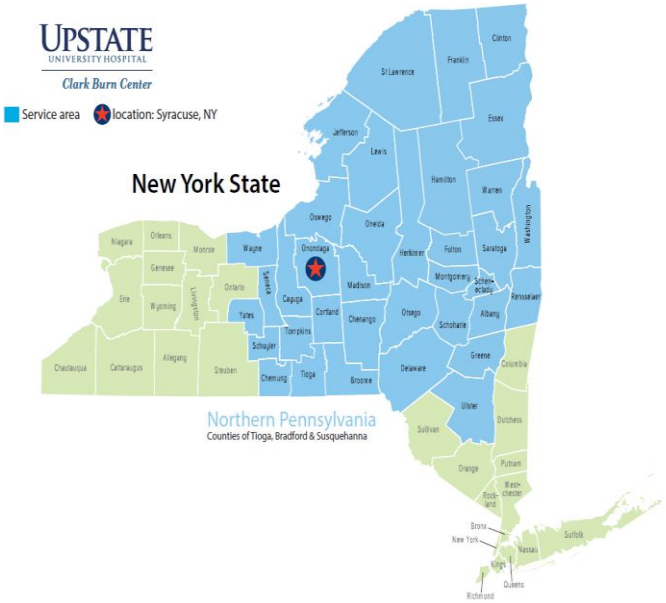
Burn Service

Resident Manual



UPSTATE
UNIVERSITY HOSPITAL
Clark Burn Center

Resident Orientation to the Burn Service

Welcome to the burn service. The burn service is a unique specialty that you have the opportunity to participate in. Not all Health institutions have a burn service or have training in the specialized care of a burn injury.

Per the American Burn Association (ABA.2020), annually there are approximately 486,000 burn injuries that require some form of medical intervention, approximately 4,500 individuals that die from an inhalation or burn injury, and still another 10,000 that will succumb to infection from their injuries.

Burns are one of the most painful and devastating traumas that a person can endure. Significant burn injuries do not just heal and the patient is recovered. A burn injury can change a person's life forever, from disfigurement, PTSD, lifelong pain, contractures, multiple surgeries, inability to regulate body temperatures, complications with intimacy, depression and more. Many will question, what is the quality of life after a burn injury. There are several factors to consider when we look at a patient's quality of life after a devastating burn injury. A patient's quality of life is going to depend on the following:

1. Size, severity and location of the injury
2. Pre-existing conditions
3. Age
4. Initial burn management and ongoing treatment
5. Individual recovery (how well that person's body is able to recover)
6. Intense Physical and Occupational Therapy both inpatient and outpatient
7. Nutrition
8. Ongoing emotional support

There are times that the question needs to be asked-what would the patient want? This is what they could before, they will possibly never be able to do that again, this is their prognosis. What would they want? Is this the quality of life they would want?

On the other hand, there are many patients who have survived very devastating burn injuries and are living meaningful and happy lives. Their lives are just different than before, they had to go through the process of adjusting to the new normal. Every patient is different and each one will respond differently.

Managing a burn patient is performed by a multidisciplinary team. It has been said that the care of a burn patient demonstrates the greatest integration of health professionals, seeing the most benefit from the influence of truly multidisciplinary care. The complexities of a burn injury necessitate the need for a multitude of specialties for the best overall outcome of the patient.

Also, in addition to patients with burn injuries the burn service also treats patients with injuries from frostbite, Steven Johnson Syndrome (SJS), Toxic Dermal Necrolysis syndrome (TEN's), Pemphigus vulgaris, and other Skin disorders.

Our Burn Team:

Burn Attendings

Residents

Physician Assistant

Nurse Practitioner

Nurse Manager/Nurses

Hospital Techs

Pharmacist

Respiratory Therapist

Physical/Occupational/SLP Therapies

Child Life Specialist

Nutrition

Case Manager

Social Work

Spiritual Care

OR Staff

Patient's/Family

Schedule

Rounds

Begins daily at 8:00 in the Burn Unit or according to the current Attending's schedule.

Attended by – current Attending M.D., N.P., Resident, any student on rotation (ER, Surgical) other members of the multidisciplinary team:/O.T., staff nurses, Pharmacy, Dietician, Social Work **Exception**: Wednesdays – Large Burn Rounds at noon. There is a white board located on the Burn Unit next to the nurse's station, this lists the inpatients in the Burn unit, what service they are on, and who their nurse is.

OR Scheduling

Usually done by the Attending, can be any day that works with the Attending's schedule.

A preop OR sheet is completed by the attending and sent to the OR to allow for the OR to prep appropriately for the case.

Weekends

Check with Attending for rounds start time.

Burn Clinic

When: Mondays: 0900-1100

Tuesday: 0900-1100

Wednesday: 0900-1200

Wednesday: 0900-1100 (Laser clinic is every Wednesday by Dr. Dolinak (cap 10)

Thursday: 0900-1100

Friday- 11-130 NP (cap 8) 1230-1600 MD

Where: UH Lower level room 0222 Tel:4-1800

If you receive a call from an ER/ED or a private MD's office and they want to refer a patient or ask us see a patient ASAP, please direct them to call the transfer center 315-464-5449, even if they do not think they need transfer. The transfer center will then call the attending on call. This is a recorded line, which protects the doctors and the patients, and it is important for us to see where our consults come from.

Getting Started

In this packet is information in the form of outlines, short narratives, copies of specific chapters of "TOTAL BURN CARE" by D. Herndon M.D. as well as Clark Burn Center protocols. Please read these, they may help with the assessment of burns and offer an insight as to direct care. Most of the information relates in some fashion to your survival on the Burn Service.

If you find an article or other information that is relevant to this rotation, please do not hesitate to include it in the packet for future Residents use.

This packet includes:

Helpful hints/things that may come in handy

Assessment of Depth of Burn

Treatment of Outpatient Burns

Protocols (fluid resuscitation, donor sites)

Phases of the burn injury

Nutrition and Burns

Glossary

References

This can be a learning experience for you. You are the only Resident on the service. Specific details pertaining to treatments, operating room techniques, daily wound care, bandaging and other burn unit idiosyncrasies will slowly be fed to you during your rotation so as not to overwhelm.

Sometimes there may be a medical student III and sometimes there may be a second year ER resident assigned during your rotation. They are here to learn also. The PA and NP are involved with the day-to-day patient care such as wound care, OR cases and clinic patients. If needed you can always tap into their knowledge for assistance or rely on any member of the burn team to help and be supportive.

Transfers to the Clark Burn Center

Calls from an outside MD office or an ER/ED asking to transfer a burn patient need to be directed to transfer center (315-464-5449). If a call comes in to the resident directly, the resident needs to advise the caller to go through the transfer center. The transfer center will then call the attending on call.

We are a Verified Burn Center as well as a Level 1 Trauma Center. This means we accept all Burn transfers even if we have no beds, **WE DO NOT TURN AWAY BURN PATIENTS**. If we have a full Burn Unit but all are not burn patients, the off-service

patients are to be moved out first. Sometimes we have patients in the Unit with minor burns or a patient who can be treated on the floor and the off- service patients may still require an ICU setting or there are no other available ICU beds.

