ORDERS IN BURN CARE

SECOND EDITION

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Preface to the second edition

This book was created after recognizing the need to explain admission orders in the burn unit. Each chapter follows one section of the pre-printed orders used by our burn service. By explaining the pathophysiology and referenced algorithms behind each 'tick' on the order sheet, we aim to provide a resource for the house officer that creates an interactive learning process.

The principal sections of the admission orders form the template upon which the details of patient assessment and initial treatment are discussed. This is not meant to be an encyclopaedic text, as brevity was a priority. We hope, however, this reference will prove valuable to anyone involved in the initial care of the burn patient.

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___ Vitamin A 25,000 U PO DAILY
___ Zinc Sulfate 220 Mg PO DAILY
___ Ferrous Sulfate 300 Mg PO TID
___ Ascorbic Acid 500 Mg PO TID
Children: ___ Poly Visol w/ Iron 1 ml PO DAILY
___ Ascorbic Acid 250 Mg PO DAILY
___ Chewable MV PO DAILY

Antibiotics:_____

Ulcer Prophylaxis:
___ Carafate 1 Gm PO Q 6 hr
___ Ranitidine 50 mg IV Q 8 hr
___ Other

Antiemetic:
___ Zofran 4 mg PO/IV Q 6 hr PRN
___ Reglan 10 mg PO/IV Q 4-6 hr PRN
___ Other:_____

Analgesia:
___ Morphine ____ mg IV Q _____hr PRN
___ Vicodin 1-2 tabs PO Q 4-6 hr PRN
___ Ibuprofen 400 mg PO Q 4 hr PRN
___ Tylenol 650 mg PO Q 6 hr PRN
___ Other:_____

Anxiolytics:
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___ Benadryl 50 mg PO TID PRN
___Other: _____

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___ Other:_____

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1. Initiate Mechanical Vent Protocol.
   Dr._____notified.
2. Ventilator – Mode____ FiO2____ Rate ____ TV_____ PEEP_____.

ICU IV Sedation For Mechanically Ventilated Patient

1. Sedate patient to a Modified Ramsey Score of ____.
2. Modified Ramsey Scale should be assessed every 15 min until desired effect then every hour for 4 hours then every 2 hours.

Intermittent Dosing
___ Midazolam ___mg IV Q ___ hours PRN
___ Lorazepam ___mg IV Q ___ hours PRN
___ Morphine ___mg IV Q ___ hours PRN
___ Other:_____

Continuous Dosing: Long Term Sedation greater than 48 hrs

____1. Fentanyl infusion: loading dose: 0.5 mcg/kg – 1.0 mcg/kg over 3-5 min. Maintenance infusion: 1 mcg/kg/hour – 10 mcg/kg/hour.

____2. Lorazepam infusion: 0.5 mg/hr – 2 mg/hr. Titrate to desired level of sedation. (Max dose 4 mg/hr)
____3. Other:_____

For Delirium/Agitation

____1. Haldol 1 – 5 mg Q 5 min X 3 doses IV.
____2. Haldol 2 mg Q 4 hours IV PRN.

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___Pulmonary Medicine For _____
___Primary Care Physician _____
___Pediatrician_____
___Ophthalmology_____
___Infectious Disease_____
___Internal Medicine For_____

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___ Clinical Nutrition Service
___ Social Service
___ Discharge Planner

Photography:
___ Routine
___ Immediate

Chapter 1: Admit To

ADMIT TO: ____ICU
____IMC
____FLOOR STATUS

I. Admit the Following:

A. Patients requiring I.V. access[1]

1. Following a burn there is an immediate capillary leak of plasma-like fluid, which can last 18 to 24 hours. In burns greater than 30% total body surface area (TBSA), the leak occurs in both burned and non-burned tissues. If not replaced, this fluid loss can lead to hypovolemic shock and renal failure.
2. Intravenous fluid resuscitation is required for all patients with 2nd and 3rd degree burns greater than 10% TBSA in patients under 10 or over 50 years of age and for burns greater than 20% TBSA in all other age groups.
3. Intravenous access is also required for parenteral medications.

