



EMERGENCY MEDICAL
SERVICES AGENCY
LOS ANGELES COUNTY

Los Angeles County Emergency Medical Services
Multi-Casualty Burn Disaster: Hospital Management

BURN RESOURCE MANUAL 2017



EMERGENCY MEDICAL
SERVICES AGENCY
LOS ANGELES COUNTY

**COUNTY OF LOS ANGELES DEPARTMENT OF HEALTH SERVICES
EMERGENCY MEDICAL SERVICES AGENCY
DISASTER SERVICES**

Funding for this Education Program provided by a Hospital Preparedness Program (HPP)/Federal
Award Identification Number (FAIN) U90TP000516



The title of this document is "**BURN RESOURCE MANUAL 2017**".

The information in this manual is For Official Use Only (FOUO). Reproduction of this document, in whole or part, without prior permission of Los Angeles County Emergency Medical Service is prohibited.

For more information, please consult the following points of contact (POC's):

Disaster Program Manager-Surge Programs

Los Angeles County Emergency Medical Services Agency
10100 Pioneer Blvd, Suite 200
Santa Fe Springs, CA 90670
(562) 347-1500

Chief, Disaster Management Section

Los Angeles County Emergency Medical Services Agency
10100 Pioneer Blvd, Suite 200
Santa Fe Springs, CA 90670
(562) 347-1500

ACKNOWLEDGEMENTS
2017 Burn Manual Review Committee

Terry Crammer, RN

Chief Disaster Services
562-347-1646

Warren Garner, MD

LAC+USC Burn Center
323-409-7996 OR 323-409-7991

Peter Grossman, MD

The Grossman Burn Center
818- 981-2050

Zachary Heinemann, RN

Long Beach Memorial Hospital
562-933-1315

Laurie Lee-Brown, BSN, RN,

Disaster Program Manager-Surge Programs
543-562-1651



EMERGENCY MEDICAL
SERVICES AGENCY
LOS ANGELES COUNTY

Los Angeles County Emergency Medical Services
Multi-Casualty Burn Disaster: Hospital Management

Vimal Murthy, MD

Torrance Memorial Burn Center– 4 East Lundquist Tower
310-517-4622

Elaine Rojas, RN

Education and Outreach-Grossman Burn Center at West Hills Hospital
818-676-4743

ACKNOWLEDGEMENTS
2010 Burn Manual Review Committee

Kay Fruhwirth, RN, MSN

Assistant Director LA County EMS Agency

Roel Amara, RN, BSN

Acting Chief, Disaster Management Section

Jacqueline Rifenburg, RN

Disaster Training Specialist



TABLE OF CONTENTS

1. BURN RESOURCE CENTER DESIGNATION AND ACTIVATION POLICY

2. BURN CARE PLAN

Introduction and Background

References

3. APPENDICES

Appendix A: Burn Care Resources – LA County and surrounding area

Appendix B: Trauma Centers (Burn Resource Centers)

Appendix C: Triage Decision Table for Burn Mass Casualty Disaster

Appendix D: Patient Transport Form

Appendix E: Measuring Total Body Surface Area Burn

Appendix F: Fluid Resuscitation

Appendix G: Inhalation Injury

Appendix H: Escharotomy

Appendix I: Wound Care

Appendix J: Nutrition

Appendix K: Multi casualty Burn Disaster Hospital Management Program
Overview, course description & program objectives

4. TRAINING RESOURCES

a. "Multi-Casualty Burn Disaster: Hospital Management of the Burned Patient" Revised 2017

- i. Presentation Handouts
- li. Policies



- b. Burn Wound Care – DVD (provided with original training in **2010**)

5. PUBLICATIONS

- a. Journal of Trauma Article: Burn Surge for Los Angeles County, California (Vandenberg & Roel Amara, 2009)
- b. Journal article: Guidelines for Burn Care under Austere Conditions



BURN RESOURCE CENTER DESIGNATION AND ACTIVATION POLICY

REFERENCE NO. 1138

REVISED: 07-01-17

PURPOSE: To define the role of a Burn Resource Center (BRC) and provide guidelines for the utilization of BRCs and the management of burn patients during a burn disaster in Los Angeles (LA) County.

AUTHORITY: Pandemic and All-Hazards Preparedness Act (PAHPA) (Public Law 109-417) Hospital Preparedness Program - Trauma Center Scope of Work.

DEFINITIONS:

Administrator on Duty (AOD): Administrator on Duty with the Los Angeles (LA) County Emergency Medical Services (EMS) Agency.

Burn Center: A specific area within the hospital that has committed the resources necessary to meeting the criteria for a burn center. This area contains beds and other equipment related to care of patients with burn injury. Hospitals are either approved by the American Burn Association or self-designated as burn centers.

BURN INJURY:

Major/Critical:

1. Patients 10 years of age or older with burn injury involving equal to or greater than 20% of Total Body Surface Area (TBSA)
2. Patients under 10 years of age with burn injury involving equal to or greater than 10% of TBSA

Minor:

1. Patients 10 years of age or older with burn injury involving less than 20% of TBSA.
2. Patients less than 10 years of age with burn injury involving less than 10% of TBSA.

Burn Resource Center (BRC): A BRC is a designated trauma center in LA County that has agreed to provide medical care for up to 12 critically burned patients for a minimum of 72 hours.



A BRC shall:

1. Be licensed by the State Department of Health Services as a general acute care hospital.
2. Maintain a special permit for basic or comprehensive emergency medicine service.
3. Be designated by LA County EMS Agency as a Trauma Center.
4. Sign a written commitment with the LA County EMS Agency to become a BRC.

Burn Surge Plan Activation: An incident resulting in 20 or more burn patients or any event that exceeds burn care resources available in LA County.

