Burn & Soft Tissue Service Orientation Slides

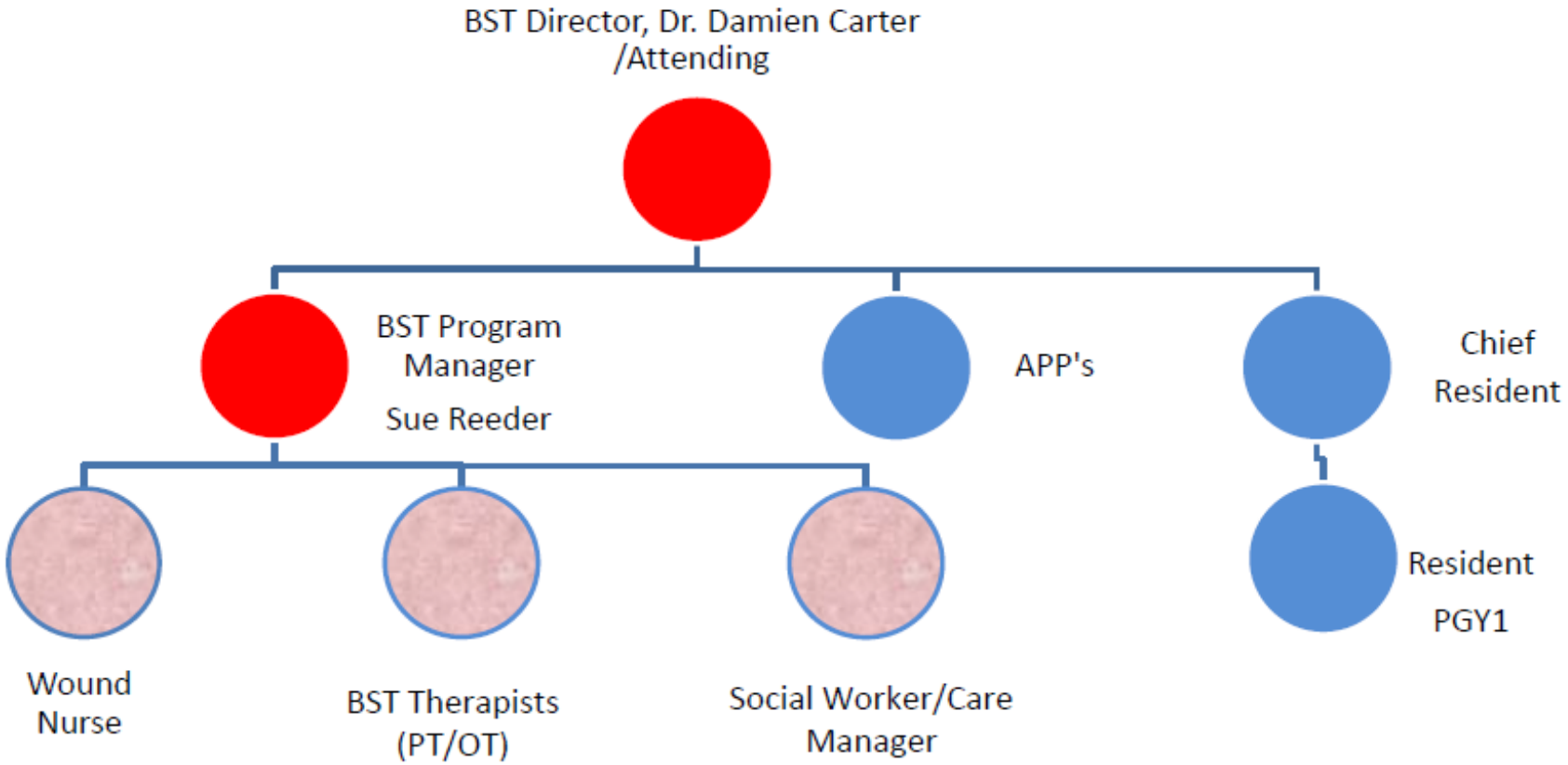
Damien Wilson Carter, MD – Director, Burn/Soft Tissue Service
Sue Reeder, BSN, CWOCN – Burn Resource Nurse Specialist