Assessment of Burn Depth and Total Body Surface Area (TBSA)

Burns are measured in degrees; superficial, partial and full thickness.

Superficial (First-Degree)

A first-degree burn involves only the thinner outer epidermis layer and is characterized by erythema and mild discomfort.

Tissue damage is minimal and the skin functions are intact. Usually resolves in 2 to 3 days, healing takes place uneventfully. Not a systemic injury. Usually caused by overexposure to sunlight or brief scalding from hot liquids.

Partial Thickness (Second Degree)

A partial thickness burn involves the entire epidermis and variable portions of the dermis. Partial-thickness can be superficial or deep. Superficial partial thickness involves the upper third of the dermis. Here, microvessels are injured and become permeable and leak plasma into the interstitium. This causes blister formation. A second-degree burn is characterized by edema, pain and the wound surface is not intact. Color of a second-degree burn is generally pinkish to a very light red.

Usually takes 7-14 days to heal, does require coverage with an antimicrobial ointment and a dressing.

A deep partial thickness burn involves most of the dermal layer. Therefore, burns this deep take longer to heal due to fewer viable epidermal cells. Also blister formation is not as prevalent because the dead layer is sufficiently thick and adherent to the underlying tissues that it cannot be lifted off the surface, however, exceptions can occur in the very old and very young who tend to have a thin dermis. The edema, pain and moistness are present but to a lesser degree than superficial partial thickness. Pain may also not be as significant as that of superficial partial thickness burn. The color of the wound will be light red with white spots to a deep cherry color. The deep partial thickness burn area is the main focus of our treatment. The partial thickness burn area is where there is damage to the tissue, which will spontaneously heal (re-epithelialize) if treated right. Deep partial thickness may need surgical intervention and must be monitored closely.

Will take 14-21 days to heal on its own. If wound is suspected to take more than 21 days to heal, the risk of hypertrophic scarring is high and the burn would benefit from surgery.

Full Thickness (Third Degree)

A full thickness burn involves the entire epidermis and dermis and extends into the subcutaneous tissue. There are no residual epidermal cells left to re-epithelialize the affected area. A full thickness burn is characterized by being painless, and dry. It can also have a waxy yellow/white color due to its avascular nature or appear leathery and may be charred. The outer layer of the full thickness burn is called eschar. A full thickness burn may also have thrombosed vessels. Tissue that has sustained a full thickness burn is nonviable and cannot swell; the injured tissue has no elasticity to expand from the inflammation and edema created by the burn injury. Therefore, a full thickness burn to an extremity or thoracic cavity that is circumferential may cause a compartment like syndrome. An escharotomy may be needed to restore the blood flow to help with venous return from the distal portion of the affected extremity or restore the ability to ventilate the patient. Full thickness burns almost always require a skin graft to definitively close the wound.

Burn Depth

The deeper the burn the more serious the injury and the more likely the patients' functional capacity and physical appearance will be altered. Correlate appearance with mechanism of injury. Measured in degrees; superficial, partial thickness and full thickness.

Burn Size

The body surface area burned (TBSA). Measured by a percent. Figured by the Rule 9's, Lund and Browder chart or for small areas the patient's palmar surface (including fingers) is approximately 1% of their total body surface area. The larger the burn the more serious the injury.

Age

An indirect variable, not necessarily good indicator of the patient's reserve. Usually infants are compromised by virtue of immature viscera and older patients (above the teen years) may have subnormal viscera function due to the aging process. Watch during the resuscitation period to see how the patient responds to the injury.

Pre-Existing Illness

Any chronic medical condition may contribute to a subnormal capacity to deal with any size burn. Mental illness, mental disability and substance abuse can alter the patient's pain threshold, all need to be considered because patient cooperation is vital for optimal burn care.

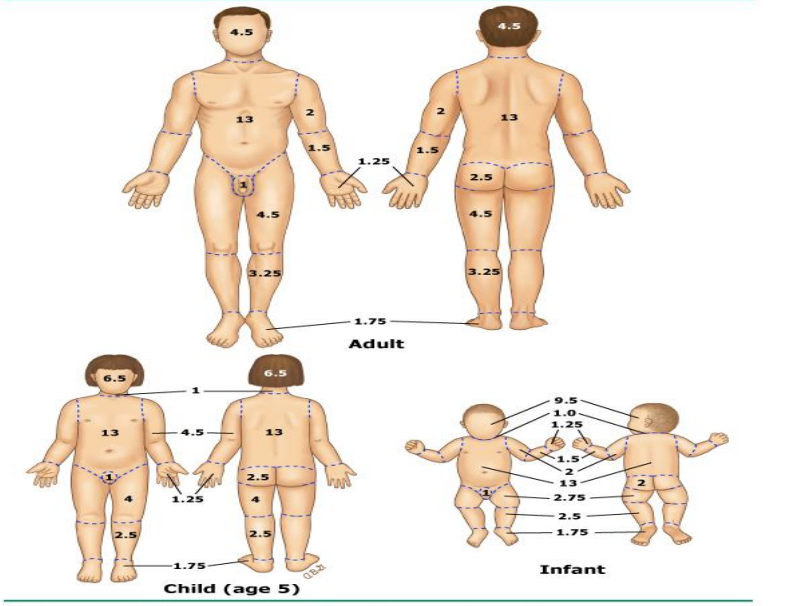
Associated Injuries

A burn plus associated injuries (smoke inhalation, MI, Fx's) equals an increase in systemic stress. The patient's ability to respond physiologically to the burn is correspondingly compromised.

Using a Lund and Browder is the best method for estimating the extent of burns that allows for

the varying body surface proportions of individuals of different ages.
https://upstate.ellucid.com/documents/view/2921

Modified Lund-Browder chart



Numbers refer to the percentage body surface area burned.

UpToDate®

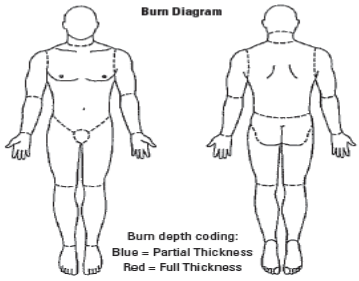
UPSTATE UNIVERSITY HOSPITAL
Clark Burn Center
LUND AND BROWDER CHART