Local Burn Lead Specialist: A Medical Director (or designee) from a burn center in LA County who will be available to provide assistance to the AOD and the Medical Alert Center (MAC) in triaging and placement of critically injured burn patients. (Ref. No. 1138.2)

Remote Burn Lead Specialist: A Medical Director from a burn centers located outside greater LA County (Orange County, San Bernardino County, San Francisco, San Diego, and Sacramento) who can provide assistance to the AOD/MAC in triaging and placement of patients in the event that the Local Burn Lead Specialist is unavailable due to the magnitude of the incident. (Ref. No. 1138.3)

PRINCIPLES:

1. As a recipient of the Hospital Preparedness Program (HPP) grant, LA County must work with healthcare entities to ready hospitals and supporting healthcare systems to deliver coordinated and effective care to victims of a multi-casualty burn disaster.
2. In the event of a multi-casualty burn disaster, LA County may not have sufficient resources to manage an influx of patients; therefore the BRC program was developed to enhance burn surge capacity through:
 - a. The provision of pharmaceuticals, medical supplies, and equipment required to manage burn patients. (Ref. No. 1138.1)
 - b. The provision of training and resource materials to BRC staff on the management of burn patients.
3. With additional training, pharmaceuticals, medical supplies, and equipment, trauma centers have the personnel and resources to adequately manage critical burn patients.



4. Priority of transfer is determined by facility resources and the patient's probability of survival. Probability of survival is based on TBSA, patient's age and co-morbidities.

5. Transfer of burn patients is coordinated and arranged through the MAC in consultation with a Burn Lead Specialist.

POLICY:

I. The following trauma centers have committed to and are recognized as BRCs:

- A. Antelope Valley Hospital
- B. Cedars Sinai Medical Center
- C. Children's Hospital Los Angeles
- D. Dignity Health-California Hospital Medical Center
- E. Dignity Health- Northridge Hospital Medical Center
- F. Dignity Health- St. Mary Medical Center
- G. Henry Mayo Newhall Hospital
- H. Huntington Memorial Hospital
- I. LAC Harbor/UCLA Medical Center
- J. LAC+USC Medical Center
- K. Long Beach Memorial Medical Center
- L. Pomona Valley Medical Center
- M. Providence Holy Cross Medical Center
- N. Ronald Reagan UCLA Medical Center
- O. Saint Francis Medical Center

II. A BRC shall:

- A.** Have a written contractual agreement with LA County EMS Agency to meet the requirements for program participation as specified in the HPP Agreement in effect.
- B.** Ensure a constant state of readiness by maintaining and replacing pharmaceuticals, medical supplies and equipment listed in Reference No. 1138.1, Burn Resource Center Required Equipment/Supplies/Pharmaceuticals.
- C.** Train a team of physicians and nurses that specialize in emergency and/or intensive care medicine. This team will act as a resource to hospital personnel.
- D.** Provide for on-going training to BRC personnel to manage critically burned patients for a minimum of 72 hours.
- E.** Provide care for up to 12 major/critical burn patients.



III. Burn Surge Plan Implementation

A. Activation: The LAC EMS Agency AOD in consultation with the Local Burn Lead Specialist, if immediately available, shall activate the BRCs and the Burn Surge Plan.

B. Destination: Burn patient destination guidelines during a burn surge:

NOTE: These guidelines are in effect only when BRCs are activated.

1. Major/Critical burn patients or any burn patient meeting trauma criteria shall be transported to the most appropriate BRC. Transportation will be based on available resources during the Multi-Casualty Incident (MCI).
2. Minor burn patients not meeting trauma criteria shall be transported to the most accessible receiving facility (MAR) that is not a BRC.

NOTE: MAC will coordinate distribution of burn patients to the most appropriate receiving facilities to avoid inundating a single facility.

C. Transfer: Patient transfer guidelines to Burn Centers.

1. Patient transfer to Burn Centers will be coordinated through the MAC under the guidance of a Burn Lead Specialist.
2. LAC EMS Agency in conjunction with the burn centers will maintain a call panel of Local Burn Lead Specialists (Ref. No. 1138.2), who are on call to assist the LA County EMS Agency AOD prioritize and assist burn patient transfers and placement.
3. If a Local Burn Lead Specialist is unavailable, a Remote Burn Lead Specialist may be contacted. (Ref. No. 1138.3).
4. The Local Burn Lead Specialist shall be board certified with a specialty in burn management.
5. Priority of transfers:
 - a. Major/critical burn patients at a non-BRC.
 - b. Major/critical burn patients at a BRC.
 - c. Minor burn patients at a non-BRC.
 - d. Minor burn patients at a BRC.

NOTE: BRCs may have to provide care to major burn patients beyond 72 hours.
BURN CARE PLAN



BURN CARE PLAN

INTRODUCTION AND BACKGROUND

In 2007, as participants in the United States Department of Health and Human Services Hospital Preparedness Program, Los Angeles County Emergency Medical Services Agency (EMSA) was charged with the task of creating a plan to surge for 150 burn beds in the event of a multi-casualty burn disaster. This number is based upon the population of Los Angeles County.

In 2017, the burn plan was updated to reflect accurate counts of trauma centers and burn beds: Currently there are 62 burn beds available in Los Angeles County. After evaluating the burn resources of the county, it was determined that the most viable method of surging beds was to utilize the hospitals already committed to our established trauma system. The trauma program in Los Angeles County includes 15 level I and level II trauma centers. Each of these 15 hospitals have been designated as a Burn Resource Center (BRC) and are prepared to accept up to twelve burn patients in the event of a burn disaster.

In 2007, Los Angeles County Emergency Medical Service Agency created a Burn Task Force to assist in the development of a burn plan. This multi-disciplinary group included the Medical Directors and Administrative Nurses from the three burn centers in Los Angeles County, one center in Orange County and one center in San Bernardino County and representatives of the Emergency Medical Services Agency.

This Burn Resource manual has been created as a tool for use by the Emergency Departments in all Los Angeles County Hospitals. The materials were developed and/or selected from the burn literature by Burn Task Force back in 2007-2008. Resources in the manual were updated in 2017 by a new Burn Task Force to reflect the new resuscitation formulas (according to the American Burn Association 2016) and update the burn policies (LA County Prehospital Care Policy Manual 2017). These tools are provided to assist the individual hospitals in offering the presentation to their employees.