Maine Medical Center

Scope

- **ALL Burn injuries (> Age 12)**
- Cold injury/ Frostbite
- Soft tissue infections & necrotic wounds
- Necrotizing soft tissue infections
- **Acute Podiatric infections**
- Pressure Ulcerations
- All exfoliative skin diseases
- Hidradenitis Suppurativa
- Soft Tissue Masses
- Muscle compartment syndromes
- Soft tissue injuries (Hematomas, degloving, road rash)
- Chronic non-healing wounds
- Non-viable limbs
- Wounds referred from CWOCN nurses

Burn and Soft Tissue (BST) Service



BST Service Schedule

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8am: Morning Report (ALL) 9-11a: WR's 12p: OR →	8am: Morning Report (ALL) 9-11: WR's 1p: OR→	8am: Morning Report (ALL) 9-11: WR's 12p: OR→	8a: M&M 9a: Grand Rounds 10a: Morning Report (ALL) 11p: WR's/OR/ & Teaching Conference	8am: Morning report (ALL) 9-11: WR's 1p: OR→	Rounds: Resident Team	Rounds: Resident Team
	12p: BST Case Review Conf.– Monthly (2th Tue) 10:30: BST service Admin meeting (4th Tue)	1p: Burn Clinic 2nd & 4th Wednesday				

WR- Wound Rounds

Service Documentation Commandments

Thou shalt,

- Write a daily progress note for all primary patients on the service
- Write a progress note at least once per week for inpatient consults
- Discuss any new consults with the attending on the day the consult was received

PHOTO POLICY COMMANDMENTS

Thou shalt

- Photograph all wounds upon admission or after tank room debridement
- Photograph all consult wounds at time of initial consult
- Take a wound photo for all inpatients (consult & primary) at least once per week
- Place photos in the media tab as directed

Burn Documentation Specifics

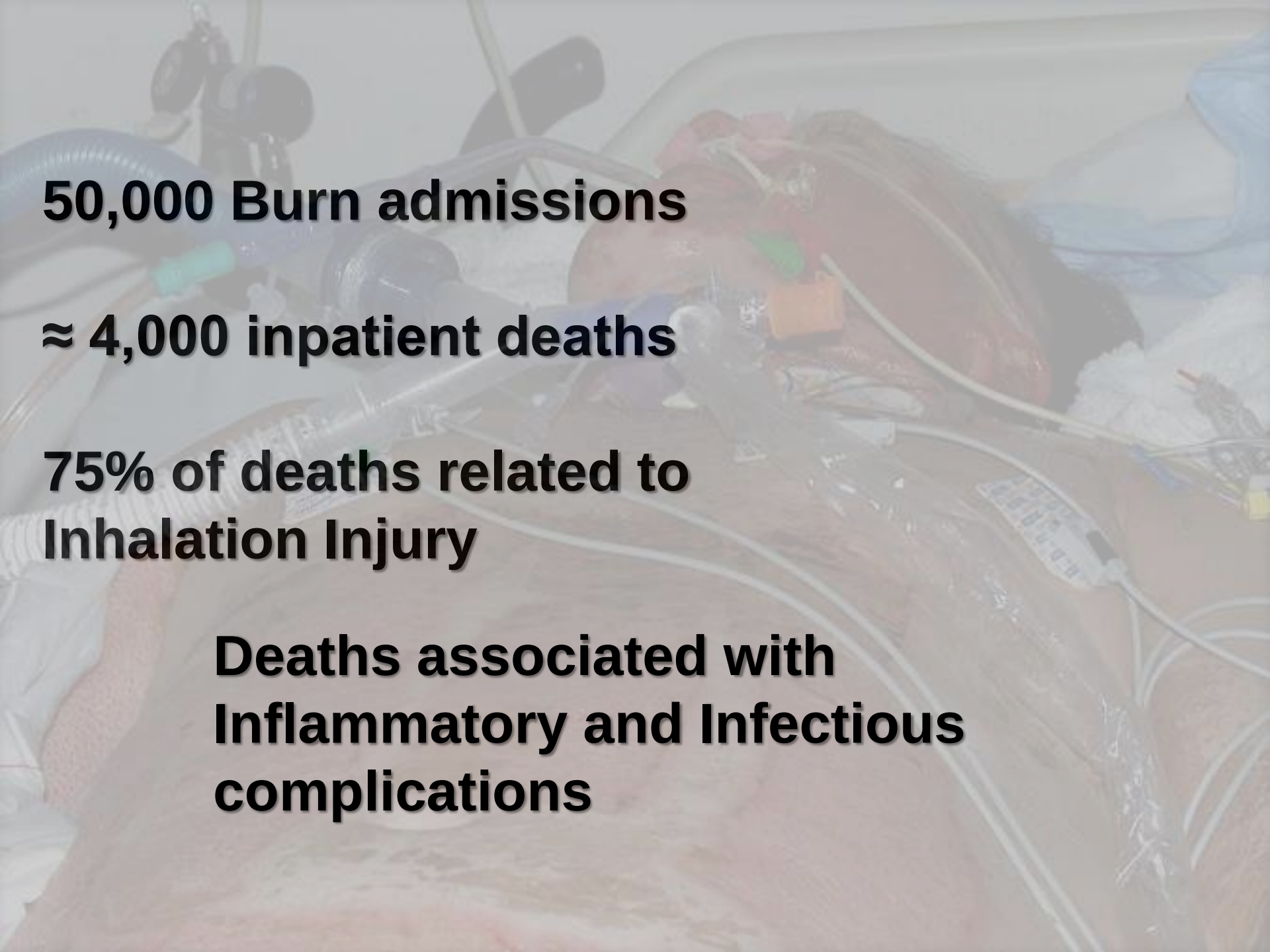
In order to meet national burn database standards, we need certain elements to be included in the admission note and/or subsequent progress notes

