



Ch. 9. Stabilization, Transfer and Transport

Objectives

Upon completion of this lecture, the participant will be able to:

- Identify the criteria established by the American Burn Association (ABA) for burn injuries requiring referral to a burn center.
- Describe pre-transfer stabilization.
- Describe transfer procedures.

I. Introduction

The patient with a compromised airway, electrical, chemical or major thermal injury requires immediate assessment and stabilization at the closest appropriate hospital. Hospital personnel must complete a primary and secondary survey and evaluate the patient for potential transfer to a burn center. Burn injuries may be a manifestation of multiple trauma and the patient must be evaluated for associated injuries. All procedures employed must be documented to provide the receiving burn center with a transfer record that includes a flowsheet. Transfer agreements should exist to ensure orderly transfers.

II. ABA Burn Center Referral Criteria

The American Burn Association (ABA) has identified the following injuries as those requiring referral to a burn center. A burn center may treat adults or children or both. Burn injuries that should be referred to a burn center include the following:

- Partial thickness burns of greater than 10% total body surface area.
- Burns that involve the face, hands, feet, genitalia, perineum, or major joints.
- Third-degree burns in any age group.
- Electrical burns, including lightning injury.

- Chemical burns.
- Inhalation injury.
- Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality.
- Any patients 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's condition may be stabilized initially in a trauma center before transfer to a burn center. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.
- Burned children in hospitals without qualified personnel or equipment for the care of children.
- Burn injury in patients who will require special social, emotional or rehabilitative intervention.

Patients at the age extremes are subject to variable physiologic response to thermal injury. Infants and elderly patients are less tolerant of burn injuries. The burn team approach, utilizing physicians, nurses, psychologists, dietitians, social workers, physical and occupational therapists, has a significant influence on outcome for major burn and electrical injuries.

III. Stabilization in Preparation For Transfer To A Burn Center

Once the decision has been made to transfer a burn patient, it is essential that the patient be properly stabilized prior to the transfer process. The principles of stabilization are implemented during the primary and secondary survey in the following manner.

A. Body Substance Isolation

Prior to initiating care of the patient with burns, it is critical that healthcare providers take measures to reduce their own risk of exposure to potentially infectious substances and/or chemical contamination. Body isolation devices include gloves, eyewear, gowns and respiratory protection. The level of protection utilized will be determined by patient presentation, risk of exposure to body fluids and airborne pathogens, and/or chemical exposure.

B. Primary Survey

During the primary survey all life- and limb-threatening injuries should be identified and management initiated.

1. Airway Maintenance with Cervical Spine Protection

The airway must be assessed and management initiated immediately. One hundred percent oxygen per non-rebreather mask should be applied to all patients with serious burns and/or suspected or confirmed inhalation injury. Intubation should be performed when indicated.

It is important to protect the cervical spine before doing anything that will flex or extend the neck. In-line cervical immobilization is performed during initial assessment, in general, and during endotracheal intubation, in particular, for those patients in whom cervical spine injury is suspected by the mechanism of injury or for those with altered mental status.

2. Breathing and Ventilation

Ventilation requires adequate functioning of the lungs, chest wall, and diaphragm. Circumferential full thickness burns of the trunk and neck, and the abdomen in children may impair ventilation and must be closely monitored. It is important to recognize that respiratory distress may be due to a non burn condition such as a preexisting medical condition or pneumothorax from associated trauma.

3. Circulation and Cardiac Status

Major thermal injury results in a predictable shift of fluid from the intravascular space. Assessment of the adequacy of circulation includes evaluation of blood pressure, pulse rate, and skin color (of unburned skin). Baseline vital signs are obtained during the primary survey and are monitored throughout care and transport.

A large bore IV should be inserted and fluid resuscitation started using LR. In burns greater than 30% TBSA two catheters should be used. During the primary survey the fluid infusion rate should be based on patient age as follows:

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

Frequent assessment of the peripheral circulation, especially in areas of circumferential extremity burns, should be performed. Escharotomies may need to be performed.

4. Disability, Neurological Deficit and Gross Deformity

Typically, the patient with burns is initially alert and oriented. If not, consider associated injury, carbon monoxide/cyanide poisoning, substance abuse, hypoxia, or pre-existing medical conditions. Assess for any gross deformity that may be due to an associated trauma.

5. Exposure and Environmental Control

Expose, completely undress the patient and **Examine** the patient for major associated injuries and maintain a warm Environment.

The burning process must be stopped during the primary assessment. Cool the burn briefly (3 – 5 minutes) for thermal burns, with cool, not cold water. Remove all clothing, jewelry/body piercings, shoes, and diapers to complete the primary survey. If any material is adherent to the skin, stop the burning process by cooling the adherent material, cutting around it and removing as much as possible.