NOTE: It is the responsibility of each individual hospital to continue to provide updates and training to their staff regarding. The hospitals shall update the manuals as policy and/or best practice changes regarding treatment, transport and care of the burn patient.



REFERENCES

Guidelines for the Operations of Burn Units (pp. 55-62),
Resources for Optimal Care of the Injured Patient: 1999, Committee on Trauma,
American College of Surgeons.

The American Burn Association website www.ameriburn.org

Advanced Burn Life Support – ABLSNow@ameriburn.org

American Burn Association Advanced Burn Life Support Course Provider Manual
2016 Update

BURN CENTER VERIFICATION

http://www.ameriburn.org/verification_verifiedcenters.php

Verification of burn centers is a joint program of the American Burn Association (ABA) and the American College of Surgeons (ACS). It is a voluntary rigorous review program designed to verify a burn center's resources that are required for the provision of optimal care to burn patients from the time of injury through rehabilitation.

2017 Verification

CALIFORNIA	
LAC+USC Medical Center Burn Center	Los Angeles
UCI Regional Burn Center	Orange
Shriners Hospital for Children - Northern California Pediatric Burn Center	Sacramento
UC Davis Regional Burn Center Adult Burn Center	Sacramento
University of California San Diego	San Diego
Saint Francis Memorial Hospital Bothin Burn Center	San Francisco
Santa Clara Valley Medical Center	San Jose
Torrance Memorial Medical Center Burn Center	Torrance
Grossman Burn Center at West Hills Hospital Adult Burn Center	West Hills



APPENDIX A:

BURN CARE RESOURCES:

LOS ANGELES COUNTY

LAC+USC Burn Center

2051 Marengo – Inpatient Tower – 5D

Los Angeles, CA 90033

323-409-7996 OR 323-409-7991– Tel

323-441-8375 – Fax

Torrance Memorial Burn Center – 4 East Lundquist Tower

3330 Lomita Blvd

Torrance, CA 90505

310-517-4622 – Tel

310-784-4803 – Fax

The Grossman Burn Center –At West Hills Hospital

7300 Medical Center Drive

West Hills, CA 91307

818-981-2050 – Tel

818-676-4462 –Fax

University of California Irvine Regional Burn Center

101 The City Drive South

Orange, CA 92868

714- 456-5304 –Tel

714-456-5305 - Fax

ORANGE COUNTY

Burn in Orange County Global Medical Center

1001 N. Tustin Avenue

Santa Ana, CA 92705

714-953-2377 – Tel

714-953-3362 – Fax

Edward G. Hirschman Burn Center at Arrowhead Regional Medical Center

400 N. Pepper Ave.

Colton, CA 92324

909-580-2100- Tel

909-580-2120 – Fax

Grossman Burn Center at Bakersfield Memorial Hospital

420, 34th Street

Bakersfield, CA 93301

661-323-2876



REMOTE BURN SPECIALISTS

Shriners Hospital for Children

2425 Stockton Blvd.
Sacramento, CA 95817
916-453-2111 – Tel

916-453-2373 - Fax

UC Davis Burn Center

2315 Stockton Blvd.
Sacramento, CA 95817
916-734-3636 – Tel

916-734-5375 - Fax

AMERICAN BURN ASSOCIATION (ABA):

www.ameriburn.org or info@ameriburn.org

ABA Central Office – Chicago
625 N. Michigan Ave., Ste 2550
Chicago, Illinois 60611
312.642.9260 – Tel

312-642-9130 - Fax



APPENDIX B:

TRAUMA CENTERS - BURN RESOURCE CENTERS (BRC)

Antelope Valley Hospital Center

1600 West Avenue J
Pasadena, CA 91105
(661) 949-5000

Cedars Sinai Medical Center

8700 Beverly Boulevard
Los Angeles, CA 90048
(310) 855-5000

Children's Hospital Los Angeles

4650 Sunset Boulevard
Los Angeles, CA 90027
(323) 660-2450

**Dignity Health-California Hospital
Medical Center**

1401 South Grand Avenue
Los Angeles, CA 90015
(213) 748-2411

**Dignity Health-Northridge Hospital
Medical Center**

18300 Roscoe Boulevard
Northridge, CA 91328
(818) 885-8500

**Dignity Health-St. Mary
Medical Center**

1050 Linden Avenue
Long Beach, CA 90813
(562) 491-9000

Henry Mayo Newhall Memorial Hospital

23845 West McBean Parkway
Valencia, CA 91355
(661) 253-8000

Huntington Memorial Hospital

100 West California Boulevard
Pasadena, CA 91105
(626) 397-5000

LAC HARBOR/UCLA Medical Center

1000 West Carson Street
Torrance, CA 90502
(310) 222-2345

LAC/USC Medical Center

1200 North State Street
Los Angeles, CA 90033
(323) 226-2622

Long Beach Memorial

2801 Atlantic Avenue
Long Beach, CA 90806
(562) 933-2000

Pomona Valley Medical Center

1798 North Garey Avenue
Pomona, CA 91767
(909) 623-8715

Providence Holy Cross

15031 Rinaldi Street
Mission Hills, CA 91345
(818) 365-8051

**Ronald Reagan UCLA Medical
Medical Center**

757 Westwood Plaza
Los Angeles, CA 90095
(310) 825-9111

St. Francis Medical Center

3630 East Imperial Highway
Lynwood, CA 90262
(310) 900-7301



APPENDIX C:

TRIAGE DECISION TABLE FOR BURN MASS CASUALTY DISASTER

The American Burn Association has provided a Triage Decision table based on Age, TBSA and survivability. This grid is intended for mass burn casualty disaster only. It should be used where responders are overwhelmed and transfer possibilities are insufficient to meet needs (*ABLS 2016 Provider Manual, Burn Disaster Management Chapter 10, page 113*).

Triage Decision Table of Benefit-to Resource ratio based on patient Age and Total Burn Size.