Patient Name: _____ MR#: _____
Account #: _____ DOB: _____

Burn Size Estimate -Age vs. Area

Area	Birth - 1 yr	1-4 yr	5-9 yr	10-14 yr	15 yr	16 yr-adult	2°	3°	Total	Donor areas
Head	19	17	13	11	9	7				
Neck	2	2	2	2	2	2				
Anterior trunk	13	13	13	13	13	13				
Posterior trunk	13	13	13	13	13	13				
Right buttock	2½	2½	2½	2½	2½	2½				
Left buttock	2½	2½	2½	2½	2½	2½				
Genitalia	1	1	1	1	1	1				
Right upper arm	4	4	4	4	4	4				
Left upper arm	4	4	4	4	4	4				
Right lower arm	3	3	3	3	3	3				
Left lower arm	3	3	3	3	3	3				
Right hand	2½	2½	2½	2½	2½	2½				
Left hand	2½	2½	2½	2½	2½	2½				
Right thigh	5½	6½	8	8½	9	9½				
Left thigh	5½	6½	8	8½	9	9½				
Right leg	5	5	5½	6	6½	7				
Left leg	5	5	5½	6	6½	7				
Right foot	3½	3½	3½	3½	3½	3½				
Left foot	3½	3½	3½	3½	3½	3½				
						TOTAL TBSA%				

Burn Diagram



Burn depth coding:
Blue = Partial Thickness
Red = Full Thickness

Cause of burn: _____
Date of burn: _____ Time of burn: _____
Age: _____ Sex: _____
Weight (kg): _____ Height (cm): _____
Date drawn: _____ Time drawn: _____
Drawn by: _____
Attending physician: _____

Checklist for Burn Patients

- ☐ Admit patients under Burn Service
- ☐ Inhalation protocol ordered for inhalation injuries (peds & adults)
- ☐ Burn H&P complete
- ☐ Lund and Browder complete
- ☐ Photos of burn injuries obtained and uploaded in patient chart
- ☐ Fluid resuscitation >20%TBSA
- ☐ Burn admissions order set used Adults/Pediatrics
    - ☐ Wound care
    - ☐ Activity
    - ☐ Daily Weights
    - ☐ Calorie Counts
    - ☐ Medications/pain control
    - ☐ Prealbumin on admission and every Mo/Th ordered
    - ☐ MRSA PCR ordered
    - ☐ Ace consult for patients >65
    - ☐ Ophthalmology consult for patients with facial burns
    - ☐ Nutrition consult
    - ☐ Occupational Therapy consult
    - ☐ Physical therapy consults
    - ☐ Palliative care consult for peds with baux >100 and adults with a baux >100
    - ☐ Feeding ordered within 24hours of admission for intubated patients
    - ☐ Feeding ordered within 4hours of admission for po intake
    - ☐ Spiritual Care
- ☐ **Patients with mild inhalation injury admitted to 5b for airway watch, anesthesia notified**

Policies/Procedures you need to be familiar with:

Pediatric Invasive Procedures Guideline: LEAPP	Policy Number CM L-07
https://upstate.ellucid.com/documents/view/3758	
Fast Track of Burn Patients 6E/8E/PICU	Policy Number CM B-28
https://upstate.ellucid.com/documents/view/10356	
Fluid Resuscitation of Adult Burn Patients	Policy Number PROC CM F-15A
https://upstate.ellucid.com/documents/view/6169	
Smoke Inhalation Injury Treatment Guideline	Policy Number S-27
https://upstate.ellucid.com/documents/view/3870	

In addition to policies and procedures there are several guidelines that are pertinent to the management of the burn patient. These can be located on the Clark Burn Center website under education and safety (click link below). These guidelines are continuously updated with the most current information for the treatment of patients with an injury requiring the burn service.

https://www.upstate.edu/burncenter/guideline.php

Support for Burn Patients and Family Members

1. Burn Survivor Support Group
    a. Meets the first Thursday of the month from 5-7pm via zoom and in person
2. SOAR (Survivors Offering Assistance during Recovery) Peer support program
3. Facebook page “Burn Survivors of Central New York”

Burn Quality Improvements (QI) and the Burn Registry

Overview

A vital component of the ABA verification process is Quality Improvement Process. There are several data points that are evaluated. Our Burn Data Coordinator extracts the data to be placed in the burn registry. The burn registry is what drives our quality and process improvements, outreach and education.

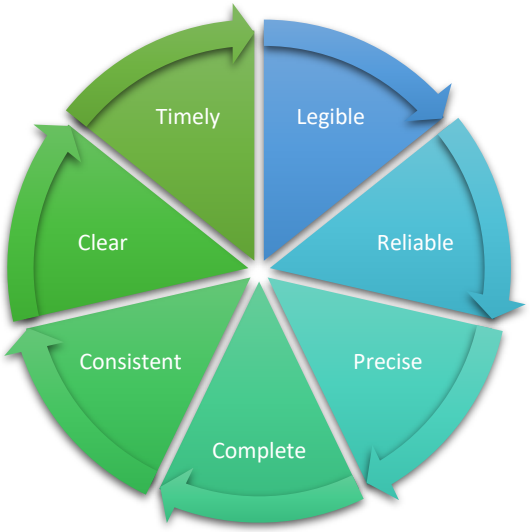
Burn Registry

In addition to collection of the data fields, comorbidities, complications, and procedures are abstracted from the chart. Accurate and thorough documentation is imperative as this is our driver for QI and benchmarking.

PI Program

Our PI Program is our ongoing commitment to providing optimal safe quality patient care through event identification, review, and corrective action. Indicators for review are identified by the entry of our data in the registry or referrals. Any team member can email a referral or contact the Burn Program Manager. Events can be closed on a primary, secondary, or tertiary level. While on the burn rotation you are encouraged to participate in the Burn Quality meeting.

HIGH QUALITY CLINICAL DOCUMENTATION



Seven criteria for high quality clinical documentation

Legible:

Record is clear enough for the reader to comprehend and easily decipher.

(With EHR systems-Epic-there is a greater focus on consistency)

Reliable:

Record is trustworthy, safe, and yields same result when repeated.

Reliable criteria relate to treatment provided supported by the documentation.

Example: Blood transfusion given for GI bleed. Diagnosis is upper GI Bleed. This not a reliable diagnosis based on treatment given. Acute blood loss anemia is a more reliable diagnosis.

Precise:

The record is exact, accurate, and strictly defined.

More detail=accurate, representative of the patient

Example: Patient admitted with chest pain, SOB, fever, & cough. CXR shows aspiration pneumonia. Final dx is pneumonia. A more precise dx would be aspiration pneumonia.

Complete:

Maximum content & thorough, all concerns fully addressed.

Example: Did the physician document the clinical significance of any abnormal diagnostic or lab result? (it is okay to document abnormal lab result is clinically insignificant.

Consistent:

The record is not contradictory.

When another physician's documentation conflicts with the Attending and the Attending is unavailable to state otherwise, the Attending physician's documentation takes precedence.