B. Anticipated surgery

1. Deep burns are best treated by surgical excision and skin grafting, which has been found to speed wound healing, provide more stable skin, and reduce contractures.

C. Respiratory problems

1. Admission is required for observation and/or mechanical ventilation if a patient is having respiratory distress, requires oxygen therapy, or if there is a high suspicion of inhalational injury.

When to Suspect Inhalational Injury
History of unconsciousness
Altered level of consciousness
Injury in an enclosed space
Noxious chemicals involved
Carbonaceous sputum
Facial burns. Singed nasal hairs
Tachypnea. Anxiety. Cyanosis
Intercostal retractions
Hoarse voice
Rales and rhonchi
Erythema or swelling of the oropharynx or nasopharynx

D. Special nursing issues

1. Burns of the face, hands, feet, perineum, and genitalia may require specialized dressings and nursing care.
2. Patients may also need to be admitted if they are incapable of caring for themselves.

E. Special burn injuries

1. Chemical injury.

Most chemical burns are often more severe than the initial examination would suggest. Unlike thermal burns, tissue destruction can occur many hours after injury. Patients with chemical burns should be admitted if:

- **a.** The injuries are deep and will require excision
- **b.** Systemic manifestations of chemical toxicity are present
- **c.** The chemical responsible for injury requires a specific antidote

2. Circumferential Burns

- **a**. Deep 2nd or 3rd degree circumferential burns that may constrict the chest or limbs which may impede ventilation and limb perfusion respectively. They should be monitored for possible escharotomy.

3. Mechanical Burns

- **a.** Traumatic abrasions may cause large areas of skin loss.

4. Significant frostbite injuries.

F. Electrical injury

1. The following require admission for 24-hour monitoring:

- **a.** Documented cardiac arrest at the scene
- **b.** Cardiac arrhythmia noted at any point prior to admission
- **c.** Abnormalities on 12-lead EKG

G. Skin disorders

1. Certain skin disorders may require admission to a burn unit for intensive care and wound treatment e.g. Toxic epidermal necrolysis syndrome, Stevens-Johnson syndrome, and necrotizing fasciitis.

H. Pre-Existing Illness

1. Pre-existing medical problems may complicate burn care.

I. Domestic violence

1. Every state requires physicians to report all cases of suspected child abuse. Admission of the child to the burn unit affords protection. The burn physician in these situations also functions as facilitator, ensuring full investigation and documentation has been completed. This includes confirming that the appropriate skeletal x-ray surveys, rape kit tests, head CT, etc. have been performed. Similar attention is given to elderly abused patients.

II. Should you admit to the ICU or the ward?

Burn Unit Admission Criteria to Intensive Care Unit[2,3]

1. Patients requiring IV fluid resuscitation.
2. Those who are hemodynamically unstable and require vasoactive medications and/or invasive monitoring.
3. Significant inhalation injury requiring mechanical ventilation.
4. Unstable patients requiring hemodialysis.
5. High-voltage electrical burns.
6. Chemical injuries with systemic manifestations of toxicity or the need for an antidote.
7. Pre-existing medical conditions such as heart failure, complex arrhythmias, severe diabetes, or renal failure complicating burn management.
8. Associated traumatic injuries including severe head or spinal cord injury, flail chest, major blood loss, unstable spine fractures, multiple organ injury, paralysis, and recent cardiac or respiratory arrest.

Burn Unit Admission Criteria for IMC Status

1. A criterion for IMC status includes a nurse to patient ratio of 1:4. Generally, all burn admissions require intensive nursing in view of frequent monitoring, medication, and complex dressing changes.

Burn Unit Admission Criteria for Observation

1. Stable patients that have sustained small burns but require evaluation or treatment for up to 23 hours, before a decision regarding disposition is made.

