Burn Resident Manual

The Burn Resident Manual

Updated 2017

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Contents

Introduction

Welcome to the Burn Service at the Clark Burn Center, Upstate Medical University. This outline although written for Residents new to the burn service may be of interest to any new member of the "Burn Team". It is intended to provide the framework for a systemic approach to both inpatient and outpatient care of burn victims; it is hoped that this framework will provide perspective for individuals new to burns so that errors of omission are relatively infrequent.

This outline is not intended to limit the flexibility of our approach to the burn patients. The great variability in the severity of the injury, the difference in patient's ages, the frequent presence of associated injuries and pre-existing illnesses, and the unique social background of each patient demand an individual approach. The complexity of the burn illness and the different responses to the stress imposed by a large burn will make it impossible to use any protocol in a cookbook or unvarying fashion. This outline is not intended as a text on burn treatment or a complete discussion of the pathophysiologic mechanisms, which apply to these patients.

Changes in availability of hospital resources and in the expertise and capabilities available on the burn team may require deviations from standard practices. For the most part, however, specific protocols are the foundation of our practice and should lead to a collaborative effort to deliver optimum care.

Burn Team

		Beeper #
Director	Dr. Joan Dolinak	213-0245
Burn Attendings	Dr. Joan Dolinak	213-0245
	Dr. Richard J King	213-1273
Nurse Manager	Denise Letourneau	VOCERA
Burn Program Manager	Tamara Roberts	4-9369/VOCERA
Nurse Practitioner	Yingzi Wang	213-0420
Burn RN	Rebecca Willison	(315)409-3780
Occupational Therapist	Shannon Mullen	VOCERA
Physical Therapist	Craig Decker	VOCERA
Dietician	Maria K Deleo	VOCERA
Social Worker	Cheryl A Valentine	VOCERA
Case Managee	Sandy Widger	VOCERA

Staff Nurses: Too numerous to name. ***It will, however, benefit you if you learn their names!***

Although the complexity and multi-faceted nature of the burn illness as well as its length, provide a unique opportunity for the significant contributions to patient care come from different disciplines, it is important that this care be coordinated by responsible physicians and the senior members of the burn team so that it is delivered in accordance with appropriate priorities.

Weekly burn rounds to which all interested parties are invited provides the forum for effective communication between the disciplines to coordinate care.

Wednesdays at 12:00 Room 6408

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., P.A.CNOR?,

P.T. /O.T., staff nurses, any student on rotation and rotating Residents (ER, Surgical)

- Exception: Wednesdays – Begins after M&M conference.

OR Scheduling

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

If the Resident schedules the case, **the OR needs to know if there are any special needs** such as the need for Rm 11 to hang extremities, the need for Watson knives, the Versajet, a warm room, is the case a BIG or small burn. Please check with the burn team on these needs. Postitioning equipment, dressing on the OR table prior to start

Weekends

Check with Attending for rounds start time. You may schedule outpatient visits (check with Attending) for either day but remember to schedule for early times (9:00 AM) and always have the patients register at patient registration.

Burn Clinic

Main Clinic

When: Tuesday morning and Friday morning starting at 9AM until 12 noon

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

How many: Maximum patient load is 20

Every other Tuesday the clinic schedules patients for the measuring and fitting of Burn Scar Management garments also known as Pressure or Jobst garments.

Laser clinic is every other Wednesday by Dr. Dolinak

Clinic other than Tuesdays

If patients need to be seen on days other than Tuesday, check with the Attending of the week as to when they can see outpatients. Each Attending has different times and days they prefer to see outpatients.

If you receive a call from an ER/ED or a private MD's office and they want to refer a patient or have 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. 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.

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.

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:

1. Burn Transfer Information Sheet
2. Helpful hints/things that may come in handy
3. Assessment of Depth of Burn
4. Treatment of Outpatient Burns
5. Protocols (fluid resuscitation, donor sites)
6. Admission orders (not complete)
7. Phases of the burn illness
8. Nutrition and Burns
9. Water Temperature Information
10. Advanced EMT Protocol-field Care
11. Glossary
12. 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, however, YOU are the Chief of the service. The NP, and Burn RN 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. NP works from 6am-2pm from Monday to Friday. The Burn RN is here Monday – Friday and flexes her schedule to coincide with OR cases

GOOD LUCK AND WELCOME

Transfers to the Clark Burn Center

Calls from an outside MD office or an ER/ED asking to transfer a burn patient should 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. Once the TBSA has been determined, fluid resuscitation and the necessity for a foley catheter can be discussed. Additionally, patient will need a tetanus if they have not received one in the past five years. Mode of transportation will also be determined at this time. ETA and any other pertinent information should be relayed at this time. This information should be relayed to the Burn Unit Charge Nurse as well as the Attending MD in our ER if the patient is coming through the ER. Usually most burns come through the ER/ED. The transferring facility should also call our ER for an ER-to-ER transfer. However, if the patient is an inpatient at another facility and is now being transferred to the Clark Burn Center for a definitive treatment they will be direct admits.

Since we are a Level I Trauma Center we accept all Burn transfers even if we have no beds, work with Bed Control. If we have a full Burn Unit but all are not burn patients, the off-service patients are to be moved out first. However, first check with the Burn Attending, because 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.

Once again, collect the information about the transfer, call the Attending and let the Burn Unit know what's up and **WE DO NOT TURN AWAY BURN PATIENTS!**

Burn Transfer Information Sheet

DATE: _____ **TIME OF CALL:** _____

NAME & LOCATION OF CALLER: _____

_____

LOCATION PHONE # _____

PATIENT NAME: _____
DATE OF BIRTH: _____
PATIENT ADDRESS: _____

_____

PATIENT PHONE #: _____

LOCATION OF ACCIDENT: _____

ESTIMATE % OF BURN: _____

BURN AREAS: _____

_____

_____

MECHANISM OF INJURY: _____

_____

_____

_____

OTHER PERTINENT INFORMATION: _____

_____

_____

_____

Just a Few Things That May Come in Handy

This is a teaching rotation. The Resident Manual has important information you should know to treat Burn injuries.

You should create a patient list and include:

- Diagnosis
- Date of Admission
- Post Burn Day
- Post Op Day
- Complications and Current Treatments: PT/OT, ABX and Discharge information.

This is required by some of the Attending's and you have probably created one on other services, so it should not be a problem.

All Burn admissions require a Burn Admission Packet. This includes an HPI/PMHx sheet, Physical exam sheet, Lab values and problem list sheet, and a Lund and Browder Burn. and an Attending sheet. You do not need to fill out a Burn Admission Packet for consults in the ER if they were not admitted. You can dictate the ER consult by using 07. Burn Clinic notes are dictated using 70.