Clear

Example: Patient presents with syncope. EKG, labs, CT, MRI of the
brain was completed and all WNL's. Discharge diagnosis is syncope

Timely:

Physician needs to be timely with diagnoses that are POA

(impacts reimbursement, research, quality indicators, planning, & risk adjustment)

Problem List

Problem lists must be **reliable**

Documentation on a problem list that is **inconsistent** makes the list unreliable

Inconsistent entries result in **quality of care** concerns for the patient

Inconsistent entries are ineffective for care planning and provider communication

Purpose and scope of the Problem list should:

-Facilitate continuity of care

-Provide comprehensive list of patient problems for use in patient care

-Serves as a communication vehicle between care providers

Healthcare organizations are required to have a compliant problem list with current and active diagnoses (Stage 1 meaningful use requirement of the American Recovery and Reinvestment Act (ARRA) of 2009)

H&P

Establishes tentative provisional diagnosis (diagnoses) that is basis for treatment

Timeliness is essential (assists w/ establishing Present on admission-POA)

Clarity & completeness - if author knows or believes a diagnosis to be present, this should be documented

If the diagnoses are differential, ruled out, probable, or possible, or not established at the time of the writing, the author should document these as well

(It is okay to use terms such as likely, possible, or probable)

H&P important w/ validation of POA indicators

Providers should clearly document which conditions & diagnoses were prior to the patient's admission to the facility

example - DNR if POA should be documented as POA

- Shock (specify type) if POA should be documented as POA

H&P important to identify hospital acquired conditions (HACs) - HACs negatively impact quality scores & reimbursement

Improper reimbursement has an impact on many things such as:

-access to the latest equipment (anesthesia monitors, OR equipment, towers)

-best technology available (Digital consulting, computers, tablets, cell phones)

-supplies (Vashe for Burn patients)

-staffing (support staff for the students)

-education (selection of classes, support)

Documentation for Burns

-There are three areas needed for documentation of the burn:

1. Document the site and severity (include laterality)
2. Document the extent of the burn
3. Document the external cause

-It's important to include in your documentation if the burn site is infected and include the organism associated with the infection

-If multiple sites are burned it is important to document each site and to what degree.

-Document total body surface area (TBSA) as well including what percentage involves third degree burns

-Document if this episode of treatment for burns is the initial encounter, subsequent encounter or treatment of sequela from the original burn

- Non-healing burns or necrosis of burned skin are **considered acute burns**

- Late effects and current burn codes may occur at the same episode of care, if this occurs it's important that the record is clear so that the chart will be coded properly (for ICD-10 the 7th character S instead of A would be coded for sequela)

The S is only added to the injury code, the sequela (i.e. scar) would also need to be reported. the S identifies the injury that caused the sequela

Just a Few Things That May Come in Handy

Tetanus shot should be given to all burns especially if last tetanus shot date is in question.

• Ear and nose burns usually require Sulfamylon cream, not Silvadene or Bacitracin

• Also, no pillow is to be placed under heads with ear burns.

• There are Burn Service order sets for adults and pediatrics. See Admission Orders.

• When in doubt about anything, check with the Attending of the week.

You should be able to answer questions during your rotation related to burns and skin grafting such as:

- How does the skin graft adhere to the surface of the wound and how is it supplied by blood?
- The skin causes hemostasis when placed on the excised wound. What are the factors that allow this?
- We use 2 types of meshers to mesh donor skin – one uses "boards" and one does not.
- The mesher that uses boards – What makes the mesh or interstices (holes) large or small? It has to do with the board itself so take the time to look at the boards.
- Signs of partial and full thickness burns
- Calculating the Parkland formula

There is a nurse driven resuscitation protocol that can be initiated in the ICU. PROC CM F-15A

- The Nurse-driven resuscitation protocol may be used for adult patients with 2nd and/or 3rd degree burns equal to or greater than 20% TBSA being resuscitated with LR.
- The resuscitation protocol is not to be used for patients with unstable vital signs (including HR>140 and/or MAP<60).

1.The MD begins by projecting the amount of fluid the patient will require using the Modified Brooke Formula. Use the worksheet on page 2 for this calculation.
2. The RN initiates IV fluid infusion at the ordered rate.

3. The RN monitors hourly urine output and uses the flowsheet on page 3 to adjust IV fluid infusion rate. The RN modifies the IV fluid infusion order in EPIC as needed.

4. The RN will notify the Burn Resident or Burn Attending if Urine Output is less than 30 mL per hour (in adults) for 2 hours despite increasing the IV fluid rate. The provider may order the Albumin Protocol if appropriate.

5. The Albumin Protocol may also be indicated if the patient's required IV fluid rate exceeds two times the total rate calculated in the Modified Brooke Formula.

6. For patients with burns equal to or greater than 50% TBSA, an Ascorbic Acid infusion can be considered for the first 24 hours of treatment if this infusion can be started within 6 hours' post-injury. The volume of fluid provided by this infusion should be taken into account when

determining the required IV fluid rate. However, the rate of the Ascorbic Acid infusion will not be titrated by the RN.

Note: When Ascorbic Acid infusion is used, POC glucose testing is considered inaccurate for 36 hours following completion of the infusion. Serum glucose levels must be used instead. After 36 hours, the POC glucose level should be compared to the serum level before routine POC testing is initiated.

Phases of The Burn Injury

Resuscitative/Emergent Phase

In this phase, immediately after the burn injury, the vascular space becomes permeable allowing plasma to leak into the interstitium. If the burn injury is massive enough, this huge vascular leak can result in hypovolemic shock. Resuscitative fluid is needed quickly to hydrate the vascular system. There is a formula for calculating the amount of fluid required called the Modified Brook Formula (for adults: 2mL's x %BSA x Kg of body wt). (for children: 3 ml's x %BSA x Kg) and this is the amount needed over the first 24 hours. Administer 50% of this in the first 8 hours post burn and the next 50% over the next 16 hours. This formula is a good starting point. The goal is a GOOD urine output. That is to say 30-50 ml/hr for adults and 1ml/kg/hr for children. The composition of fluid is as follows:

- For burns >20% BSA use Lactate Ringer.
- **No fluid boluses!**

The resuscitative phase usually lasts 3-5 days. You may very well notice that the patient becomes very edematous during this phase. This of course is due to the body's response to the burn injury (the inflammatory response) and the massive fluid shift from the vascular space to the interstitial space. It is very important to reduce the edema. This can be accomplished by elevation of affected extremities and by the infusion of albumin. It is important to note that edema or under resuscitation can result in conversion of Partial thickness burns into full thickness.

The burn wound has three zones:

• **The Zone of Coagulation** is where the heat source was most intimate with the skin. The full thickness or third- degree area. This area is non-viable and has no epidermal appendages to re-epithelialize.

• **The Zone of Stasis** is the area surrounding the zone of coagulation. This is the partial thickness or second- degree area. In this area cells have been injured and may be salvaged. It is this zone as well as the next zone (Hyperemia) that is affected by under resuscitation or edema and may result in the conversion of the burn wound from partial thickness to full thickness, due to poor perfusion.

• **The Zone of Hyperemia** is the area that borders the zone of stasis. It is the least affected area with minimal injury. This area usually heals spontaneously. Also known as: superficial partial thickness area or superficial. Therefore, it is imperative to resuscitate the burn victim as soon as

possible to decrease the risk of death from hypovolemia to stop burn wound conversion and to perfuse major organs.

Acute Phase

In this phase, which also starts immediately after the burn and continues until the end of wound closure, the wounds are assessed. A determination of depth, body surface area and areas burned is made to assess the severity of injury. A treatment plan is also started.