- A 'Burn Man' chart must be filled out specifying areas of partial thickness and/or full thickness burn. 1st degree burns are not included in this calculation
- Determine whether there is an inhalation injury (Yes/No)
- In the assessment, you must include:
  - %TBSA total + locations
  - Designate burns as partial thickness and/or full thickness
  - List etiology(s) → flame, scald, contact, electrical, etc…

Assessment: 36yM with 27% TBSA partial thickness and full thickness flame burns to bilateral lower extremities, abdomen and left forearm

Note: Does not apply to frost bite/cold injury. These are considered traumatic injuries, not burns

BURNS



50,000 Burn admissions

≈ 4,000 inpatient deaths

75% of deaths related to Inhalation Injury

Deaths associated with Inflammatory and Infectious complications

Modern Burn Care

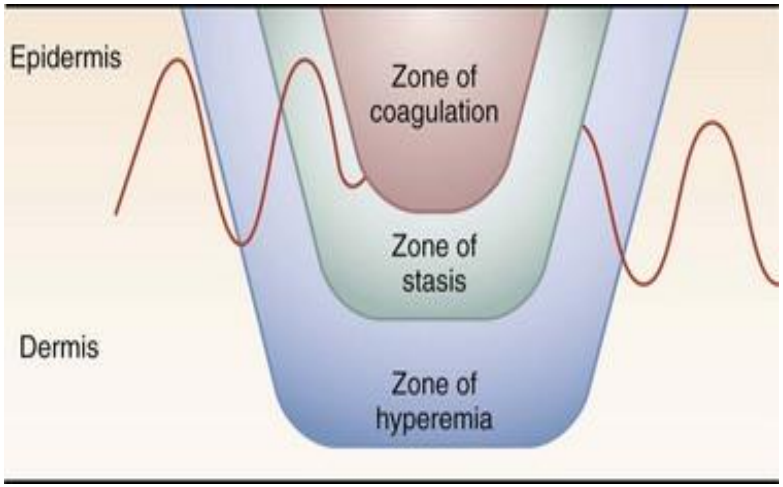
- Burn injuries represent the most severe model of traumatic injury with considerable challenges to functional and psychological recovery
- Dramatic improvements in survival over past 50 years:
  - In 1952, a 25 year old would have an expected 50% survival rate with a 45% TBSA burn. Today, burns in excess of 80% TBSA have the same expected chance of survival.