Burn Charge Nurses will fill out NYS Burn Injury reports if you **admit** a patient with 5% or more body surface area burn/ or an inhalation injury. This is only for admitted patients but it must be done within 72 hrs. The burn unit nurse will **copy** the report and **file it** in the patients' chart, and **fax** the form to Albany.

- The PA or NP will help fill out the wound care/ dressing care section and do the discharge.
- The PA or NP usually dictates discharges unless they are both off that day.

- Please let all Attending's know about patients being seen in the ER so that they have the option of seeing the patient while in the ER **(often there may be special products that could be put on wounds that may benefit the patients emergently)**.
- Tetanus shot should be given to **all** burns especially if last tetanus shot date is in question or has not been given in the past 5 years.
- **Ear burns usually require Sulfamylon cream, not Silvadene or Bacitracin**
- **Also no pillow is to be placed under heads with ear burns. 2 different sized donuts can be made out of stocking net 6" by the nurse.**
- There are Burn Service inpatient order sets. See Admission Orders. Make sure include Lund and Browder Chart.
- When in doubt about anything, check with the Attending of the week or NP.

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 autograft 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.
- What makes the mesh or interstices (holes) large or small? *** We rarely use the mesher with boards the Zimmer meshes the skin 1:1, 2:1, and 3:1 and are three separate meshers…
- Signs of second and third degree burns
- Calculating the Parkland formula

- Patients with Burns less than 20% typically do not need resuscitation, only a maintenance fluid
- Calculating the evaporative water loss in big burns (25+%BSA) x M^2 x 24 = EWL in 24 hrs

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

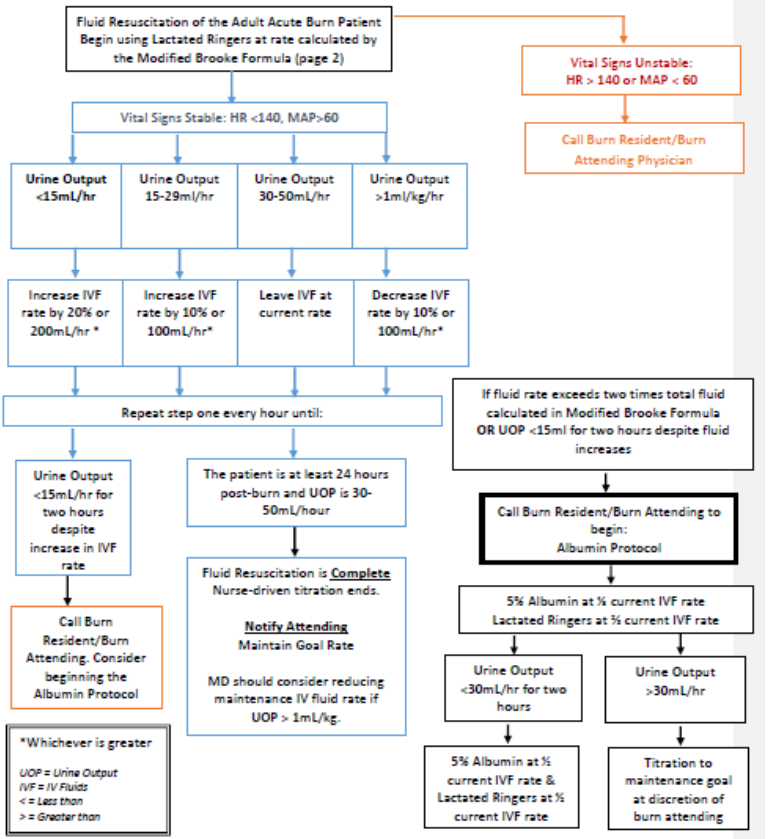
- The Nurse-driven resuscitation protocol may be used for adult patients with 2nd and/or 3rd degree burns equal to or greater than 20% TBSA being resuscitated with LR.
- The resuscitation protocol is not to be used for patients with unstable vital signs (including HR>140 and/or MAP<60).

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.

Patient Weight (kg)	**Weight** _____ **kg**
Time of Arrival to unit (Military Time) **Time of Injury (Military Time)**	**Arrival Time** _____ **Injury Time** _____
Hours elapsed since injury	**Time Elapsed** _____ **hours**
% TBSA burned (2nd and 3rd degree burns only)	**% TBSA** _____
Amount of fluid received prior to arrival, if applicable **Add the sum of fluids given by EMS/ED**	**Fluids given by EMS** _____ **mL** **Fluids given in ED** + _____ **mL** **Total fluid received** = _____ **mL**
Modified Brooke Formula **Project the total fluid required over 1st 24 hours:** **2mL × Weight (kg) × %TBSA =** **Total fluid projected**	**Total fluid requirement projected for 1st 24 hours** _____ **mL** *Lactated Ringer's solution is the most common IV fluid used in burn resuscitation.*
Determine how much fluid is still needed in the 1st 8 hours post-injury: **Divide the total calculated above by 2** **Subtract EMS/ED fluids from the "1/2 total fluid"**	 **½ of total fluid** _____ **mL** **Already received** – _____ **mL** **Remainder required** = _____ **mL**
Determine the starting hourly fluid rate: **Subtract the 'hours elapsed since injury' from 8** **Divide the 'remainder required fluid' by the time remaining:**	**Time remaining** _____ **hours** **Starting fluid rate:** _____ **mL/hour**

PLACE THIS CALCULATION IN THE PATIENT'S CHART FOR REFERENCE


Fluid Resuscitation of the Adult Acute Burn Patient Begin using Lactated Ringers at rate calculated by the Modified Brooke Formula (page 2)
Vital Signs Unstable: HR > 140 or MAP < 60
Call Burn Resident/Burn Attending Physician
Vital Signs Stable: HR <140, MAP>60
Urine Output <15mL/hr
Urine Output 15-29ml/hr
Urine Output 30-50mL/hr
Urine Output >1ml/kg/hr
Increase IVF rate by 20% or 200mL/hr *
Increase IVF rate by 10% or 100mL/hr*
Leave IVF at current rate
Decrease IVF rate by 10% or 100mL/hr*
Repeat step one every hour until:
Urine Output <15mL/hr for two hours despite increase in IVF rate
Call Burn Resident/Burn Attending. Consider beginning the Albumin Protocol
The patient is at least 24 hours post-burn and UOP is 30-50mL/hour
Fluid Resuscitation is Complete Nurse-driven titration ends.
Notify Attending
Maintain Goal Rate
MD should consider reducing maintenance IV fluid rate if UOP > 1mL/kg.
If fluid rate exceeds two times total fluid calculated in Modified Brooke Formula OR UOP <15ml for two hours despite fluid increases
Call Burn Resident/Burn Attending to begin:
Albumin Protocol
5% Albumin at ½ current IVF rate
Lactated Ringers at ½ current IVF rate
Urine Output <30mL/hr for two hours
Urine Output >30mL/hr
5% Albumin at ½ current IVF rate & Lactated Ringers at ½ current IVF rate
Titration to maintenance goal at discretion of burn attending
*Whichever is greater
UOP = Urine Output
IVF = IV Fluids
< = Less than
> = Greater than

Helpful Hints

Flammable Liquids, Beer, Alcohol, Drugs, Bonfires or **Campfires** are things that should not be mixed in any form. **They Usually Result in Flame Burns** and an admission to a Burn Unit. Scald Burns can easily be prevented by doing the following:

- Lower the temperature on your water heater to 120° – 130° F.
- Install thermostatically controlled faucets
- Provide supervision of children when they are in the bath

Tap Water – Time/Temperature Relationship

Temperature	Time to Produce Serious Burns
120° F	more than 5 minutes
125° F	1.5 to 2 minutes
130° F	about 30 secs.
135° F	about 10 secs.
140° F	less than 5 secs.
145° F	less than 3 secs.
150° F	about 1.5 secs.
155° F	about 1 sec.