References

1. Recommendations for Intensive Care Unit Admission and Discharge Criteria. The Task Force on Guidelines. Society of Critical Care Medicine. Critical Care Medicine 1998;16(8):807-8.
2. Burn Center Admission Criteria. 20th Annual Business Meeting of the American Burn Association, Seattle, 1988.
3. Guidelines for ICU Admission, Discharge, and Triage. Society of Critical Care Medicine. Critical Care Medicine 1999; 27(3):633-638.

Chapter 2: Diagnosis

DIAGNOSIS: TYPE OF BURN_____
_____%TBSA _____%FULL THICKNESS
OTHER CONDITIONS_____

I. Type of Burn

A. Scalds – Water at 140ºF (60ºC) will create a deep dermal burn or full thickness burn in 3 seconds, and at 156ºF (68.8ºC) in 1 second. The temperature of freshly brewed coffee is 180ºF (82.2ºC). Depth is greatly increased by immersion due to a longer duration of contact.

1. Deep burns are associated with hot grease, which can reach 400ºF (204.4ºC), and tar which is adherent.[1]

TIME/TEMPERATURE RELATIONSHIPS IN SCALDS

Temperature	Time to Produce Deep Burns
120°F	More than 5 minutes
125°F	1- 1/2 to 2 Minutes
130°F	About 30 Seconds
135°F	About 10 Seconds
140°F	Less than 5 Seconds
145°F	Less than 3 Seconds
150°F	About 1-1/2 Seconds
155°F	About 1 Second
160°F+	Instantaneously

B. Contact – Due to direct contact with hot objects, e.g. child touching hot oven door.[1]

C. Chemical - These burns cause progressive tissue damage until inactivated or removed. Acids cause protein coagulation, limiting further penetration, whereas alkali burns combine with cutaneous lipids causing tissue saponification, further injuring the skin. Until proven otherwise, all chemical burns should be considered deep.

D. **Flame**

E. **Flash** - Flash burns occur during an explosion of gasoline, propane, and other flammable liquids. They produce intense heat over a brief time but generally cause second degree burns to exposed skin.

F. **Radiation Burns** - Accidents involving ionizing radiation are not common. The clinical picture may range from erythema to a charring of the superficial layers of skin. Whole-body exposure of more than 100 rads causes acute radiation syndrome, marked by nausea, vomiting, diarrhea, fever, fatigue, and headache within hours of exposure. This is followed by a latent period, and then by hemopoietic, GI, and vascular complications.

G. Electrical Burns

1. Electrical injuries are of three major types, which may occur in combination:

2. True electrical injury exists when electricity passes through the body. An entrance and exit wound is produced, along with significant deep-tissue destruction. The quantity of heat produced is expressed in Joule's Law: $J=I^2RT$, where (J) is the heat produced, I is the current, R is resistance, and T the duration of contact. Therefore when performing the history and physical examination, record the voltage and duration of contact with the source.

3. Arc burns occur when electrical current jumps from one part of the body to another, producing scattered spots of injury, which may be deep.

4. High-voltage, high-current source electrical injuries (>1000 volts and >5000mA) cause significant soft tissue damage. Low voltage, low current (<1000volts and 5-60mA) cause less soft tissue damage but are noted to more commonly cause cardiac fibrillation.

5. Complications of electrical injuries include tetanic muscle contractions with resulting muscle fractures and dislocations, or falls with crush injuries. Intraperitoneal damage can occur, perhaps due to the low-resistance mesenteric vascular system. Cardiac dysfunction may be seen initially in as many as one third of electrically injured patients, and ECG changes may be present, including RBBB, SVT, and other focal ectopic dysrhythmias[2,3]. Electrical injuries may also cause delayed neurological changes and cataract formation.[4]

II. Estimation of Burn Depth

A. Structure of the Skin

1. The skin is composed of two distinct layers, the epidermis and the dermis, which overlies subcutaneous fat.
2. The epidermis is composed mainly of epidermal cells, which are rapidly dividing to replace those lost from the surface. The outer-layer of dead keratinocytes on the surface form a protective barrier.
3. The dermis is a vascular structure. Epithelial cells extend into the dermis lining the hair follicles, sweat glands, and sebaceous glands. These cells can regenerate sufficient epithelium to permit healing of a superficial burn wound. This layer also contains sensory fibers for pain.