For chemical burns, remove all clothing and foot coverings, brush dry chemicals off the patient and then flush with copious amounts of running water.

Maintaining the patient's core body temperature is a priority. The EMS transport vehicles and treatment rooms should be warmed. As soon as the primary survey is completed, the patient should be covered with dry sheets and blankets to prevent hypothermia.

C. Secondary Survey

The secondary survey does not begin until the primary survey is completed and after resuscitative efforts are well established. The secondary survey entails:

- History
- Complete head-to-toe evaluation of the patient
- Determination of percent TBSA burned
- Fluid calculations using the ABLIS 2010 Fluid Resuscitation Formula
- Insertion of lines and tubes

- Lab and X-rays
- Monitoring of fluid resuscitation
- Pain and anxiety management
- Psychosocial support
- Wound care

1. History

Using the acronym AMPLET obtain the following history:

- A:** Allergies. Drugs and environmental
- M:** Medications: Prescription, over-the-counter, herbal and home remedies
- P:** Past medical history: **P**revious illnesses or injuries, potential for **p**regnancy
- L:** Last meal or drink
- E:** **E**vents/**e**nvironment relating to incident. Suspicion of abuse or neglect? Intentional or unintentional injury?
- T:** Tetanus and Childhood Immunizations

Tetanus is considered current if given within the past five years. It is also important to know if a child is up-to-date with his/her childhood immunizations.

2. Complete Physical Exam

a. Determining the Severity of the Burn and Fluid Resuscitation

During the secondary survey the Total Body Surface Area (TBSA) burned is determined using the Rule of Nines.

- Adult thermal and chemical burns
 $2\text{ml LR} \times \text{weight kg} \times \% \text{ third/fourth degree burn}$
- Pediatric patients <14 years old or less than 40 kg
 $3\text{ml LR} \times \text{weight kg} \times \% \text{ third/fourth degree burn}$
- Pediatric high voltage electrical injuries: **consult the burn center immediately**
- High voltage electrical injuries (adult)only with evidence of deep tissue injury or presence of hemochromagens in the urine (red urine) **4ml LR x weight kg x % full thickness (third/fourth degree) burn**

In the first eight hours post injury, half of the calculated fluid amount is given. In the second eight hours, 25% is given. And in the third eight hours, the remaining 25% of the fluid is given. The IV rate should be adjusted as

needed to maintain adequate urine output. Administer LR based on the ABLIS 2010 Fluid Resuscitation Formula.

Insert urinary catheter and maintain an hourly urinary output of:

- Adult thermal and chemical burns: 30 – 50 ml urine/hour
- Pediatrics: 1 ml urine/kg/hour
- High voltage electrical (adult): 75 – 100 ml urine/hour

Adjust IV fluid rate hourly based on urinary output and physiologic response

3. Vital signs

Vital signs should be monitored and documented at frequent intervals.

4. Insertion of Nasogastric Tube

Patients with burns of more than 20% TBSA are prone to nausea and vomiting. A nasogastric tube may need to be inserted to prevent aspiration. Consider insertion of a nasogastric tube for the following patients:

- Adult and pediatric patients with burns > 20% TBSA
- Intubated patients
- Patients with associated trauma

5. Assessment of Extremity Perfusion and Ventilatory Status

Frequently assess for the 5 Ps --- **p**ain, **p**allor, decreasing **p**ulse or **p**ulselessness, progressive **p**arathesia and **p**aralysis --- for signs of circulatory compromise. Doppler assessment may be necessary if pulses are difficult to palpate. Chest and abdomen excursion should also be monitored closely. Escharotomies may need to be performed.

6. Pain and Anxiety Management

Burn pain may be excruciating and must be managed. Control of the pain must begin upon initiation of medical care. Morphine or another narcotic is indicated for control of the pain associated with burns. Small frequent doses should be administered through the IV route only.

7. Psychological Assessment

Health care providers must be sensitive to the variable emotions experienced by burn patients and their families. Feelings of guilt, fear, anger, and depression must be recognized and addressed.

8. Tetanus Immunization

The tetanus prophylaxis administered should be consistent with the recommendations of the American College of Surgeons. Tetanus prophylaxis can be delayed for 72 hours to ascertain patient tetanus immunization status, but such a deferral must be specifically recorded so prophylaxis will not be overlooked.

9. Burn Wound Care

All burn wounds should be covered with a clean, dry sheet. A blanket may be needed to maintain body temperature. It is imperative that the patient remains warm during stabilization and transfer. Do not delay transfer for debridement of the wound or application of an antimicrobial ointment. Cold application is to be avoided.