Under the hood of your car the radiator cap states **do not open**, it says this for a reason. So do not open!

The sun heats the earth. It can also burn you if you don't take precautions. Use a sunblock SPF15 or higher and don't expose yourself for long periods of time to the sun.

If a fire starts in a pan of grease, do not try and move it. This will only fan the flames causing them to get bigger and splatter the grease. You should smother the fire. Always keep the proper fitting lid for the pan you are using nearby. Dares and fires do not go together. Spread safety keep our census low.

UPSTATE
UNIVERSITY HOSPITAL

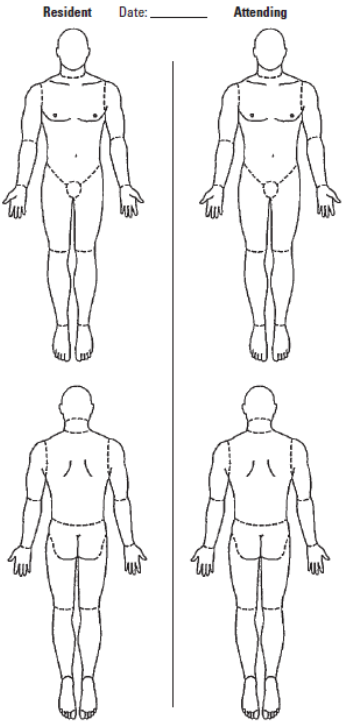
Patient Name: _____ MR#: _____

LUND AND BROWDER CHART

Account #: _____ DOB: _____

Shade the burn area on the figures below, and use the table to estimate the percentage of the burn

Area	Age – Years					% 2°	% 3°	% Total
	0–1	1–4	5–9	10–15	Adult			
Head	19	17	13	10	7			
Neck	2	2	2	2	2			
Ant. Trunk	13	13	13	13	13			
Pos. Trunk	13	13	13	13	13			
Right Buttock	2 ½	2 ½	2 ½	2 ½	2 ½			
Left Buttock	2 ½	2 ½	2 ½	2 ½	2 ½			
Genitalia	1	1	1	1	1			
Right Upper Arm	4	4	4	4	4			
Left Upper Arm	4	4	4	4	4			
Right Lower Arm	3	3	3	3	3			
Left Lower Arm	3	3	3	3	3			
Right Hand	2 ½	2 ½	2 ½	2 ½	2 ½			
Left Hand	2 ½	2 ½	2 ½	2 ½	2 ½			
Right Thigh	5 ½	6 ½	8 ½	8 ½	9			
Left Thigh	5 ½	6 ½	8 ½	8 ½	9			
Right Leg	5	5	5 ½	6	7			
Left Leg	5	5	5 ½	6	7			
Right Foot	3 ½	3 ½	3 ½	3 ½	3 ½			
Left Foot	3 ½	3 ½	3 ½	3 ½	3 ½			
				TOTAL				



BURN EVALUATION Severity of Burn 2° 3°	Resident	Attending
Major:	_____ %	_____ %
Moderate:	_____ %	_____ %
Minor:	_____ %	_____ %

Resident Signature: _____ Print Name/Title: _____ Date/Time: _____

Attending Signature: _____ Print Name/Title: _____ Date/Time: _____

Assessment of Burn Depth

Burns are measured in degrees; first, second and third degree.

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.

Second-Degree also called Partial Thickness

A partial thickness burn involves the entire epidermis and variable portions of the dermis. Partial-thickness can be superficial or deep. This burn is also referred to as a *partial thickness* injury. 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 **moistness** as seen in a blister or on the wound surface when the blister is not intact. Color seems to be too soft a sign but a second-degree burn is generally pinkish to light red.

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. This burn is also

characterized by edema, pain and moistness but the pain may not be as great as with superficial partial thickness. 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.

Third-Degree also called Full Thickness

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. This burn is called a *full thickness* burn and the tissue is referred to as *eschar.* A full thickness burn is characterized by being **painless, non-edematous** and **dry**. It can also have a waxy white color due to its vascular nature. Some may even say a full thicknes burn appears leathery and may be charred but these terms are not the best adjectives

to describe a third-degree burn. A third-degree burn may have thrombosed vessels. Tissue that is burned full thickness has no living properties and therefore, is nonviable. Hence, a full thickness burn cannot swell; the injured tissue has no elasticity even though fluid from the vascular space is still leaking into the interstitium. Therefore, an extremity burn that is **circumferential** may become tense and sometimes pulse less due to the fluid buildup. This is sometimes called a compartment like syndrome. An escharotomy may be needed to restore blood flow to the distal portion of the affected extremity but more importantly this procedure will help with venous return. Third degree burns almost always require a skin graft to definitively close the wound.

Burn
Severity

It is constructed by a number of subjective variables listed below, however, you must also consider what the mechanism of injury is, Thermal, Chemical, Electrical, and/or Radiation, as well as the length of exposure time to the source and the area of body injured.

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**; First, 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. **(See Upstate Medical Record F87041 on Page 12)**

Age

An indirect variable, not a good indicator of visceral 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

When the patient's visceral function is subnormal the capacity to deal with any size burn is reduced. Mental illness and retardation and 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.

Burns to Special Areas

Burns to the Face, Hands, Feet, and Perineum are critical areas. Burns to the face (eyes, ears, nose) can cause increased risk of infection, interfere with alimentation and with the patient's sensory perception, reducing their ability to understand and cooperate in their care. Burns to the hands, feet, and perineum could increase morbidity because they can interfere with the patient's functional capacity.

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 first, 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 deafness**
- **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 Biological or Synthetic dressing
- **No Creams or Ointments on Blisters** (except ears)
- **Instruct patient as to home care**; daily washing of burn unless Biological or 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 or PEDs surgery for NAE 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), #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.

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.

Fluid Resuscitation Protocol

Adults: Only for TBSA >20% or above.