B. Traditional classification of burn depth

1. First-degree burns involve just the epidermis (e.g. sunburn).
2. Second-degree burns involve the epidermis and variable amounts of dermis.
    - **a.** Superficial second-degree burns involve the epidermis and superficial dermis. Blisters are present and burns are pink, moist, and tender. Healing takes place within 2-3 weeks, often with minimal scarring.
    - **b.** Deep second-degree burns extend into the deeper dermis. Skin is usually cherry red, mottled, or white. Due to the long healing time, these burns have increased risk of infection and there is a greater potential for hypertrophic scar formation.[1] Skin grafting is usually required.
3. In third-degree burns, both the epidermis and dermis are destroyed. Skin has a white or leathery appearance, is anesthetic, and does not blanch with pressure. Skin grafting is always required to treat the wound, unless the burn is small enough to heal by contraction and secondary intention.
4. Fourth-degree burns cause full-thickness destruction of the skin and underlying tissue e.g. muscle, tendon or bone.

C. A more practical description (which determines treatment and prognosis) is to divide burns into superficial and deep categories.

Superficial vs. Deep Burns			
Depth	**Traditional**	**Significance**	**Characteristics**
Superficial	1st degree and superficial 2nd degree	Sufficient epithelial appendages to allow healing within 2 weeks	Wet, pink, blistered, blanches with pressure, and painful
Deep	Deep 2nd and 3rd degree	Insufficient epithelial appendages; if healing occurs, it will be slow with resultant unstable skin, hypertrophic scarring, and contracture; best treated by excision and grafting	Ranges from cherry red, mottled, white, and non-blanching to leathery, charred, brown and insensate

* More sophisticated techniques to differentiate between superficial and deep burns such as ultrasound[5], laser doppler[6], vital stains such as India ink and fluorescein,[7] and temperature mapping[8] have been used**.** Ultrasound has failed to show any substantive improvement in predicting the burn depth. Laser Doppler readings vary with temperature, catecholamine release, and elevation of an extremity. Fluorescein fluorometry cannot distinguish between intermediate and deep burns, and therefore is of little use in operative planning. Temperature mapping, while accurately predicting wound outcome initially, has been unable to predict burn wound healing time. More recently, magnetic resonance imaging and orthogonal polarization spectral imaging have been investigated in burn evaluation, but are still undergoing development.[9] To date, none of these modalities are more practical than clinical examination.

III. Estimating Percentage of Total Body Surface Area

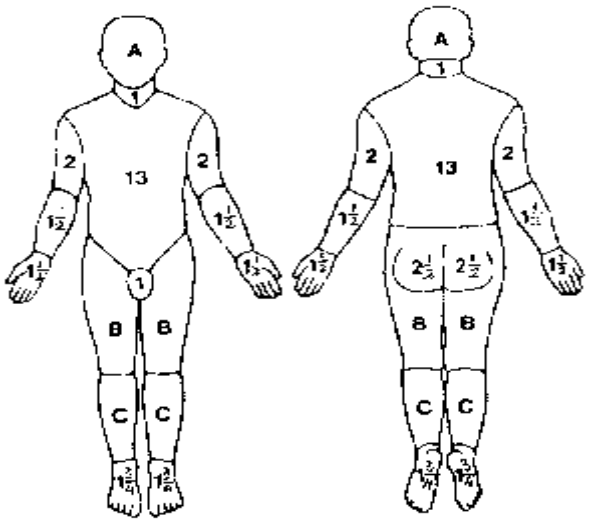
A. The percent Total Body Surface Area (TBSA) estimation provides a guide to fluid resuscitation and prognosis.