The introduction of various bandages or wound coverings that claim to assist with the cleaning of wounds, absorb exudates, decrease pain, decrease nursing intervention saving time and money and promoting healing appears to be on the increase. Just remember that the treatment of burns depends heavily on an accurate assessment. Topical Antimicrobial's are creams or ointments used in conjunction with various bandages ranging from adherent to non-adherent.

1% silver sulfadiazine or Silvadene: The silver ion binds with the DNA of an organism and releases sulfonamide which interferes with the metabolic pathways of the microbe. Complications of use include a transient leukopenia, which is treated by sometimes stopping the cream for a short time but is more commonly treated by doing nothing. Silvadene can also cause "pseudo-eschar" formation and make the burns look deeper than it actually does. Silvadene may be used on partial thickness burns that range from superficial to deep. Do not use on the face, or any cosmetically sensitive area. Use with caution in patients with a sulfur allergy.

Bacitracin: antimicrobial, commonly used for superficial partial thickness burns. It is petrolatum based and seems to keep the wound moist and the bandage non-adherent, usually combined with xeroform gauze.

Any petroleum product should be avoided in patients requiring HBO, as it can combust.

Mafenide acetate or Sulfamylon is a cream or aqueous solution that covers a broader spectrum of bacteria than Silvadene or Bacitracin. Sulfamylon is a carbonic anhydrase inhibitor and can cause a metabolic acidosis. It also can cause burning after application and pain medication bay need to be timed with the soaks. Sulfamylon can penetrate eschar better than Silvadene or Bacitracin. It is used primarily on ear and nose burns to prevent the cartilage from becoming infected.

Santyl Collagense ointment is an enzymatic debriding agent used for deep partial thickness burns, small full-thickness burns with a fibrinous exudate. It must be applied nickel thickness and covered with a secondary dressing/gauze to keep moist. It is often combined with Bacitracin or Sulfamylon cream in a 1:1 ratio. Not to use with silver products as it de-activates the enzymes. Don't use Santyl on fresh graft.

Vaseline ointment is mainly used on face or neck burns, some attendings prefers to use Vaseline to substitute bacitracin and apply edema gloves for hands burns. You may ask NP to obtain edema gloves. If they are used in clinic, they should be charged to the patient at that time under 'charge capture' part of the chart.

Nystatin is a powered form we usually mix with bacitracin or Sulfamylon to provide anti-fungal coverage.

Bactroban is a topical cream usually used as anti-MRSA topical agent. If there is a slow healing wound with hypergranulation tissue, sometimes using this closes it by treating a subclinical infection.

Silver Nitrate applicators are firm wooden sticks with 75% silver nitrate and 25% potassium nitrate embedded on the tip. It is often used in aid remove and debride hypergranulation tissue or cauterize bleeding in wounds.

All the typical antimicrobials are used in conjunction with various gauze bandages. The ointments are applied to the wound then covered with xeroform, Vaseline gauze, or adaptic and covered with dry gauze. Sulfamylon cream should just be covered with dry gauze.

Sometimes a more effective vehicle for delivering a topical antimicrobial agent is to impregnate the desired gauze then apply it to the wound. The object of the topicals and gauze is to deliver antimicrobial coverage, therefore reducing the bacterial load at the wound site. The bandage can also serve as an agent that will clean wounds by sticking to the surface adhering to the debris and as the bandage is removed the debris is also removed. Finally, the bandage that is placed on the wound can also serve as a reducer of pain by covering exposed nerve endings.

Obviously, the best replacement for skin loss is skin itself. In order to place and auto graft there needs to be an adequate wound bed, therefore the use of temporary coverage is necessary until such time.

Biological dressings can be anything from animal to fetal membranes to cadaver tissue. The most common animal product is Xenograft (Pigskin). However porcine xenograft is no longer available. Suprathel will be replacing Pigskin.

Remember Biologic dressings are temporary, and only meant to provide coverage until the wound is healed or the area is viable for an autograft.

**Remember that there are some religious and ethical concerns to take into consideration when performing xenografting. Ensure patients are educated on the product being used and informed consent is done.

Synthetic Long-Term Dressings were introduced into burn care to minimize wound care time and decrease painful daily dressing changes These substances do various tasks, such as, keeping the wound moist allowing the air to filter in while any exudate filters out, maintaining an acceptable temperature at the wound, promoting healing, and reducing painful stimuli by acting as a barrier for air currents.

Mepitel Ag is the main synthetic substance that we use. It is an atraumatic contact layer featuring exclusive patented safetac (soft silicone) technology that will not stick to moist tissue such as a wound bed but adheres gently to intact skin. It contains silver too which inactivates a broad range of wound-related pathogen up to 8 days and usually is covered with non-sticky gauze like Telfa or Conformant and then a bulky gauze dressing to absorb the drainage. This type of dressing can be left on for up to 8 days.

Aquacel Ag is another dressing reinforced with nylon, absorbent dressing is soft, sterile non-woven hydroentangled dressing This conformable and absorbent dressing absorbs wound fluid and creates a soft gel which maintains a moist environment which supports the body's healing process and aid in the removal of unnecessary material from the wound (autolytic debridement), without damaging newly formed tissue. Aquacel ag can stay up to 2 weeks and usually covered with Duoderm Extra thin. It can leak around the dressing and require reinforcement with additional duoderm or changing of the entire dressing. Patients are usually provided with a few duoderm patches if they are out-patient.

INTEGRA: is a bi-layer dermal regeneration template matrix that becomes the dermis or acts as scaffolding for any remnant of dermis to rebuild upon. It is usually used for deep full thickness burns. Its dermal layer is made from cross-linked bovine tendon collagen and its epidermal layer is a thin silicone layer, which is removed after the matrix becomes vascularized and that process usually takes about 2-8weeks.

Then a thin split thickness skin graft is required to cover the area. The key to this product working well is adherence of the product.

There are even newer products out that may enhance the treatment of wounds in the same manner as antimicrobials. These newer products are gauzes impregnated with silver ions that become activated by moistness to decrease and in some cases kill bacteria.

The key to any product is how effective it is for your application and is everyone confident and instructed in its usage.

Treatment for a full thickness burn is excision and grafting. Keep in mind that if it is a big burn, multiple OR's may be needed.

There are three types of skin grafts:

- Meshed split thickness graft: used most often.
- Sheet split thickness graft: for face, neck, or hands.
- Full thickness graft: face, palm, or areas that need reconstruction.

After survival is not in question, function should be the next concern, then cosmetics. Sometimes the use of cadaver skin or Xenograft may have to be used to buy some time until donor sites heal. Healing a burn wound is achieved by feeding the patient, keeping them clean and by excising and grafting the burned area. Meticulous attention to decreasing any type of sheering is critical for graft take. Dressings to cushion and protect, positioning without causing friction and initial graft stabilization are all are important for successful graft take, bulky dressings protect the graft.

