please call for more information.

For assistance, or to arrange transfer, call The Arizona Burn Center:

Local: 602-344-5726
Long Distance: 1-866-PHX-BURN (749-2876)
Fax: 602-344-1499
Website: www.azburncenter.com

Daniel M. Caruso, MD, FACS

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602-344-5637

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602-344-5637

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Director of Burn Center &
Cardiopulmonary Services
602-344-5447

Suzanne M. Buchanan, RN, BSN, CCRN

Outreach Educator
602-344-5327

For Outpatient Burn Clinic Please Call for Appointment:

Local: 602-344-5112
602-344-5575

Burn Clinic hours:

Tuesday 10:00am - noon

Wednesday 9:00am - noon

Friday 8:00am - noon

Afternoon 1:00 - 4:00pm

Afternoon 1:00 - 3:00pm

Afternoon 1:00 - 2:30pm



Count on us to care.