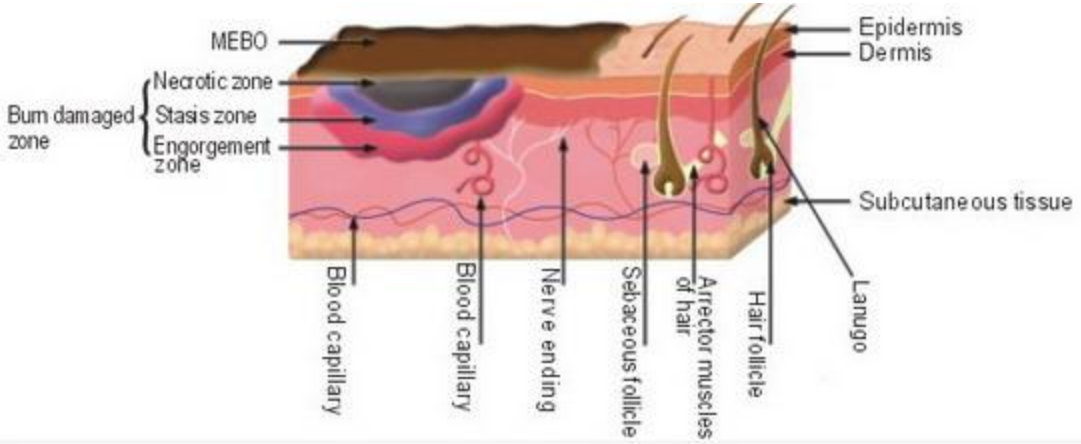
SURVIVAL

Quality of Life

Pain control
Functional recovery
Mental Health
Return to work
Cosmesis
Scar reduction

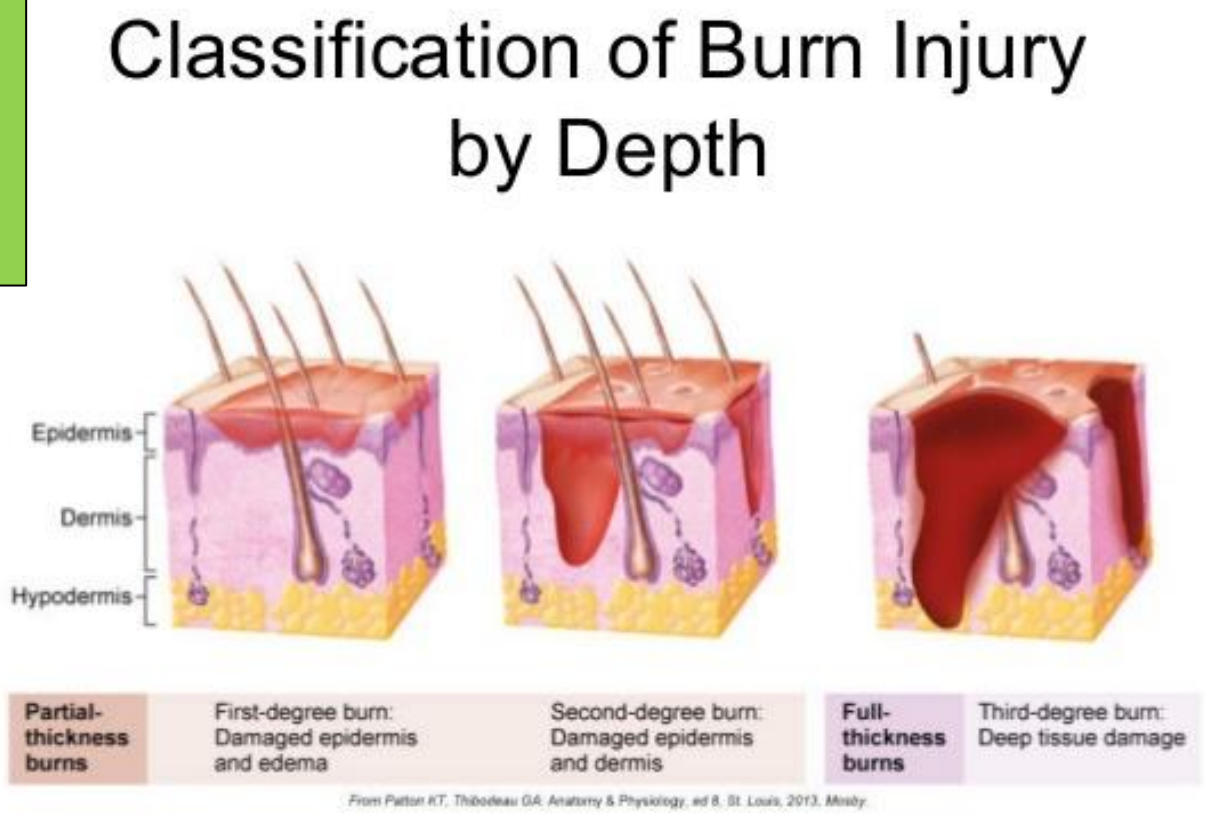
Burn Zones of Injury





Burn Depth

Dupuytren's Classification
1st Degree
2nd degree – PT
3rd Degree – FT
4th Degree - SubQ
5th Degree - Muscle
6th Degree - Bone