10. Documentation

Transfer records need to include information about the circumstances of injury as well as physical findings and the extent of the burn. A flow sheet to document all resuscitation measures must be completed prior to transfer. All records must include a history and document all treatments and medications given prior to transfer. (See Sample Form)

A copy of the patient's Advance Directives or Durable Power of Attorney for Healthcare should be sent to the burn center with the patient.

Sample Transfer Information Form

Today's date: _____ Time: _____

Information Obtained From: _____

Referring Agency: _____

Referring Physician: _____ Phone #: _____

Patient's Name: _____

Age: _____ Sex: _____ Wt: _____ Ht: _____

Date of Burn: _____ Time of Burn: _____

Source of Burn: _____ Estimated % TBSA: _____

Body Areas Burned: _____

Associated Injuries: _____

Other procedures performed (e. g., x-ray): _____

Allergies: _____

Current Meds: _____

Past Medical History: _____

Tetanus Given:

Analgesics Given: _____ Route/Dosage: _____ Time: _____

Inhalation: Yes No Intubated: Yes No O2 per _____

Circumferential: Yes No Where: _____

Distal Pulses: Yes No Escharotomies: Yes No

Where: _____

Pulses After: Yes No

IVs: 1. _____ Rate _____ /hr.

2. _____ Rate _____ /hr

Total IV fluid intake since burn _____ ml

Output (Foley) _____ ml past hr. _____

Total output post burn _____ ml

Burn treatment: _____

Present status of pt: BP _____ P _____ R _____ Combative: Yes No

Please send copies of any lab, X-ray results and Advance Directives/Durable Power of Attorney for Health Care if applicable.

IV. 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.

The burn center and the referring physician, working in collaboration, should make the decision as to the means of transportation and the required stabilization measures. Personnel trained in burn resuscitation should conduct the actual transport. In most cases and subject to state law, the referring physician maintains responsibility for the patient until the transfer is completed.

A transfer agreement between the referring hospital and the burn center is desirable and should include a commitment by the burn center to provide the transferring hospital with appropriate follow-up. Quality indicators will provide continuing education on initial stabilization and treatment of burn patients.

V. Summary

Patients with compromised airways, electrical, chemical or thermal injuries that meet the ABA Criteria for Burn Center Referral should be assessed, stabilized, and promptly transferred to a burn center. Burn center personnel must be available for consultation and may assist in stabilization and preparation for transfer.

VI. Select References

Sheridan R, Weber J, Prelack K, et al. Early burn center transfer shortens the length of hospitalization and reduces complications in children with serious burn injuries. *J Burn Care Rehabil*, 1999; 20:347-50. (Demonstrates that delay in transfer of seriously burned patients compromises outcome, increases length of hospitalization and increases costs.)

Vestrup J A. Interinstitutional transfers to a trauma center. *Am J Surg* 1990; 159:462-5. (Reviews protocols for transfer of seriously injured patients.)

Young J S, Bassam D, et al. Interhospital versus direct scene transfer of major trauma patients in a rural trauma system. *Am Surgeon* 1998; 64:88-91. (Reviews indications for transfer of seriously injured patients directly to specialty centers.)

Guidelines for the Operation of Burn Centers . In: *Resources for Optimal Care of the Injured Patient*. Chicago, IL: Committee on Trauma, American College of Surgeons; 2006, pp. 79-86.



Ch. 10. Burn Disaster Management

Objectives:

Upon completion of this lecture, the participant will be able to:

- Define burn triage and how to sort burn casualties
- Identify patient treatment priorities in a burn disaster
- Describe priorities for transfer of patients to a burn center
- Describe why patients with burn injuries are best managed in burn centers

I. INTRODUCTION

A. Burn injuries are common in disasters and terrorist acts.

Burn disasters can occur in any community. Most do not involve terrorism or terroristic attacks. They can occur anywhere people congregate: schools, churches, housing units, dormitories, workplaces and entertainment establishments. They can also occur as the result of natural disasters such as wild land fires, earthquakes, etc. Each community has its own high-risk locations. All healthcare providers should be aware of the potential for burn disasters and plan, prepare and practice community wide drills.

On September 11, 2001 terrorist attacks both in New York and Washington, DC, produced large numbers of patients with burn injuries in a short period of time. Burn Centers in New York and Washington, DC, almost immediately saw a capacity of patients and in the weeks that followed were challenged with the demands of ongoing care for those burn survivors. In addition to surface injuries, many of the patients also had inhalation injuries.

People with burn injuries due to disasters frequently have associated injuries, minor to severe inhalation injuries are common. In 2003 the Station Nightclub Fire, in Rhode Island, burned with over 400 people inside at the start of the fire. There were 96 dead at the scene and four died later