Calculated 24 hr Fluid Resuscitation using:

2 mL/%BSA Burn/kg weight (Modified Brooke Formula)

- Administer 50% in first 8hrs
- Administer next 50% in next 16hrs
- **NO IV** Fluid boluses, unless patient is hypotensive or potentially bleeding
- Diuretics should not be used during the first 24 hours except during very special circumstances (i.e. mannitol with myoglobinuria- very rare)
- **Goal = urinary output** of 0.5mL/kg/hr or 30-50mL/hr in adults. If UOP is >1cc/kg/hr, titrate the fluids down by 10% If UOP is too low- increase by 1/3

Fluid Composition:

For Burns>20%

- Use Lactated Ringer's Solution

Children

(Usually < 15 years of age)

Calculated 24hr Fluid Resuscitation using:

3mL/%TBSA Burn/kg weight plus Maintenance fluid

- **Modified Brooke Formula –** Administer 50% in the first 8 hrs, the rest over the next 16 hrs
- Maintenance use either:

2000mL/m2BSA over 24 hrs

OR

4mL/kg per hour for the 1st 10 kg

2mL/kg per hour for any increment

of weight >10kg to 20kg plus

40ml/hour

1ml/kg per hour for any increment of weight over 20 kg plus 60ml/hour, to a maximum of 100ml/hour

- Some Attendings may also use 5% Albumin added to each liter of LR
- **Goal = urinary output for** < 30kg child is 1mL/kg/hr

  > 30kg child is 30-50mL/hr

Fluid composition:

- LR for resuscitation of burn
- D5LR for maintenance fluid especially for child <10kg. Do not titrate the maintenance fluid.

The above formulas are estimates only; a starting point, (HR, B/P, HCT, UOP) and other values may assist you in determining how adequate resuscitation is going. Some injuries, however, may require more than the predicted amount of fluid for adequate resuscitation. **They can include: electrical injuries, inhalation injuries, very deep burns, delayed resuscitation, associated injuries and patients with alcohol and drug dependencies to name a few. High glucose and hypothermia can also cause an inappropriate diuresis,**

making you think you are on track when you are still behind.

Admission Orders

Burn Unit Order Sets – are under Order Sets in EPIC, then choose specialty at the bottom of the page, pick SUR-BURN and in the left column you will see Burns I, II, and MEDS

Usual orders should include but not limited to:

Activity

PT/OT within 24 hours

Positioning

Wound Care

Medications

Pain: IV= Morphine, Fentanyl

PO= Hydrocodone or Oxycodone, Tyenol, Diclofenac (NSAID), Gabapentin.

Prophylactic meds:

Prontonix – given to all admissions

Lovenox – given to all admissions (with good kidney function)

IV ABX-NONE

Topical Creams and Ointments:

Bacitracin – Please Order Large Jar for burns larger than 1%

Sulfamylon (mafenide acetate) – Order Small Tube

(Sulfamylon also comes in liquid form (aqueous), 5%) , Mupuricin, Silvadine Vaseline

Santyl-Order small tube.

PT/OT consult

If child, obtain Child Life consult.

Diet-

PO – usually high protein/high caloric with Ensure TID

NG – see dietician's recommendations for enteral formulas typically started with in 24hrs for Sedated patients

Consents or Permits

Moderate sedation (NPO after midnight), and consent for sedation signed for the AM

Transfusions

Any others can be obtained later on in the admission

Not A Complete List But A Good Start

Medication Dosing Guidelines for Pediatric Burn Patients

Ascorbic Acid:

1-6 months: 40 mg daily

7-12 months: 50 mg daily

1-3 years: 15 mg daily

4-8 years: 25 mg daily

9-13 years: 45 mg daily

14-18 years: 65mg-75mg daily

Magnesium:

(1 gram Magnesium Sulfate = 8 meq)

Hypomagnesemia general dosing:

Magnesium Sulfate: 25-50mg/kg/dose IV every 8-12Hrs for 2-3 doses

Morphine:

>6months and <50 kg = 0.05-0.2mg/kg/dose IV Q2-4H prn

>6months and >50 kg =2-5mg IV every 2-4 hours' prn

Multivitamins:

< 50 kg and 12 years old = Polyvisol 1ml or 1 chewable Pediatric multivitamin tab Q Day

> 50 kg or 12 years old = Adult MVI tab Q Day or Therapeutic Multivitamin Liquid 5ml QDay

Zinc Sulfate:

Infants and children: 0.5-1mg elemental zinc/kg/day in divided doses 1-3 times daily.

Adolescents: 25-50mg elemental zinc(110-220 mg zinc sulfate) 3 times daily.

PLEASE CALL PEDS PHARMACY-42840 TO CONFIRM IT BEFORE PRESCRIBE ANY UNFAMILIAR MEDICATIONS.

References:

UptoDate: Https:// www.uptodate.com//

Upstate Medical university policy

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. 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.

And can also do home assessments for possible modifications to bathrooms, stairs or kitchens.

We are very capable of treating burn wounds with great success. Infections are minimal, superficial wounds can be healed within the two-week limit, graft take is 95 - 100%, scarring can be controlled to an acceptable degree and survivability is very high. However, with all this good stuff if we don't require that the patient be functional at the time of discharge then all our good work is for naught.

Social Services and Case Management

The burn unit has a dedicated social worker and case manager that 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., 7am – 5pm to speak with the family and or staff as issues arise. However, there is always someone on-call for emergency issues that need to be addressed immediately.

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 **(2mL's x %BSA x Kg of body wt.)** 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 may last for 7 days, however, 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 in the burn wound 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 fluid resuscitation and reducing edema. If resuscitation and elevation to reduce edema is not addressed quickly, the result will be conversion of the burn wound from partial thickness to full thickness will occur 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 1st degree.

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. In determining the depth, first, second, or third degree, an understanding of the signs and symptoms is needed for proper assessment.

- **First Degree Burn** involves only the thinner outer epidermis layer and is characterized by erythema and mild discomfort. The tissue damage is minimal and the skin functions are intact. Pain seems to be the chief complaint and usually resolves in 2-3 days. Healing takes place uneventfully. The most common causes of first degree burns are overexposure to sunlight and brief scalding by hot liquids. **There is no systemic response to a first degree burn and should not be included in the estimation of burn severity.**
- **Partial Thickness Burn** is one in which the entire epidermis and variable portions of the dermis have been destroyed by heat. Partial thickness can be either superficial or deep. Also referred to as partial thickness. Superficial second degree involves the upper third of the dermis. Here microvessels are injured, become permeable and leak plasma into the interstitium. This causes blister formation. This burn is also characterized by edema, pain and moistness. Color seems to be too soft a sign but second-degree burns are generally pinkish to light red.