B. The Lund-Browder diagrams are the most accurate method for estimating burn extent. Exclude erythema.

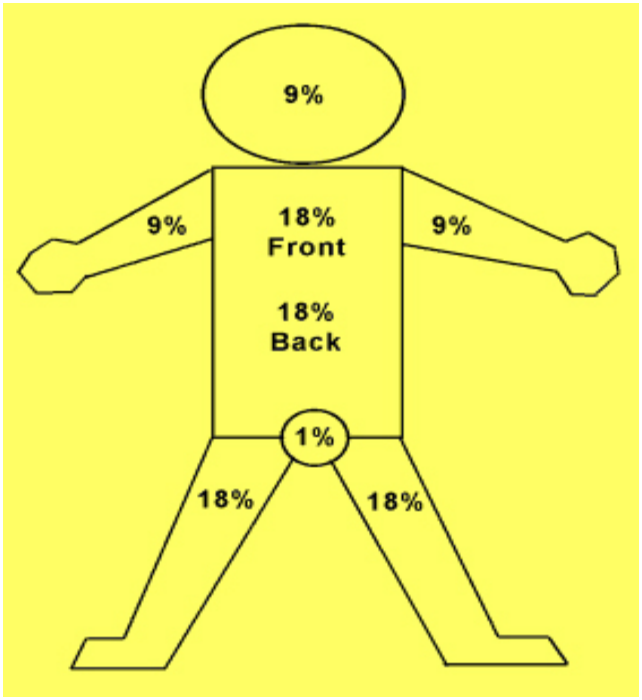
LUND-BROWDER CHART

Relative Percentage of Body Surface Area Affected by Growth

Age in years	**0**	**1**	**5**	**10**	**15**	**Adult**
A-head (back or front)	9_	8_	6_	5_	4_	3_
B-1 thigh (back or front)	2_	3_	4	4_	4_	4_
C-1 leg (back or front)	2_	2_	2_	3	3_	3_



C. If you lose this book, use the "Rule of Nines" for adults and children:



RULE OF NINES FOR CHILDREN LESS THAN 10 YEARS	
Area	**TBSA**
Head & Neck*	18
Chest, abdomen, and genitalia	18
Back	18
Upper Extremity & Hand	9
Lower Extremity & Hand**	14

* subtract 1% from head for each year over one year of age

** add _% to each leg for each year over one year of age

Palm trick- Use the patient's palm size to represent approximately 1% TBSA. Imagine a rectangle the width and length of your entire hand (from wrist to fingertips) and that is the size of "one palm."

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Chapter 3: Condition

CONDITION: _____GOOD
_____SERIOUS
_____CRITICAL

I. The stated condition is a lay term that conveys to family, referring institutions, and the media a sense of the patient's prognosis. Although several descriptions are available, for practical purposes these can be limited to:

A. GOOD: Patients not requiring resuscitation.

C. SERIOUS: Patients that require resuscitation but stable and expected to survive.

D. CRITICAL: Unstable and/or not expected to survive.

II. Determination of prognosis[1,2]

A. Various scoring systems are used to predict the prognosis of burn patients.[3] There is no uniformity in the burn scoring systems used and they have not proved to be accurate.[1] The best burn score is likely from experienced clinical judgment.

B. Risk factors that increase mortality include:
1. Age > 60 years[4,5]
2. Burn > 40 % TBSA
3. Significant third degree burn[6]
4. Inhalation injury[7]
5. Pre-existing illness such as DM or CAD[2]
6. History of tobacco and/or alcohol abuse.

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1. Tejero-Trujeque, R. How effective is the ABSI in predicting patient mortality? Journal of Wound Care 2000;9:475-478.
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Chapter 4: Allergies

ALLERGIES: _____

I. Significance

A. A history of an allergy to a vital drug could be a death sentence.

B. The major allergies encountered in burn care are to β-lactam antibiotics and sulfa drugs**.**

II. History

A. Any allergic history must be taken seriously and penicillin should be held pending further investigations.

B. An accurate history of the specific reaction elicited is important.

C. You need to distinguish between:

1. A true allergic reaction which is anaphylaxis (i.e. hypotension, laryngeal edema, bronchospasm) and cutaneous reactions