This survivability grid utilizes the same 4-color code scheme used for EMS personnel. Survivability will differ if the patient has also sustained an inhalation injury.

FOUR TRIAGE CATEGORIES:

Immediate /Red: immediate treatment needed to save life, limb, or sight (highest priority).

These patients have a higher probability of survival with immediate treatment.

Delayed/ Yellow: less urgent than immediate, but still potential for life or limb threatening issues.

These patients are not in danger of going into immediate cardiac or respiratory arrest. Treatment may be temporarily delayed in order to care for more critical patients.

Minimal/Green: outpatient treatment and returned to duty/home.

These are patients who are ambulatory, alert and oriented and have no life- or limb- threatening injuries. (Note: These "walking wounded" may initially refuse care at the scene, then present at the local hospital for treatment compromising capability assessments).

Expectant/Black: poor prognosis even with treatment (lowest priority).



TO BE USED BY RECEIVING HOSPITAL IN CONSULTATION WITH THE BURN LEAD SPECIALIST.

Burn Size (% TBSA)

Age, in years	Percent TBSA burn size									
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	≥ 90
0-1.9										
2-4										
5-19	Outpatient			Delayed			Immediate			
20-29										
30-39										
40-49										
50-59										
60-69					Low survival, may opt for expectant management					
≥ 70										



APPENDIX D:

BURN DISASTER PLAN – PATIENT TRANSPORT FORM

Hospital Name:	
Patient Identification	Sex: Male____ FEMALE____ AGE: DOB: Weight:____kg
TRANSFER TO:	
Authorized by:	
Date/Time of Injury	DATE: TIME:
TBSA Cutaneous Burn Size Total burned surface area ____% Please mark superficial burns as dots, partial thickness burns as stripes and full thickness burns as solid areas.	<p>Back view: 4 1/2%, 1%, 18%, 4%, 4%, 9%, 9%</p> <p>Front view: 4 1/2%, 1%, 18%, 4%, 4%, 9%, 9%</p>
INHALATION INJURY	NO:____ POSSIBLE:____ YES:____
OTHER INJURIES	Describe:
FLUID VOLUME	Total Fluid () ml (Oral + Infused fluid) Infused Fluid () ml Time () (Duration of infusion)
FLUID TYPE	L/R: () ml Saline: () ml Other: () ml
Completed by:	Name: PHONE:

APPENDIX E:

FAX: (562) 906-4300

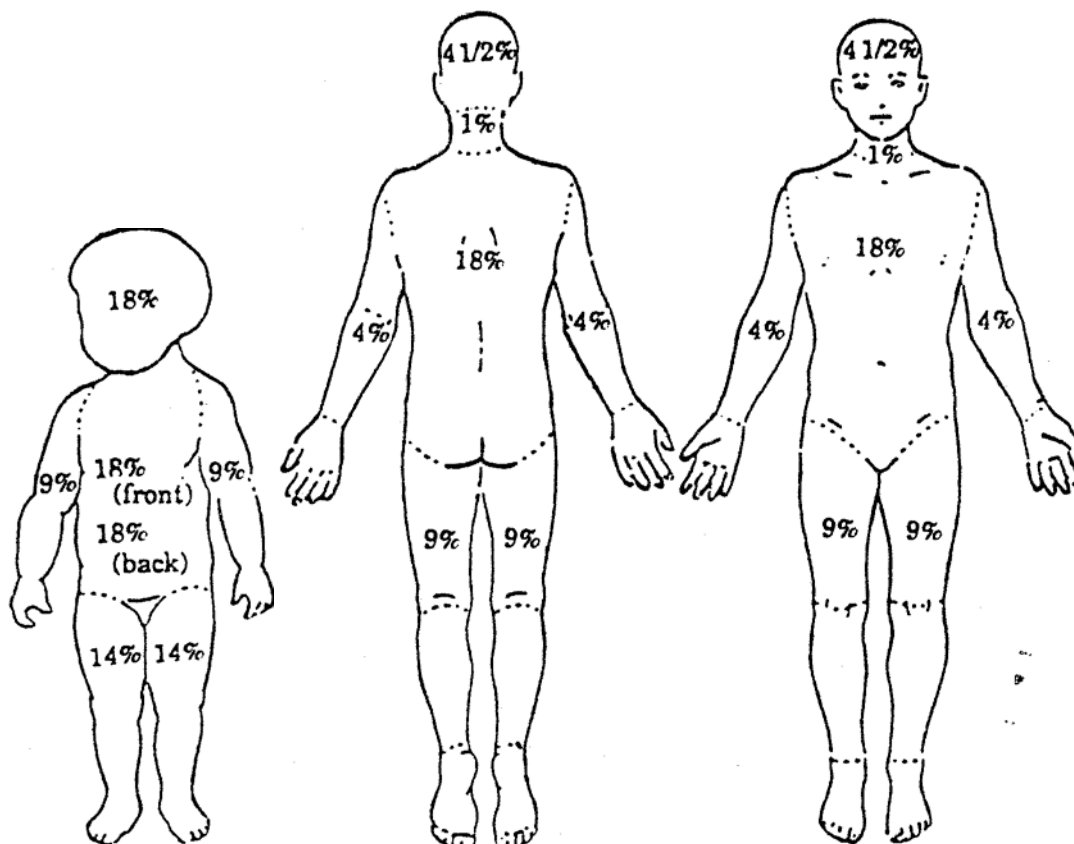
24 Hour Phone: (866) 940-4401

Los Angeles County Medical Alert
Center Fax & Phone Number



RULE OF NINES

Estimating Total Body Surface Area (TBSA) Burned



INSTRUCTIONS:

The Rule of Nines is used in the pre-hospital setting. In the adult, the large body parts are designated as either 9% or twice this – 18%.