  Deep partial thicknes burns involve most of the dermal layer. Fewer epidermal cells remain, causing a slower re-epithelialization of the burned area. Blister formation is not generally found to be present because the dead layer is sufficiently thick and adherent to the underlying tissue that it cannot be readily lifted off the surface. However, exceptions can occur in the very young and very old who tend to have thin dermis. The wound appearance is moist,

edematous and painful but not as painful as a superficial second degree. Blood supply to this area is marginal; thus there is a high probability that tissue damage may deepen with time. The fluid loss and metabolic changes are essentially the same as that of a third degree burn. Dense scarring, fragile skin and prolonged disability usually occur if skin grafts are not performed.

- **Full Thickness Burn** is where the entire epidermis and dermis is destroyed. There are no residual epidermal cells left to re-epithetialize the affected area. It is sometimes called a full thickness burn and the tissues are referred to as eschar. Third degree burns are dry, non-edematous and painless. They may also have a waxy white color due to its avascular nature. They may also be leathery or black if the tissue is charred. Third degree burns may also present with thrombosed vessels. This burn is caused by an exposure to a heat source and the severity is directly related to the length of time of exposure, the temperature and the area of body affected.

  Tissue that is burned third degree is dead and therefore has no living properties. It is because of this that a third degree burned area does not swell, even though the leak of plasma into the interstitium is still going on. Elasticity is the property that is lost and the result, if the burn is on an extremity, is a tense sometimes pulse-less area distal to the burn. If this is the case,

  an escharotomy, an incision from an unburned area through the eschar to another unburned or superficial area, relieves the pressure and restores the blood flow. Third degree burns almost always require a skin graft for closure of the wound.

In determining the severity of the wound, identifying the depth is only one relative factor. You must also determine the percentage of body surface area burned. This is accomplished by utilizing the Rule of Nines, which means that each part of the body is equal to 9 or a multiple of 9. This method of mapping body surface area is adequate for big burn surfaces but on small surface areas, figuring the percentage burned using the rule of nines becomes more of a guessing game than an actual mapping of the body surface area. On small burns a more accurate way of determining how much area is damaged is by using the palmar surface of the patient. The patient's palmar surface (including all fingers) is equal to 1% of their body surface area. Therefore, if the palmar surface of the care giver's hand is the same size as the patients then by using his/hers palm the care giver can map an estimated body surface area burned.

Another factor in determining severity is where specifically on the body the burn is. There are areas of the body that have thick skin and there are areas that have thin skin. If any thin skinned area is burned, watch for signs that it may be deep, based on the history and area burned, conversely a thick skinned area may be superficial in depth. All factors in determining burn severity are important and must be used for an accurate diagnosis.

Treatment of a partial thickness burn varies with depth, from the very superficial to the deeper second degrees. Basically, there are four (4) methods of treatment for partial thickness burns: **topical antimicrobials** used with gauze bandages, **biological dressings, synthetic dressings.**

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** as it is better known by, is a combination of two antimicrobials; sulfadiazine and silver. 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 second degree burns that range from superficial to deep dermal. Do not use on the face, or any cosmetically sensitive area. The concentration of silver is high and can delay healing, leading to a pinker scar.

Bacitracin ointment is also an antimicrobial and is commonly used for minor burns. It is petrolatum based and seems to keep the wound moist and the bandage non-adherent. When burns are small in size and minor in depth the use of a topical antibiotic should fit the burn. Vaseline is bacteriostatic and can be used per attending preference.

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

In other words, you do not need a bazooka (silvadene) to go rabbit hunting when a 22-gauge rifle (bacitracin) will do just fine. It is also much more cost effective.

Mafenide acetate or **Sulfamylon** is a cream that covers a

broader spectrum of bacteria than Silvadene or Bacitracin. However, it does have more systemic side effects such as metabolic acidosis, since sulfamylon is a carbonic anhydrase inhibitor and it has been known to cause burning after application. Since Sulfamylon can penetrate burn tissue (eschar) better than Silvadene or Bacitracin. It is used primarily on ear and nose burns to prevent the cartilage from becoming infected. Sulfamylon also comes in a 5% Aqueous solution that is delivered to the wound via red rubber catheters incorporated in the dressing. This concentration of Sulfamylon does not cause burning.

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 nickle thickness and covered with a secondary dressing, such as xeroform, to keep moist. Not to use with silver products as it de-activates the enzymes. Don't use Santyl on fresh graft as it will destroy the burn 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.

Vashe is a weak bleach solution used to moisten and cleanse burn wounds or over skin graft dressings. It is known to effectively against pseudomonas and fungus and not damage healthy skin cells.

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

Bactroban is a topical cream usually used as anti-MRSA topical agent.

If there is a slow healing wound, 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 creams and ointments are applied to the wound then covered with xeroform, Vaseline gauze, or adaptic and 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. It must be noted that all gauze is not created equally. That is to say that some gauze are adherent and some are not. The wound should dictate what kind of gauze is preferable. If the wound is full of debris and in need of debridement, an adherent bandage (such as dry gauze) is needed. If the wound is clean, bandages such as **Adaptic**, or **Xeroform**, non-adherent gauzes, seem to work better because they deliver the topical but do not stick to the wound when the bandage is changed. The object of the topicals and gauze is to deliver antimicrobial coverage, therefore reducing the bacterial load at the wound site. The bandage also serves 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 hide to fetal membranes to cadaver tissue. The most common is **Xenograft**

(Pigskin). Pigskin is from a pig that has been harvested, sterilized or irradiated then frozen. Xenograft application is done in the OR. To minimize hematoma formation and graft loss, it is crucial that adequate homeostasis be achieved before the placement of skin grafts, cadaveric, or other skin substitutions.

Removal of any debris or loose skin is required. The removal of any serous exudates, adherent or not, is also required. The xenograft is laid dermal side down. A bandage is then applied to make sure the pigskin stays in contact with the wound surface. Adherence of the pigskin is imperative for it to work. Over the next few days the xenograft becomes translucent, a sign that it is doing its job. Once the wound is healed a band net is applied to the xenograft and the patient is instructed as to its removal. As stated previously there are other biologicals but pigskin is still the easiest to obtain.

Remember Xenografts are temporary, and only meant to provide coverage until 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 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. The exclusive safetac

layer seals the wound edges, which prevents the exudate from leaking onto the surrounding skin and minimizes the risk of maceration. It contains silver too which inactivates a broad range of wound-related pathogen up to 8 days and usually is covered with non-sticky absorbent gauze like Telfa or Conformant. 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 comprised of hydro fiber with nylon thread used to stitch bond the product along the length. This conformable and highly 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. Patients are usually provided with a few duoderm patches if they are out-patient.

BIOBRANE is a biocomposite dressing made from an ultrathin, semipermeable silicone membrane mechanically bonded to a flexible knitted trifilament nylon fabric.