Rehabilitative Phase

In this phase, which starts on the first post burn day, assessment of functional damage and the start of functional restoration begin. Daily exercises and range of motion are the usual treatment. Splinting is done in position of function, not position of comfort. Splinting is also ordered at

times of rest and may be ordered during the day in an on and off schedule. The more the patient moves the better the outcome.

Partial thickness burns may heal spontaneously. This is accomplished by the shrinking of the skin causing tightness and a loss of elasticity. The only way to regain the elasticity is to exercise. Occupational and Physical therapists usually evaluate and treat based on the burn and the potential physical disabilities. This mainly pertains to deep partial thickness burns as superficial partial thickness burns heal without too much concern for contraction.

Full thickness, if they cover a large enough surface area or cover a joint are typically skin grafted. The type of skin graft used could pose potential problems. Most all skin grafts contract. If the skin graft is meshed, then the interstices (the holes) of the mesh must heal in spontaneously by contracture. It is this contracting action that causes the skin to become tight and less flexible than normal skin. OT/PT, reinforcement from the staff and family regarding the importance of moving the grafted area will help return the affected areas to their greatest functional capacity.

All healed burns and skin grafts are considered scars. All scars take approximately 1-2 years to mature (go through all stages of growth). During this maturation phase the graft or healed skin is malleable, be able to be stretched, molded or massaged into being more functional. Scarring, hypertrophic or keloid, is usually based on two things; how long it takes to heal and genetics. A superficial partial thickness burn wound that does not need grafting usually takes up to two weeks to heal. When it does heal in that time frame the scarring is non-existent, not noticeable or very minimal. Healing that occurs after the two-week time frame has a stronger chance of becoming hypertrophic (raised up above the skin but remains within the borders of the original wound). Some specific genetic make ups have tendencies for hypertrophic or a keloidal type of scarring. Keloid scarring is where the scar extends beyond the original wound margins. Scarring can be affected by pressure during the maturation phase. Traditionally, pressure garments are worn to smooth out the scar, making it as cosmetically acceptable as possible and to help with vascularity and itching. This method is not fool proof. Sometimes silicone sheets are used to affect a smoother appearing scar. Sometimes steroids are injected into the scars to calm down the over growth of collagen. Laser therapy is also used for hypertrophic scars and is the main treatment. These healed burns are going to be temperature sensitive and may change color from purple to bright red or pink.

In summary, the Resuscitative Phase: large volumes of fluid are replaced over a period of time.

Acute Phase: wounds are identified as to the severity by depth of burn and body surface area burned and the medical management begins.

Rehabilitation Phase: operations, if any, will be performed. At the end of the wound care the rehab intensifies and continues until full functional capabilities are restored.

Psychological needs of burn victims:

The loss of body image, dealing with daily painful treatments, long hospital stays away from family and changes in activities of daily living all impact enormously on our goal to treat the entire patient and end up with positive patient outcomes. Proper pain control, sedation to

minimize anxiety driven by painful dressing changes, Support groups, Child Life Staff, Clergy, Palliative Care for critical patients and their family…..

Donor Site Protocol

Xeroform

Applied in the OR under sterile technique once the skin has been taken and hemostasis has been achieved. It is rolled out onto the donor and covered with Conformant (Bridal Veil) a bulky bandage, cling, potentially and ace wrap, and netting.

On post-op day #3, dressings are removed allowing air to dry the Xeroform. Once adequate drying has taken place any curled edges can be trimmed. Healing takes place usually within 10-14 days. It is important to not have the patient place petroleum products on the xeroform donor site while healing is still occurring. After 10 days a petroleum product or lotion can be applied to help with lifting of the xeroform.

Nutrition and Burns

Purpose:

All burn patients require a Nutrition consult and calorie count monitoring to assess ongoing nutritional needs assessment.

Nutritional support should be initiated within the first 24 hours to promote optimal healing and preserve muscle mass.

A prealbumin must be ordered on admission and every Monday and Thursday thereafter.

A burn is a nutrient depleting injury because of its hypermetabolic and catabolic effects. Nutrition support during the acute care period, i.e. until substantial wound closure and autografting are completed, must be designed to meet the unique metabolic demands of severe burn trauma. Monitoring the progress of nutritional support does pose a challenge in moderate to severe burns. There is a dramatic increase in metabolic rate, directly proportional to the extent of injury up to 40-50% TBSA. After this point, the body appears to be maximally stressed; there is no significant increase in metabolic rate beyond 2x the normal. The maximum level is thought to be reached between the 5th and 12th post burn day. For this reason, it is important that the patient is receiving adequate kcals and protein by the end of the first post-bum week.

Protein

1. An estimated 20-25% of calorie needs should come from protein.

3. Fluid status, BUN, serum creatinine must be monitored for all patients receiving high-protein regimens because of the high renal solute load.

4. Excessive nitrogen may be detrimental to any patient and should not exceed 4 gm/kg/d. The provision of protein at 2.5 gm/kg IBW if > 20 kg and 3.0 gm/kg IBW if <20 kg is sufficient to promote healing. The optimal non-protein kcal: N2 ratio is 100-150:1.3

5. High protein diets are known to suppress appetite.

Nonprotein Calories

Glucose appears to be more efficient than fat as an energy source. Fat can depress immune function and, in nitrogen retention studies, has been shown to be less effective than carbohydrate.

Treatment of Outpatient Burns

Immediately cool the burn! (This is usually done prior to coming to the hospital) NO ICE! Use lukewarm or tepid water.

Once in The Hospital

• Assess the burn: is it superficial, partial thickness, or full thickness? (See assessment of burns)

• Consider how to manage the pain, during the cleaning in ER and daily at home

• Wash the burns with Chlorhexidine soap and water

• Use lotion soap on the face and ears as Chlorhexidine soap can cause Ototoxicity and ophthotoxicity

• Lyse blisters if more than 2 cm in diameter or if it impairs range of motion, function or if you need to assess the dermis below.

• Remove any loose debris

• Dry the burn by patting with gauze (No paper towel)

• Take pictures NOW with EPIC Haiku and upload to EPIC

• Apply appropriate bandage; topical antibiotic with gauze or Synthetic dressing

• No Creams or Ointments on Blisters (except ears)

• Instruct patient as to home care; daily washing of burn unless Synthetic dressing has been applied then leave alone

• Make Follow Up Appointment for Burn clinic. Give Burn clinic # 315-464-1800

• All patients must register at Patient Registration (first floor) Before coming to clinic

Special Considerations

Any burn patient whose injury appears to be non-accidental should be assessed for admission for their own protection, also any suspected abuse should warrant admission. Call appropriate consults services (social work for NAT work-up).

Bandaging

An art form that takes some practice. The main functions of a bandage are:

• Protection – it helps to keep dirt and/or bacteria off the wound.

• Comfort – burn wounds have exposed nerve endings that are extremely sensitive to air currents. A bandage will prevent air currents from reaching the exposed nerve endings.

• Absorption (Metabolic) – an occlusive bandage will absorb any exudate and reduce evaporative water loss.