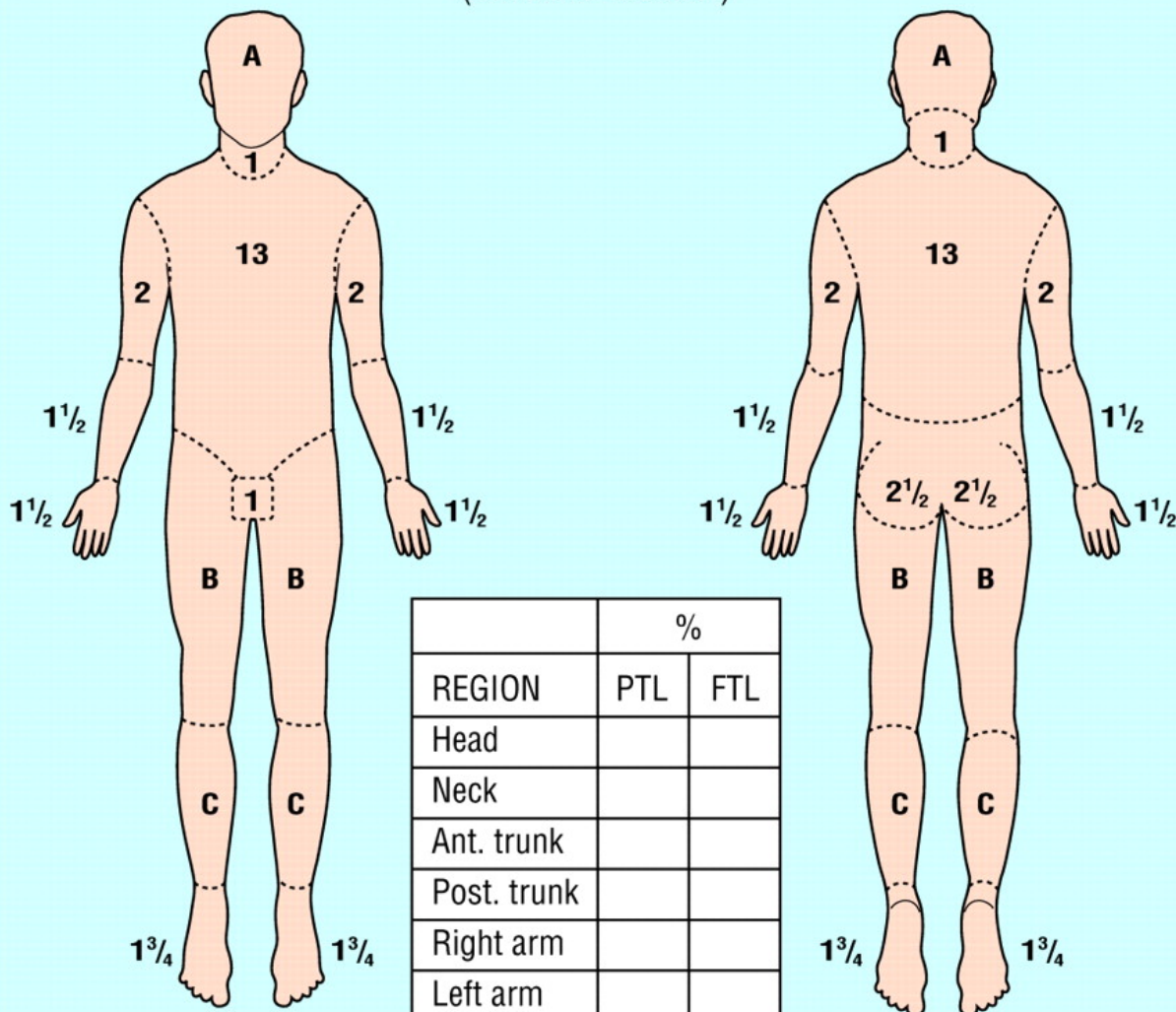
In a child, the percentages are slightly different. The head of a child is much larger in proportion to the body than in an adult. Therefore, the head is 18%. Notice also that the legs are 14% each, not 18%.



LUND BROWDER DIAGRAM

% Total Body Surface Area Burn

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



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

AREA	Age 0	1	5	10	15	Adult
A = 1/2 OF HEAD	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
B = 1/2 OF ONE THIGH	2 3/4	3 1/4	4	4 1/2	4 1/2	4 3/4
C = 1/2 OF ONE LOWER LEG	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2



RESUSCITATION

PURPOSE

The purpose of this guideline is to provide the hospital-based physician and staff with information on assessment and management of fluid resuscitation in the burn injured patient. The American Burn Association, Advanced Burn Life Support course curriculum was used as a guideline for preparation of this appendix.

VASCULAR ACCESS AND FLUID OF CHOICE

If peripheral intravenous access is not possible, a central line may be necessary. The intraosseous route may be considered if IV access is not immediately available and cannot be established.

Lactated Ringer's is the fluid of choice for burn resuscitation because it is widely available and approximates intravascular solute content.

GOAL OF RESUSCITATION

Maintain tissue perfusion and organ function. Avoid complications of excessive or inadequate fluid resuscitation.

EXCESSIVE RESUSCITATION

Edema is part of the natural history of burn injuries. Maximum edema is seen 24 – 48 hours post burn. Those particularly sensitive to excessive resuscitation are: elderly, children and persons with preexisting cardiac disease.

INADEQUATE RESUSCITATION

Prompt administration of adequate fluid is essential to a good outcome. Inadequate fluid therapy may result in shock, organ failure, acute renal failure and death.

CALCULATE PERCENT TOTAL BODY SURFACE AREA BURN

Obtain patient weight

Calculate percent burn using the Lund Browder diagram or the rule of nines (Appendix 1).

Establish peripheral IV access or central line if necessary.



FLUID RESUSCITATION

Thermal and Chemical Burns

First 24 hours:

ADULT

2 ml LR X patient's body weight in kg. X % TBSA of 2nd and 3rd degree burns
(Research indicates that resuscitation based upon using 4 ml LR per kg per %TBSA burn commonly results in excessive edema formation and over-resuscitation).