Combined Synthetic and Biological Dressings are being used with more frequency by the burn community. These products offer a covering that can be used on varying depth burns. These products decrease LOS and pain as well as the amount of time needed for wound care, however, they do carry a price tag that is far more than that of pigskin or Mepitel/Aquacel AG. One such wound product is called **INTEGRA**. This 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 third degree 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. Once again the key to this product working well is adherence of the product. These products do have a place in the treatment of burns but as with any item, cost, ease of application, and product availability need to be considered. A small insignificant burn will heal just fine with bacitracin and a bandage. It may also heal with the application of Mepitel or Aquacel AG, and finally it may do wonderful with Integra but does the end justify the means, even when you consider pain, admission or outpatient status and the psychological impact burns have on individuals.

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 third degree burn is simple, wash with soap and water daily and apply the appropriate topical cream and bandage. Start with PT/OT twice a day and schedule the patient for an operation to excise and graft the burn. Keep in mind that if it is a big burn, multiple OR's may be needed. There are three types of skin grafts. We mostly use the meshed split thickness graft. However, we may use a sheet split thickness graft on the face or hands. We also could use a full thickness graft on areas that need reconstruction. After survival is not in question, function should be the next concern, then cosmetics. The first OR should concentrate on hands, feet or the neck if they are involved, then reduce the size of the burn and remove the bacterial load. Sometimes the use

of cadaver skin or Xenograft may have to be used to buy some time until donor sites heal. We should strive for healing on average of 1% BSA per day. This is only 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.

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 not while the patient is awake. 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. There should be a set time for formal range of motion with strengthening exercises. Occupational and

Physical therapist 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 (shrink). There are three basic types of skin grafts. First, there is a meshed split thickness graft, then a sheet split thickness graft and finally there is a full thickness graft. A meshed graft is used to cover a large surface area when

limited area of donor site is available. A sheet graft is usually used in functional areas such as the hands, antecubital or popliteal areas. Sheet grafts are also used for cosmetic results, in areas such as the

face or neck. 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. If the skin graft is a sheet graft, the amount of contracture is less than if the graft was meshed, since a sheet graft is one contiguous piece of tissue, all areas are covered, no spontaneous healing is necessary to close gaps. 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 two 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 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). Some specific genetic make ups have tendencies for a keloidal type of scarring. Keloid scarring is where the scar extends beyond the original wound margins and it may be raised above the level of the skin similar to a hypertrophic scar. 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. This method is not fool proof but when used as prescribed and sometimes in conjunction with silicone sheets, the affect is a smoother appearing scar. Sometimes steroids are injected into the scars to calm down the over growth of collagen. Now we use laser therapy for hypertrophic scars as well. It is important to note that the color of most burns after they heal is going to fade but slowly. 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** is when large volumes of fluid are replaced over a period of time. The **Acute Phase** is when the wounds are identified as to the severity by depth of burn and body surface area burned, the medical management begins, the **Rehabilitation Phase** starts and operations, if any, will be performed. At the end of the wound care the rehab intensifies and continues until full functional capabilities are restored.

One aspect of the burn injury that has not been covered in the **Phases of the Burn Injury** but is an important subject nevertheless is that of the 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. We certainly can ask for help with a consult from psychiatry. Sometimes anxiolytics are helpful but the patients' emotional needs are very hard to diagnose and treat and are certainly better dealt with by dedicated staff members trained in total burn care that can address these issues on a daily basis. 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

Purpose:

To consistently maintain donor sites, which are free from infection, promote re-epithelialization, and decrease pain.

Products:

Aquacel Ag, Xeroform

Xeroform

Xeroform is sterile fine mesh gauze dressings impregnated with 3% Xeroform (Bismuth Tribromophenate). Xeroform comes in 4inX3yd rolls and in sheets 5inX9in. They are applied in the OR under sterile technique once 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 and ace.

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. Petroleum could cause the xeroform to come off prematurely leaving an open, sore area.

Aquacel Ag

Aquacel Ag with hydrofiber is a silver impregnated antimicrobial dressing composed of sodium carboxymethlcellulose and ionic silver.

This dressing is highly absorbent. Similar to Calcium Alginates. When used on donor sites, it is placed on in the OR

after some hemostasis is achieved. Aquacel comes in 2 sizes, large and small. When placing on a donor site overlap Aquacel on to good skin by approximately one inch. Xerofrom can be used to hold in place and then staples are used to secure all in place.

On post-op day #3 the dressings are usually removed to expose the Aquacel Ag. Sometimes a dressing is replaced and sometimes not. If any area of the donor site is not covered with Aquacel, more can be added. If the Aquacel is too gelled and floats off the site, remove and replace with a new sheet.

The patient cannot shower or take a bath with the Aquacel, it will get wet and gel up. This defeats the purpose of the aquacel.

Aquacel Ag usually heals in 10 days and most importantly the patients do not complain of pain when the first dressing is changed.

The Aquacel Ag is supposed to dry as with all donor site products. It may appear very crusty or parchment like and may even have some exudates but this is normal. Any concerns please consult MD, PA or NP.

Nutrition and Burns

Purpose

To provide consistent quality nutritional care for the thermally injured patient. All burn patients require a Nutrition consult and ongoing nutritional needs assessment.

Nutritional support should be initiated within the first 24 to 48 hours to promote optimal healing and preserve muscle mass.

Goals of Nutritional Management

1. To provide sufficient calories (kcal) and protein to compensate for the increase in metabolic rate and the hypercatabolism which occurs in response to thermal injury.
2. To maintain adequate body weight and promote anabolic healing of both the autografted wound and donor sites. Generally, some weight loss is expected following a severe burn and muscle mass will not be retained while on strict bed rest, therefore, our goal is to try to maintain at or above 90% of IBW and/or UBW.

Characteristics

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.

Two Components Contribute to the Elevated Protein Need:

1. Metabolic turnover of the protein pool is increased including both the rate of protein synthesis and the rate of catabolism
2. A redistribution of body protein from peripheral locations, primarily skeletal muscle, to visceral compartments occurs.

Protein

1. An estimated 20-25% of calorie needs should come from protein.[2]
2. Arginine enrichment has been shown to improve cell-mediated immunity and improve wound healing and decreases morbidity and mortality in burns.[2]
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

1. 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.[2]

2. Dietary enrichment with fish oil (rich in omega-3 fatty acids) may prove to be a new frontier in nutritional management of bums, as it has divergent effects on immune response, gastrointestinal motility, and prostaglandin synthesis when compared with fat that is obtained from vegetable oils (largely composed of omega-6 fatty acids).[2] Modification of lipid intake with omega-3 fatty acids is correlated with improved immune competence and tube feeding tolerance. [3]

Classification of Burns [4]

Superficial Burns

Involve only the epidermis and are characterized by erythema. These burns tend to heal in 7-15 days.