• Aesthetics – should look good and stay on and not fall off. This may take some practice to achieve.

Some of the constants of applying a bandage are as follows:

- Wrap distal to proximal. To assist with venous return.
- Wrap in position of function rather in position of comfort. This will reduce the possibility of contractures.
- A pressure bandage MUST be applied to ALL dependent burns (lower extremity). This will help reduce edema. Ace wrap, Tubigrip
- A pressure bandage can also be applied to upper extremity burns. This may help with some pain control.
- It is important to apply pressure dressings distal to proximal including the feet and hands. Equal pressure while wrapping will prevent pressure sores. Fiqure of 8 wrapping is most appropriate
- Burn netting is used to hold the bandage on (no tape) *OF NOTE Bandnet has latex*
  - ☐ #10 for adult torso, # 6 or #7 for adult extremities, #5 for kid extremities, #1 for fingers. If netting is constricting in any way, it is too small.

Make Follow Up Appointment for Burn clinic.

- Give Burn clinic # 315-464-1800
- **All** patients must register at Patient Registration (first floor) **Before coming to clinic**
- Clinic is available 5 days a week 9-12
- Laser clinic is Wednesday afternoons

Special Considerations

Any burn patient whose injury appears to be non-accidental should be assessed for admission for their own protection, also any suspected abuse should warrant admission. Call appropriate consults services (social work or PEDs surgery for NAT work-up).

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BURNS/ASSESSMENT/DRESSING GUIDE

- ✓ Provide Analgesia & Anxiolytic prior to treatment
- ✓ Cleanse wounds with mild soap and water
- ✓ Remove all foreign, loose and non viable skin and tissue
- ✓ Debride blisters that are >2cm (Do not debride frostbite)

Burn Injury	Image	Assess Depth	Topicals/Primary Dressing	Secondary Dressing/Care
Superficial Burn 1st Degree		Painful, epidermis is damaged but intact. Red/Pink (Sunburn) Does not count inTBSA%.	Water based moisturizer PRN	None
Superficial Partial Thickness 2nd degree		Blistered, painful, raw. Pink/ in color, hair follicles still intact.	Outpatient a. Mepitel with a non-stick layer (telfa/conformant), gauze, kling wrap, coban b. Aquacel and duoderm c. Bacitracin and xerform, gauze and wrap Inpatient a.Bacitracin and Xeroform	4x4's, 12x12 or 18x36, Kling and bandnet or coban Elevate extremities
Deep Partial Thickness Deep 2nd Degree		Blisters easily removed. Red beefy/non-blanchable. Painful. Hair follicles intact.	Outpatient a.<5% Bacitracin and santyl 50/50 Or b. Aquacel and Duoderm Inpatient a.>5% Bacitracin/Santyl 50/50 and Xeroform	4x4's, 12x12 or 18x36, Kling and bandnet Elevate extremities
Full Thickness 3rd degree		Leathery white, brown,black or yellow. No sensation. Hair folicles not intact.	Outpatient a.Bacitracin and santyl 50/50 Or Sulfamylon cream Inpatient a.Aqueous Sulfamylon Q8hr b.Bacitracin and santyl 50/50 to face c.Sulfamylon cream to the ears/nose d.Patients with a known allergy to sulfa may need to use ¼ strength Dakins solution Q6hr	4x4's, 12x12 or 18x36, Kling and bandnet Elevate extremities
Facial Burns		Check for ocular injuries. Consider inhalation injury.	Bacitracin/Santyl to face Burns to ears/nose: Sulfamylon Cream	Open to air 4x4's, netting Shave daily Keep head elevated to decrease swelling **N**O pillows if burns to ears

Frostbite		Serous blisters, most likely partial thickness. Hemmorrhagic blisters most likely full thicknes. Do not debride hemmorrhagic blisters	Bacitracin, xeroform or adaptic, ensure applied between toes	4x4's, 12x12's, kling, netting, elevate extremities
Steven Johnson Syndrome (SJS)/Toxic Epidermal Necrosis (TEN)		Classic hallmark of SJS/TENS is keratinocyte necrosis	Cover all open areas with bacitracin/xeroform, gauze, wrap. Apply lotion QID to closed areas.	Can apply non-stick dressing such as exu-dry.

Pain Control

Partial thickness burn pain is very intense, whether it is superficial or deep. The pain can also be relieved by elevation of the affected area. Pain increases with wound manipulation as when wound care is being done. Exposure of the burn wound to air also increases pain. A pressure bandage will help with this. Pain medication should be given to help try and alleviate the pain, as much as possible. Percocets™, Lortabs™ and Diclofenac all provide adequate pain control. If you are worried about too much Tylenol™ plain Oxycodone can also be used. Remember that with pain pills and the increased stress that burns cause, GI problems may occur. The number of pain pills given should be enough to get the patient through until they follow up in the clinic. The maximum narcotic pills can be given is #18 pills in 3 days.

Physical and Occupational Therapy (PT/OT)

Rule #1 burn patients should not refuse this aspect of their care

Rule #2 see rule #1

PT/OT is required on admission orders for all burn patients whether they are in the burn unit or on the floor. Early assessment of functional damage and the start of functional restoration is imperative for an optimal outcome.

When burned skin either heals spontaneously or is transferred as in skin grafting, the skin contracts or tightens due to the loss of elasticity. Moisturizer will help keep the skin soft and supple but there is no way to alleviate contractures other than range of motion and exercising a number of times per day for sometimes up to two years post burn. This is the length of time we have to mold or modify the skin back to a functional state, after two years what is accomplished is what the patient ends up with. **There is no reason for burn scar contractures to occur while the patient is in the hospital!**

PT/OT will participate in daily rounds and monitor the progress of every patient, and provide recommendations for discharge and follow-up.

Schedule of times for PT/OT will be coordinated with wound care, eating, pain medication, resting and for the children school, playtime and naps. Proper positioning is required to maintain function and reduce the possibility of burn scar contractures. Static splints put parts of the body in a position of function. Specific times and orders are needed for these splints. (PT/OT will usually place these orders, check with them) Sometimes the patient is just placed in a required position without splints. Either way it is important to understand the problems that occur if proper splinting or positioning is not done. **The position of comfort is the position of contracture.**

- PT/OT not only deal with ROM and exercising but also strengthening, posture, gait and activities of daily living.
- PT/OT also assess the need for assisted devices such as; Crutches, walkers, hand grippers, special shoes or other PT/OT equipment.
- Do home assessments for possible modifications to bathrooms, stairs or kitchens.

Social Services and Case Management

Social Work and Case Management are vital to the burn service. Both services oversee patient and family issues related to the psychosocial impact of the hospitalization as well as discharge needs.

They work in conjunction with the burn team to address insurance, homecare needs and possible referral to rehab centers all aiming for a safe discharge plan.

The social worker addresses issues such as drug and alcohol abuse and support services needed in the community. The social worker also obtains the "real family dynamics".