PEDIATRIC PATIENTS (14 years of age and under AND less than 40 kg.)

3 ml LR x child's weight in kg x % TBSA second and third degree burns

High Voltage Electrical Injuries

ADULTS Patients with I f there is evidence of deep tissue injury or hemochromogens (red pigments) are present in the urine, begin fluid resuscitation using:

4 ml LR x patient's weight in kg x % TBSA second and third degree burns.

PEDIATRIC PATIENTS with high voltage injuries, consult a Burn Center immediately for guidance.

The most critical consideration when determining the volume of fluid to administer is the patient's urinary output and physiological response. It is better to increase fluids based on response than to attempt to remove excess fluids once given.

Some patients including those with a delayed start of fluid resuscitation, prior dehydration, chronic or acute alcohol use or abuse, methamphetamine lab injuries, high voltage electrical injuries, or inhalation injuries may require more than the estimated fluids. Again, the **rate of fluid administration is based on patient response.**

In the first eight hours post injury, half of the calculated 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.



TABLE 1: AMERICAN BURN ASSOCIATION (ABA) Formula for **ADULT resuscitation needs:**

THERMAL AND CHEMICAL BURNS	Calculated volume	Timing	Solution
	2ml X kg X % 2 nd & 3 rd degree Burns in 24 hours' time	½ of total in first 8 hours	Lactated Ringers
		Second ½ over next 16 hours	Lactated Ringers
HIGH VOLTAGE ELECTRICAL INJURIES			
	4 ml X weight in kg X % TBSA (2 ND & 3 rd degree burns)	½ of total in first 8 hours	Lactated Ringers

TABLE 2: ABA Formulas for estimating **PEDIATRIC resuscitation needs:**

THERMAL AND CHEMICAL BURNS	Calculated volume to begin resuscitation	Timing	Solution
Children ≤ 14 years or 40 kg	3 ml x kg x %TBSA burn (2 nd & 3 rd degree burns)	½ of 24 hour total infused in 1 st 8 hours	Lactated Ringers
		2 nd 8 hours	Lactated Ringer's
		3 rd 8 hours	Lactated Ringer's
Infants and Young Children ≤30kg As above for children and Supplement with:	Maintenance See Maintenance calculations Pg. 17.	1 st 24 hours	D5LR
HIGH VOLTAGE ELECTRICAL INJURIES	Consult Burn Center		



MAINTENANCE CALCULATIONS for adults and children:

1st 10 kg – 4 cc/kg/hr

2nd 10 kg – 2 cc/kg/hr

Each kg above 20kg – 1cc/kg/hr

Recommendations for ongoing resuscitation are from the American Burn Association, Advanced Burn Life Support course curriculum 2016 and subject to change.

Monitoring and observation should include the following:

- Measurement of urine output hourly.
- Frequent assessment of general condition including mental status.
- Baseline Hematocrit, hemoglobin, serum chemistries and arterial blood gases. Repeat as indicated.

HOURLY URINARY OUTPUT

- Obtain hourly urine output with the use of an indwelling bladder catheter.
- Adults 0.5cc/kg/hour (or 30-50cc/hour).
- Children weighing less than 30 Kg: 1cc/ Kg/hour.
- Increase or decrease fluid infusion rate by 1/3 if the output falls below or exceed this limits by one-third for 2-3 hours.

MANAGEMENT OF OLIGURIA

Oliguria is most likely due to inadequate fluid administration. In this case, diuretics are contraindicated.

The rate of fluid infusion should be increased.



HEMOCHROMOGENURIA

High voltage injury may result in high levels of myoglobin and hemoglobin in the urine.

Administer fluids at a rate to maintain 1.0-1.5 ml/Kg/Hr (75-100cc/hour) to clear the heme products without having to use a diuretic.

If not effective, add 12.5 Gm of osmotic diuretic, Mannitol to each liter of resuscitation fluid. Discontinue when pigment density decreases. Add sodium bicarbonate to maintain slightly alkaline urine.

Persistent hemochromogenuria may indicate compartment syndrome.

BLOOD PRESSURE

Misinterpretation of blood pressure can lead to massive fluid overload. Sphygmomanometric measurements may diminish as edema progresses. Intra-arterial monitoring may be unreliable as well due to peripheral vasoconstriction.

HEART RATE

HR is not a useful tool for monitoring resuscitation. A rate of 100-120 in adults is common in an adequately resuscitated patient. In children the levels of tachycardia are dependent on their normal heart rate.

HEMATOCRIT and HEMOGLOBIN

Not reliable guides to resuscitation in the first 24 hours. Whole blood or PRC are indicated for anemia associated with pre-existing disease or blood loss from concomitant trauma. RBC transfusion is not necessary in the ED for isolated cutaneous injury. Should Hg/Hct fall considerably alternative sources of blood loss should be considered.

SERUM CHEMISTRIES

Obtain baselines for significant burns or inhalation injury. Ongoing measurements as needed. Treat hyperkalemia and other electrolyte imbalances.



APPENDIX G:

INHALATION INJURY

PURPOSE

The purpose of this guideline is to provide the hospital-based physician and staff with information on assessment and management of inhalation injury. The American Burn Association, Advanced Burn Life Support course curriculum was used as a guideline for preparation of this appendix.

INTRODUCTION

There are three types of airway inhalation injury:

- Carbon monoxide poisoning
- Inhalation injury above the glottis
- Inhalation injury below the glottis

DIAGNOSIS

- 1) Supported by one or more specific points from patient history: closed space exposure to hot gases, steam or products of combustion
- 2) Physical exam (as below)
- 3) Airway visualization
- 4) Laboratory findings –Arterial blood gases to check for elevated carboxyhemoglobin, unexplained acidosis.