Partial Thickness Burns

Involve all of the epidermis and a portion of the dermis or corium (the fibrous inner layer of the skin containing blood vessels, nerves, glands and hair roots). Partial-thickness burns are characterized by blisters and accompanied by subcutaneous edema. Less severe partial-thickness burns heal in 10-14 days. Deeper burns may require 25-35 days for healing and may require skin grafting.

Full Thickness Injury

The entire dermis down to the subcutaneous fat is destroyed and thrombosis of small vessels in the underlying tissue occurs. Coagulation necrosis produces the eschar (a dry, leathery inelastic slough composed of former elements of the skin). The functions of the skin, including retention of heat and barrier to infection, are lost entirely. These burns require skin grafting and an estimated 3 months to heal, they will not heal on its own.

Methods of Mapping Burns/Determining % TBSA

1. The Rule of Nines: Adults

Head	9%
Front	18%
Back	18%
Each Arm	9%
Each Leg	18%
Genitals	1%
Hand	1%

2. See the Lund and Broder Burn Estimate and Diagram. (See form # 87041)

Fluid Resuscitation

Burn injury destroys the lipoprotein components of the skin allowing increased evaporative water loss. Insensible losses increase as the hypermetabolic response peaks (5-12 days after injury) and subside as wounds re-epithelialize.

The guiding principle in fluid therapy is to establish and maintain adequate urine output, often estimated as an hourly rate of 30-50 ml in adults[5] or 1 ml/kg/hr in children.[5,6,7] For the most part, fluid balance is monitored by the MD and Nursing staff, but it is important to review I/O records and weights.

NOTE: For specific guidelines for fluid resuscitation refer to the "Burn Care Protocol for Shock and Fluid Resuscitation of the Burn Patient".

After the patient is resuscitated and provision of maintenance fluid begins, enteral nutrition should begin (ideally after the first 24-48 hours post-burn and in the presence of bowel sounds). If the patient is able to take PO, a high calorie,

high protein diet is suggested in most patients. If intake is

suboptimal as indicated by calorie counts and/or observation (less than 2/3 of estimated needs) a supplemental tube feeding may be suggested.

Nutrition Assessment

Complete Adult or Pediatric Assessment form within 72 hours of admission, if at all possible, complete within 24 hours.

1. Obtain diet history (as able).
2. Obtain preburn weight or dry body weight (DBW) and weight history. For children, determine % standard for height and weight for age, and weight for length.
3. Obtain pertinent information from the medical record:
   A. % TBSA burned and extent of donor sites
   B. type of burn injury: flame, scald, electrical, chemical, frostbite, etc.
   C. thickness or degree of burn and % of third-degree burn.
   D. location of burn
   E. presence and extent of inhalation injury
   F. associated trauma, injury, fractures
   G. evidence of pre-existing malnutrition and/or chronic illness (past medical history)
   H. diagnostic tests/procedures (serum gluc, phos, albumin)

NOTE: serum values for albumin, transferrin, BUN, creatinine, Hgb and Hct and electrolytes may be unreliable for patients receiving primary excisional treatment or multiple transfusions. N hydration, edema, blood loss, sepsis, will also effect lab results. Lab values may be useful over time, therefore, it is important to look at trends.

4. Anthropometries
   A. preburn or dry weight - weight gain from fluid is common during the resuscitation phase and is generally mobilized slowly over the next 2 weeks.
   B. height
   C. realize that determining frame size, obtaining triceps skinfold measurements and midarm muscle circumference measurements may be contraindicated in burn patients.
5. Determine the function of the GI tract: swallowing ability, ileus, curlings ulcers, diarrhea, etc. Consider alimentary access vs. intravenous access. Note that nasoduodenal tubes may be used for feedings even with gastric ileus.[2]
6. Determine calorie and protein needs: Currently, there are several methods of calculating calorie and protein requirements in burn patients. The following have been selected for use at SUNY Upstate Medical University

Adults: Calories

1. Wilmore[8]: BEE x INJURY FACTOR

   BEE FOR MEN: 66.47 + (wt in kg x 13.75) + (ht in cm x 5) - (age x 6.8)

   BEE FOR WOMEN: 655 + (wt in kg x 9.6) + (ht in cm x 1.85) - (age x 4.7)

   INJURY FACTOR % TBSA BURN % change in metabolic activity

10	1.25
20-25	1.6
25-30	1.7

30-35	1.8
35-40	1.9
40-45	2.0
> 45	2.0

2. Curreri[9]:
   (25 kcal/kg) + (40 kcal x % TBSA)
   NOTE: Estimates peak energy needs.
3. Estimated calorie requirements (> 20% TBSA)[10]
   Male= (25 kcal/kg x BMR age factor*) + (40 kcal x % TBSA)
   Female= (22 kcal/kg x BMR age factor*) + 40 Kcal x % TBSA)
   *BMR age factor =
   20-40 yr = 1.00
   40-50 yr = 0.95
   50-75 yr = 0.90
   >75yr = 0.80
   NOTE: Add 500 kcal to the above equation for weight gain.
4. Fuller[11]: (for obese patients > 130% IBW)
   (15 kcal/kg) + (40 kcal x % TBSA)

Adults: Protein

1. Bell et al.[12]: 1.5 -2.5 gm/kg
2. KcaI: N2 ratio of 100-150:1
   NOTE: In severely burned adults, a ratio of 125:1 can improve amino acid utilization.[13]

3. A guideline to follow is:

   <20% TBSA - give 15% of total kcal as protein.

   > 20% TBSA - give 20% of total kcal as protein.

   In adults > 70 years give 15% of kilocalories as Protein.

Pediatric: Calories

1. Total energy needs= BMR X activity and injury factors (see table 1 & 2)
2. BMR X 1.5 to 1.7 if ,10% TBSA burn

   BMR X 1.6 to 1.8 if 10-30% TBSA burn

   BMR X 1.8 to 2.0 if > 30% TBSA burn
3. Recommended daily allowance (RDA) is used to calculate energy needs for children less than 1 year of age.
4. Children 0-6 months provide 108 kcal/kg/day
5. 6-12 months 98 kcal/kg/day

Pediatric: Protein

1. In children, 22-25% of kcal should be protein. Children < 1 year of age, give 15% of Kiliocalories as protein.
2. Bell et al.[12]: 35 gm/kgBW (Children)
3. Molnar et. al.[16]:

   > 20 kg BW = 2.5 gm/kg IBW

   < 20 kg BW = 3 gm/kg IBW
4. The American Academy of Pediatrics Committee on Nutrition recommends 3-4 gm/kg/day maximum for infants less than 1 year of age secondary to the increased renal solute load[17].
5. For infants, there is no set formula for calculating protein needs, therefore, utilize the 1989 RDA'S as a

baseline and then the non-protein kcal: Nitrogen ratio. Moderate stress: 150:1. Severe stress: < 100:1.