The case manager deals with referrals to rehab and home care as well as assisting with obtaining dressing supplies, transportation and insurance verification for all services needed.

The case manager and social worker are available Mon. – Fri., to speak with the family and or staff as issues arise. There is also someone who is on-call overnights/weekends.

Glossary

Ace Bandage: An elastic wrap used to support injured tissue and inactive muscles. May also help in the control of edema and pain. Must be applied to all patients with lower extremity burns when out of bed. Must be wrapped distal to proximal with even pressure as not to create pressure sores.

Allograft: A graft of tissue from a donor of the same species as, but different genetic make-up from, the recipient. Transplant between two humans, AKA Homograft, Cadaver.

Autograft: A graft of tissue from one area of the body to a new area of the body from the same individual it was removed from.

Antibiotic: A medication used to kill or inhibit the growth of bacteria. Given PO or IV to treat Infections. Should not be used as a prophylaxis. Also comes in topical forms such as creams and ointments.

Biological Dressings: A covering used on partial thickness wounds to promote re-epithelialization. Can be meshed or not, must be kept frozen until use and usually has few if any side effects. AKA Pig skin could also be Amniotic membrane or Cadaver skin.

Contracture: A shortening of scar tissue that limits movement, especially that of a joint. Is preventable through positioning, splinting and range of motion. Something that the Burn team tries to prevent from day 1.

Culture: A lab test to determine the presence of bacteria, viral, or fungal properties in blood, urine, sputum, or wounds. A wound culture is more often sent as a qualitative specimen but can be quantitative.

Debridement: The removal of loose, dry, necrotic tissue (eschar) or debris from wounds. This prepares the area for new epidermal cells to grow or readies the area for a skin graft. This can be accomplished by mechanical (bandages), instrumental (forceps, scissors or scalpel) or enzymatic means (enzymatic ointments).

Dermis: The second layer of skin, which contains nerve endings, hair follicles and sweat glands. If this layer is non-viable a skin graft is needed.

Diuresis: An increase of urinary output. In the burn patient it indicates that resuscitation is complete and follows most skin grafting procedures indicating the mobilization of intra-operative fluids including any pitting fluid used.

Donor Site: An area of the body from which skin or tissue is harvested for the purpose of transplanting it to another site on the same body. Most frequently used areas are the thighs, backs and the head. However, any place is usable if needed.

Edema: Swelling of the tissues. Part of the inflammatory process; the body's response to injury. Needs to be removed by elevation and movement for accurate wound assessment and proper healing. Indicates a partial thickness wound.

Epidermis: Outer layer of skin. If only this layer is burned it is first degree.

Eschar: Dead necrotic tissue, a term used to describe third degree burns and sometimes deep second degree burned tissue. Non-viable tissue.

Escharotomy: An incision through eschar to relieve the pressure caused by edema. Since eschar is dead it cannot expand as viable tissue can it is not elastic. This procedure can

restore blood flow to affected extremities and if the torso is affected, can make respiration easier. This procedure, more importantly, allows for venous return.

Excision: The surgical removal of dead skin (eschar) by scalpel, electrocautery or other sharp instruments. Can be tangential or fascial.

Fascial Excision: The surgical removal of all unwanted tissue down to the fascia. This includes skin and Subcutaneous tissue. Used in cases when survivability is questionable and where "take" is a must. Usually performed via scalpel or electrocautery.

Full Thickness Burn: A burn where all the layers of the skin are involved, damaged or otherwise non-viable. Previously referred to as 3rd degree.

Granulation Tissue: A growth of beefy red tissue (not skin) that occurs in areas of full thickness loss. Does not occur in partial thickness wounds Can become hypertrophic.

Homograft: A graft of tissue obtained from a donor of the same species but with a different genetic makeup from the recipient. A.K.A Allograft.

Hypertrophy: An excessive growth, enlargement or accumulation of any kind. Usually pertains to an abnormal growth in tissue, organs or scars.

Hypertrophic Scar: Raised red scar tissue (not skin) that can occur after some partial thickness burns heal and after skin grafting on some individuals. Does not extend beyond the margins of the original wound.

Ileus: Decreased intestinal function; digestion stops. Usually seen in burn victims during the first two to three days' post burn.

Inhalation Injury: An injury to the airways, lungs and respiratory system, produced by inhalation of irritating products of incomplete combustion. Can be: an injury above the glottis (usually just heat exposure), or an injury below the glottis (more of an inhalation of chemicals) including carbon monoxide poisoning.

Keloid: A thick rope-like scar that rises above the skin surface and extends beyond the margins of the original wound. Is not the same as a hypertrophic scar.

Moderate Sedation: A minimally depressed level of consciousness that retains the patient's ability to maintain a patent airway independently and continuously and to respond to physical stimulation and/or verbal commands. For adults or children in the Burn Unit we tend to used Fentanyl and Versed.

MRSA: Methacillin resistant staphylococcus aureus. A resistant strain of staph that has developed because of the over use of antibiotics. This strain is no more virulent than any other bacteria but can affect the debilitated as in the case of the ICU patient.

Meshed Graft: A skin graft that has been perforated to allow for expansion and inhibit fluid building up under the graft. The skin can be meshed to a ratio of 1:1, 2:1, or 3:1

depending on the availability of skin and the area to be grafted. Tends to scar and contract much more than sheet grafts.

Neoeschar: The non-viable tissue build-up that forms on the wound surface when a wound is allowed to desiccate. Neoeschar is not our friend; therefore, we do not allow wounds to desiccate. We do allow them to dry out for a period of time.

Partial Thickness: Is where only a portion of the skin has been injured. Involves only the epidermis and a portion of the dermis. Also called second degree. Hair follicles are not compromised, should heal without any surgical intervention.

Pressure Dressings: Any bandage that applies pressure to a particular area for any reason, be it to stop bleeding, relieve pain, soften and control scars, immobilize skin grafts, or help certain bandages adhere to wound surfaces. Some examples are: Elastoplast, Ace bandages, Tubigrip and Coban.

Pressure Garments: A tailored garment used to soften and smooth hypertrophic and/or keloidal scarring. Also used to assist blood circulation in venous stasis disease. Also known as Jobst garments.

Sheet Graft: A skin graft that was harvested and placed directly on the recipient site without being meshed. Usually used in functional areas such as on the hands, over large joints like the popliteal or antecubital areas, or in areas where cosmetic is important like the face or neck. May have fluid accumulate under the graft but does not contract or scar like a meshed graft.

Split Thickness Skin Grafts: Skin harvested from a donor site that has epidermis and a portion of the dermis. A portion of the dermis is left behind on the donor site so that it will re-epithelialize.

Tangential Excision: A layer-by-layer removal of dead necrotic eschar to expose viable healthy tissue. Used mostly in burn surgery. Since the excision is in a layering fashion it allows for the removal of just the damaged tissue while leaving most of the viable tissue intact. Adequate excision is achieved when the excised area bleeds in a sheeting manor.

Xenograft: A graft taken from one species and applied to different species. Example: pigskin; also called heterograft.

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