PHYSICAL ASSESSMENT

CO2 INTOXICATION

- **Early signs:** Headache, tachycardia, irritability, cutaneous flushing
- **Behavioral changes:** mental confusion, vomiting, incontinence, appears intoxicated
- **Acute:** Bounding pulse, dilated pupils, cyanosis or pall



RESPIRATORY TRACT INJURY

- Soot on tongue/in pharynx
- Facial burns, singed nasal or other hair
- Coughing/wheezing
- Agitation, anxiety, stupor, cyanosis, general signs of hypoxemia
- Restless/confused
- Carbonaceous sputum
- Hoarse voice, brassy cough, grunting, guttural respiratory sounds
- Rales, rhonchi or distant breath sound
- Erythema or swelling of the tissues of the oropharynx or nasopharynx
- Inability to swallow
- Labored or rapid breathing
- Stridor
- Decreased air exchange

TREATMENT

Carbon Monoxide Poisoning:

- Treat with 100% oxygen until a level of $<100\%$ is achieved.
- Half-life of carbon monoxide on room air is 4 hours. This is reduced to 1 hour on 100% oxygen.

Injury above the Glottis:

- Because this injury progresses rapidly –
- Intubate as soon as possible.

Injury below the glottis:

- Intubate to clear secretions, relieve dyspnea and ensure adequate oxygenation and ventilation, particularly if the patient is being transferred.
- This type of injury may result in airway obstruction that develops over time – may occur 24 -72 hours post burn. Watch for:
 - Progressive hoarseness
 - Increased stridor
 - Retractions

OTHER CONSIDERATIONS:

Circumferential burns of the chest or abdomen may result in compromised ventilation. If this occurs, escharotomies may be indicated to improve ventilation.



APPENDIX H:

ESCHAROTOMY

PURPOSE

This guideline is to review the principles of monitoring burned extremities for the presence of compartmental compression or ischemia and of performing escharotomy for relief of elevated tissue pressure.

This guideline is designed to aid those physicians who are responsible for the triage and initial management of burn patients.

SIGNS AND SYMPTOMS

Monitor for the following signs and symptoms in full thickness, circumferential burn injuries, which may indicate a circulation deficit of the compromised extremity or torso:

- Cyanosis of distal unburned skin on a limb
- Unrelenting deep tissue pain
- Progressive paresthesias
- Progressive decrease or absence of pulse
- Inability to ventilate in patients with deep circumferential burns of the chest and abdomen

DIAGNOSIS and TREATMENT

- If signs and symptoms are present, treat as below.
- Escharotomy to divide the eschar is performed at the bedside.
- Utilize a clean field and electrocautery device or scalpel.
- IV narcotics, Ketamine or Propafol for analgesia.

DIAGNOSIS and TREATMENT continued

- Incise mid-lateral or mid-medial aspect of the extremity or the anterior/axillary line of the chest/abdomen with sub-clavicular and sub-costal incisions to avoid major nerves and vessels- extend through eschar into the SQ fat to permit adequate separation of the cut edges for decompression.
- Contact the Burn Lead Specialist for further assistance.



Clinical Problem

Circumferential extremity burns may lead to neurovascular compromise and tissue ischemia secondary to elevated pressure. This is particularly a problem when a full-thickness injury is present. In the presence of progressive fluid extravasation beneath an unyielding eschar, the potential exists for tissue pressure to increase to such a point that tissue ischemia can occur.

Because the process of transcapillary fluid efflux is gradual, elevated tissue pressures necessitating escharotomy are rarely observed in the immediate post injury period, and are most likely to develop gradually over the 24 hours following injury.

Hemodynamic or pulmonary abnormalities can be attributed to full thickness, circumferential burns of the chest or abdomen.



APPENDIX I:

WOUND CARE (Also see BURN WOUND CARE training CD-2010)

PURPOSE

This guideline is designed to aid those physicians and clinical staff caring for burn wounds in the first 72 hours following burn injury.

POLICY

If transfer to a burn center is delayed beyond 24 hours specific burn wound care should be done.

GUIDELINE

Provide burn wound care on the burn patient daily. MAINTAIN BODY TEMPERATURE.

Keep room warm.

Bathe the patient in warm water with soap. Wound care may be very painful.

PROVIDE PAIN RELIEF: Provide-intravenously in small, frequent doses as necessary throughout treatment.

- Debride blisters > 2cm and cleanse with soap and water-
- Shampoo hair and clip facial hair
- Dry thoroughly – keep patient warm
- Apply Silver Sulfadiazine impregnated cream to all burned areas-except Silver Sulfadiazine should NOT be applied to the face! Be careful not to constrict edematous extremities with wrapped dressings. Lay the dressings over the wound and secure with burn net dressings-
- Treat any escharotomy sites with liberal amounts of the same cream



Special Considerations by Anatomic area:

FACE

Prone to swelling – elevate the HOB to 30 degree if patient is-not hypotensive. Use water or saline to clean the face. Protect the eyes. Clip facial hair as needed. **No creams on the face, use antibiotic ointment.**

EARS

Avoid pressure on the ear. Avoid occlusive dressings and pillows under the head.

HANDS

Elevate hands on pillows to prevent edema. Avoid restrictive dressings. Promote active range of motion hourly to minimize swelling and preserve function.

Monitor vascular status and consider escharotomy if vascular compromise. Consult with a burn specialist before performing escharotomy.

FEET

Assess circulation and neuro status hourly. Elevate extremities and avoid restrictive dressings.

GENITALIA/PERINEUM

Burns of the penis with swelling require insertion of a Foley catheter. Scrotal swelling is common. No special treatment is indicated.



APPENDIX J:

NUTRITION

PURPOSE:

The purpose of these guidelines is to summarize the role of nutritional assessment and support in the early (<72 hours after injury) acute management of the burn patient.

The purpose of this guideline is to review the physiologic background and efficacy of nutritional support during the initial care of burn patients.

BACKGROUND:

Nutritional supplementation plays a key role in the support of the burn patient, supporting the immune system and blunting the hypermetabolic response.

POLICY:

Enteral feeding should be initiated as soon as practical following burn injury >20% TBSA. Goal is to feed within 24 hours of injury. Nutritional support is associated with fewer infections and better survival.