Vitamins and Minerals[18]

Micronutrient	Adult	Child	Infant
Electrolytes (Na+ and K+)	Provided based on serum and urine data and fluid requirement.		
H20 Soluble Vitamins (B-Complex, Folate, Biotin, B-12)	RDA x 2	RDA x 2	RDA
Fat Soluble vitamins RDA (A, D, E).	RDA	RDA	
Vitamin C	1-2 gm/d	500 mg/d	250 mg/day
Zinc	RDA x 2 (30 mg)	RDA X 2 (20 mg)	RDA X 2 (10 mg)
Trace Elements (Copper, Manganese, Chromium, Iodine)	RDA	RDA	RDA
Minerals	RDA	RDA	RDA
Iron	Routine supplementation should be avoided during acute injury, particularly when associated with infection.		

NOTE: Vitamins A, C, Zinc are extremely important cofactors in tissue repair and immunocompetence.

Nutrition Care Monitoring

1. Charting will be done weekly unless nutrition classification dictates more frequent follow up.
2. Weight status changes, diet order changes, pertinent lab data and nitrogen balance will be monitored as available.
3. Estimations of nutritional needs, by formula, require review and/or read justment at intervals of 1-2 weeks.
4. Calorie Counts will be completed if there is questions on adequacy of PO intake, slow wound healing or for patients on transitioning off from tube feedings. They will be summarized every 3-5 days and discontinued once the average of 3-5 days meets ≥ 85% of estimated goals for protein and calories, as per RD assessment.

Our ultimate goal would be to have the patient's intake meet ≥ 85% of calorie and protein needs for > 80% of their hospital stay.

5. Check for the occurrence of sepsis (elevated temp = increased nutrient needs)
6. Check I/O and serum electrolytes for evidence of hydration status.
7. Assess/Monitor swallowing ability and oral feeding tolerance.
8. Monitor timing and frequency of surgical procedures, wound care, physical therapy, occupational therapy, hydrotherapy, and any other treatments and adjust feeding schedule accordingly, as able.
9. Follow reports of skingraft adherence and/or MD and Nursing reports of the healing progress or % of open wound. REASSESS needs accordingly.
10. Monitor patients' ability to tolerate advances in nutrition regimen via calorie counts and observation, tube feeding tolerance, etc. Use supplements to meet estimated nutrient needs. Encourage High Calorie and High Protein as tolerated unless medically contraindicated.

Patient Education

1. Explain feeding modality and nutrient needs to patients and/or significant others along with any other modifications ordered. Enlist cooperation with regimen as appropriate.
2. Counsel patient and/or significant others on appropriate diet and food-drug-interactions for home use, moderating calorie intake to avoid excessive weight gain or using supplements to maintain caloric intake.

INDIVIDUALIZE!

Team Monitoring

1. Attend weekly Burn Team Conference (d/c rounds-Wednesdays at 12:00) in the conference room
2. Attend Medical rounds as able.

Nutritional Adequacy/Inadequacy

This diet can be adequate in all nutrients if proper amounts and variety are consumed. The calorie and protein intake should be monitored regularly by either calorie counts and/or observation on meal rounds. If oral intake is not sufficient, it may be combined with other feeding methods, i.e. tube feeding and/or TPN, to meet the individuals' nutrient goals.

Comments

Consideration should always be given to variation and individualization of the menu in order to maximize nutrient intake.

Estimation of Energy Metabolism by Weight

Appropriate for infants – 16 years of age to Calculate BEE:

1. **Determine age and weight of patients**
2. . **Read across tO appropriate sex**
3. Read Metabolic rate (kcal/hr)
4. **Multiply metabolic rate x 24 {hrs) tO determine daily BEE**

Table **1:** **Basal Metabolic Rates: Infants and Children**

Age 1 wk to 10 Mo. Metabolic Rate (kcal!hr)		Age 11 to 36 Mo. Metabolic Rate (kcal/hr)			Age 3 to 16 Yr Metabolic Rate (kcal/hr)		
Weight (kg)	**Male or Female**	Weight (kg)	**Male**	**Female**	Weight (kg)	**Male**	**Female**
3.5	8.4	9.0	22.0	21.2	15	35.8	33.3
4.0	*9.5*	9.5	22.8	22.0	20	39.7	37.4
4.5	10.5	10.0	23.6	22.8	25	43.6	41.5
5.0	11.6	10.5	24.4	23.6	30	*47.5*	*45.5*
5.5	12.7	11.0	25.2	24.4	*35*	*51.3*	49.6
6.0	13.8	11.5	26.0	25.2	40	55.2	53.7
6.5	14.9	12.0	26.8	26.0	*45*	59.1	*57.8*
7.0	16.0	12.5	27.6	26.9	50	63.0	61.9
7.5	17.1	13.0	28.4	27.7	*55*	66.9	66.0
8.0	18.2	13.5	29.2	*28.5*	60	70.8	70.0
8.5	19.3	14.0	30.0	29.3	65	74.7	74.0
9.0	20.4	14.5	30.8	30.1	70	78.6	78.1
9.5	21.4	15.0	31.6	30.9	75	82.5	82.2
10.0	22.5	15.5	32.4	31.7			
10.5	23.6	16.0	33.2	32.6			
11.0	24.7	16.5	34.0	33.4			

Source:

Altman, PL, Dinner, D.S. (eds) : ***Meralmlism,*** **Bethesda, MD: Federation of American Societies for Experimental Biology. 1968.**

Table 2: Calculation of Energy Needs for Pediatric Patients

The World Health Organization Table is used to calculate BMR and then an activity and injury factor is added to the BMR.

BASAL METABOLIC RATE		
Age (years)	Kcal/kg/day Females	Males
1	56.4	57.0
2	54.3	53.65
3	53.0	53.5
4	51.0	50.8
5	50.9	48.63
6	47.4	46.72
7	44.7	44.8
8	42.0	41.5
9	39.1	40.3
10	37.1	38.3
11	35.2	36.6
12	32.0	35.1
13	30.0	33.4
14	27.0	30.9
15	26.0	29.5
16	25.4	28.4
17	24.8	27.6
18	24.5	27.0
19	24.3	26.5
20	24.2	26.4

Total energy needs= BMR X Activity and Injury factors

BMR X 1.5 to 1.7: <10% TBSA burn

BMR X 1.6 to 1.8: 10-30% TBSA burn

BMR X 1.8 to 2.0: 30% TBSA burn

Table 3: NAS/NRC Recommended Dietary Allowances, 1989

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.

Hypertropy: 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 second degree 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 anticbital 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 specie and applied to different specie. Example: pigskin; also called heterograft.

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    - Miller-Dwan Medical Center, Dululth, MN
    - Providence Hospital, Anchorage, AK
    - St. Joseph Medical Center, Fort Wayne, IN
    - Shriner's Burn Institute, Galveston, TX
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F87166 - Rev. 8/2008