2. Nonspecific symptoms (i.e. headache, nausea, emesis)

III. Penicillin allergy

A. Penicillin allergy is the most prevalent immunological drug reaction in clinical medicine. IgE antibodies directed against the β-lactam ring are responsible for the type 1 reaction seen. A history of urticarial rash and bronchospasm are diagnostic. Though penicillin allergies are often diagnosed in childhood, studies of this age group show that over-diagnosis of penicillin allergy may occur in up to 94% of cases.[1] Penicillin is regarded as the most important antimicrobial agent in greatly reducing hemolytic streptococcal and clostridial infections, and is often used to treat burn cellulitis.

B. Can we use cephalosporins?

1. The overall incidence of adverse reactions from cephalosporins ranges from 1% to 10%, with rare anaphylaxis (< 0.02%). Post-marketing studies of second and third generation cephalosporins showed no increase in allergic reactions in patients with a history of penicillin allergy. Similarly, patients with cephalosporin allergies have a very small risk of penicillin reactions.

2. A patient who states he or she has a history of rash to penicillin can be treated instead with a cephalosporin. Patients with anaphylactic reactions to penicillin should receive neither penicillin nor cephalosporin. These patients can be treated with vancomycin or penicillin desensitization in conjunction with recommendations by an infectious disease specialist. Intravenous desensitization is a rapid, safe, and effective technique for patients demonstrating hypersensitivity to beta-lactam antibiotics who require therapy with these medications.[2,3]

3. Penicillin skin tests are not used due to risk of anaphylaxis.[4]

4. RAST is a solid-phase sandwich radioimmunoassay to detect allergen-specific IgE antibodies. The AlaSTAT test is an enzymoimmunoassay alternative to the RAST that is more rapid. Neither of these is commonly used in confirming drug allergies.

C. Sulfa allergies

Allergies to silver sulfadiazine and mafenide acetate, the two topical agents used most widely in burn therapy today, have been reported.[6,7,8,9,10] The reactions are usually mild. Serious hypersensitivity to these agents has been rarely described.[11,12] Only 2 to 5 percent of patients treated with silvadine cream exhibit a minor maculopapular rash that rarely requires discontinuation of the agent, and 5 to 50 percent of patients treated with mafenide acetate develop a rash that is easily controlled with antihistamines and also does not require discontinuation.[9,10,11]

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11 Fraser-Moodie A. Sensitivity to silver in a patient treated with silver sulfadiazine (Flamazine). Burns 1992;18(1):74-5.

Wound care should be directed at thoroughly removing devitalized tissue, debris, and previously placed topical antimicrobials. A broad-spectrum surgical antimicrobial topical scrub such as chlorhexidine gluconate should be used along with adequate analgesia and preemptive anxiolytic in order to permit adequate wound care. For analgesia, the use of opiates is debated, as these medications induce tolerance and addiction and may promote pain, a phenomenon known as opioid-induced hyperalgesia.Â American Burn Association consensus conference to define sepsis and infection in burns. J Burn Care Res. 2007 Nov-Dec. 28(6):776-90. BibMe lets you easily and automatically create executive order citations and build your bibliography in Journal of Burn Care & Research. Itâ€™s accurate and free!Â When (month, day, year) the source was accessed or reviewed online. Electronically Published. The month, day, and year a content piece was published electronically (as opposed to in print). Depending on the webpage, it may or may not be shown. Place of Publication. Skin burn care will largely depend on the type of burn and the extent and severity of the skin tissue burnt. One of the few Precautions is never use ice to cool the burn as ice can cause further damage to the skin.Â Burn Care Precautions. Never use ice to cool the burn as ice can cause further damage to the skin. Never apply butter or ointment on the burns as this will prevent fast healing. Never try to treat severe burn or chemical burn or electrical burn at home. Sometimes serious injury can be caused inside the body due to electric burns which can not be seen on the skin. Never remove cloths from an open blister in severe burn and never apply cold water to severe burns as a person might go in shock.