Nutritional support should be used in preference to parenteral support when possible. A calorie/nitrogen ratio of 110:1 or less with provision of adequate calories to meet energy needs should be used for patients with burn >20% TBSA.

Estimate energy requirement periodically. Patients with burns require twice as many calories as they would without thermal injuries. Encourage oral intake and assess adequacy. Most patients cannot achieve goals without supplementation with enteral or parenteral feeds.

Curreri formula – ADULT

$25\text{kcal} \times \text{weight (kg)} + 40\text{ kcal} \times \% \text{BSA}$

Hildreth + Associates – CHILD – under 1 year of age

$2100\text{ kcal/m}^2 \text{ BSA/day} + 1000\text{ kcal/m}^2 \text{ burned/day}$



There are numerous formulas addressing nutritional requirements for burn patients, therefore, a nutritional consultation is advised.

Severe burn causes significant metabolic derangements that make nutritional support uniquely important and challenging for burned patients. Burn injury causes a persistent and prolonged hyper metabolic state and increased catabolism that results in increased muscle wasting and cachexia. Metabolic rates of burn patients can surpass twice normal, and failure to fulfill these energy requirements causes impaired wound healing, organ dysfunction, and susceptibility to infection. Adequate assessment and provision of nutritional needs is imperative to care for these patients. There is no consensus regarding the optimal timing, route, amount, and composition of nutritional support for burn patients, but most clinicians advocate for early enteral nutrition with high-carbohydrate formulas.

Nutritional support must be individualized, monitored, and adjusted throughout recovery.



APPENDIX K:

MULTICASUALTY BURN DISASTER: HOSPITAL MANAGEMENT PROGRAM OVERVIEW/PURPOSE:

The potential for a disaster large enough to overwhelm the current system is certainly real and warrants the attention of health providers. This educational course seeks to enhance the ability of first providers, trauma hospitals and burn centers in our region to manage a disaster and provide the best care possible in the worst situation.

This course serves two purposes. First, it provides information about the Burn Care Plan formulated by Los Angeles County Emergency Medical Services to be activated in the event of a multi-casualty burn disaster. Secondly, it provides information for medical personnel pertaining to the triage, initial care and early management of patients with burn injuries.

COURSE DESCRIPTION

The purpose of this course is to provide hospital management guidelines in the event of a multi-casualty burn disaster. Information on activation of the multi-casualty burn disaster care plan in Los Angeles as well as guidelines for the TRAUMA/BURN RESOURCE CENTER hospital management of burn injured patients during the first hours to days post burn injury will be discussed.

Topics include:

- * Burn Disaster Plan Activation
- * Pathophysiology of burn and smoke inhalation injury
- * Emergency management priorities (ABC's)
- * Fluid Resuscitation and Depth and Extent of Burn
- * Pain Management
- * Antibiotic prophylaxis and GI Considerations
- * Wound Management-Circumferential burns, high voltage electrical injury, chemical burns
- * Triage priorities in severe burns



- * Nutritional support
- * Psychosocial Care/Rehabilitation
- * Prevention and Management of Complications
- * Care beyond the first 24 hours

EDUCATIONAL OBJECTIVES

Upon Completion of this course of study the student will be able to:

- * Outline how Los Angeles County defines a burn disaster and the plan to receive a surge of burn patients.
- * Define the role of Burn Lead Specialist and when he/she may be contacted.
- * Identify triage priorities in a burn disaster setting.
- * Describe the pathophysiology of burn shock.
- * Identify the systemic effects of thermal injury from burns in the first 24 hours.
- * Describe care of inhalation injury including airway and breathing management.
- * List measures for managing exposure and environmental control.
- * Identify appropriate intravenous fluids.
- * Describe fluid formulae for the burn patient (adult, child and infant) initially, in the 2nd 24 hours and after 48 hours.
- * Define the differences in depths of burns.
- * List treatment measures for pain management, antibiotic prophylaxis and gastrointestinal considerations.
- * Define and state specific considerations in wound care.
- * Identify pathophysiology, treatment and care for exposure to high voltage, electric injury, chemical burns, military vesicants and sulfur mustard.



EMERGENCY MEDICAL
SERVICES AGENCY
LOS ANGELES COUNTY

Los Angeles County Emergency Medical Services
Multi-Casualty Burn Disaster: Hospital Management

- * Describe nutritional guidelines for burn patients.
- * Discuss complications of burn care.
- * List the guidelines for psychosocial/rehabilitation care.
- * Describe appropriate interventions beyond 24 hours post burn.



EMERGENCY MEDICAL
SERVICES AGENCY
LOS ANGELES COUNTY

Los Angeles County Emergency Medical Services
Multi-Casualty Burn Disaster: Hospital Management

NOTE PAGE:



JOURNAL ARTICLES

The Journal of **Trauma** *Injury, Infection, and Critical Care*
Volume 67, Number 2, August Supplement 2009

SUGGESTED ARTICLES

Guidelines for burn care under austere conditions: an introduction to burn disaster management principles (authors: Randy D. Kearns, DHA, MSA, CEM; Kathe M. Conlon, BSN, RN, MSHS; Annette F. Matherly, RN, CCRN)

Guidelines for burn care under austere conditions: airway and ventilator management (authors: Kevin K. Chung, MD; Vikhyat S. Bebarta, MD; Jacob J. Hansen, DO; Leopoldo C. Cancio, MD)

Guidelines for burn care under austere conditions: fluid resuscitation (author: Michael Peck, MD, ScD, and FACS)

APPLICABLE LOS ANGELES COUNTY POLICIES

Burn Resource Center (BRC) Designation and Activation Reference No. 1138

Burn Resource Center Required Equipment/Supplies/Pharmaceutical
Reference No. 1138.1

Local Burn Lead Specialist Call Panel
Reference No. 1138.2

Remote Burn Lead Specialists
Reference No. 1138.3

Trauma Center Emergency Preparedness
Reference No. 1130

Burn Patient Destination
Reference No. 512

Management of Multiple Casualty Incidents
Reference No. 516