Burn Wound Management Principles

- Partial thickness wounds will heal within 21 days given a moist environment (free of infection)
- Wounds that heal within 14 days will (usually) never scar
- ALL full thickness burn need a topical antibiotic that can penetrate eschar
- Deep Partial & full thickness burns are best managed by excision & grafting
- Small deep partial & full thickness wounds particularly in special areas, are best managed non-operatively
- Burn injuries over joints should be mobilized as soon as possible & as often as possible

TABLE 3 Wound care options

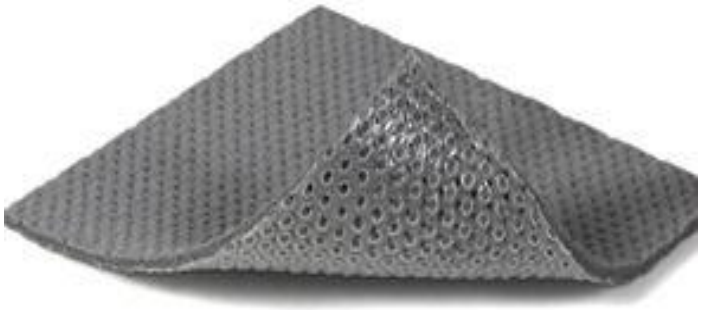
Wound care agent	Indication	Frequency of application	Advantages	Disadvantages
Silver sulfadiazine (SSD)	• Middermal to full-thickness burns with necrosis • Areas distant from mucous membranes	Twice daily until reepithelialization achieved or skin grafting performed	• Allows frequent viewing of wound for signs of healing or complications • Commonly available at community pharmacies • Painless when applied to wound • Cost effective • Delivers continuous antimicrobial therapy	• Requires frequent dressing applications, which can be painful • Cannot be used on areas near mucous membranes • Contraindicated in patients with sulfa allergies and other sensitivities • Should be discontinued upon signs of reepithelialization
Bacitracin, neomycin, polymyxin B	• Superficial burns • Facial burns • Burns proximal to mucous membranes	Twice daily until reepithelialization achieved	• Allows frequent viewing of wound for signs of healing • Commonly available at community pharmacies • Painless when applied to wound • Cost effective • Delivers continuous antimicrobial therapy	• Not indicated for deeper burns • Narrower spectrum of antimicrobial coverage than SSD
Adherent dressings (eg, Duoderm and Opsite)	Superficial burns	As needed, up to several days as indicated	• Cost effective • Flexible dressing moves with patient's movements	• Does not provide antimicrobial therapy • Not indicated for deeper burns
Multiday antimicrobial dressings (eg, Mepilex Ag, Aquacel Ag, Acticoat)	Superficial to middermal burns	Can be used for multiple days per manufacturer's recommendations	• Minimizes frequency of dressing changes • Delivers continuous antimicrobial therapy • Flexible dressing moves with patient's movements	• Costly • Requires prescription and possibly use of additional bandages to cover dressings • May not be available in many community pharmacies

As with all medications and treatments, therapy choices must consider patient allergies, concurrent illness or injury, accessibility to care, pain management, and other factors. This list is not exhaustive of all treatment options but presents those commonly used.

Gallagher JJ, et al[4]; Hartford CE[5]; Gallagher JJ, et al.[7]

MEPILEX Ag and MEPITEL Ag

- Use for Donor sites and partial thickness burns
- Can remain on wounds for up to 14 days
- Decreased pain with removal vs. xeroform dressings
- Lower cost when used as directed
- No need for daily dressing changes



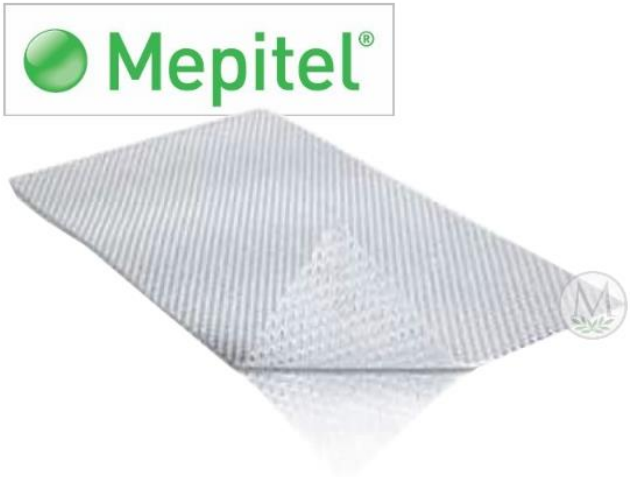


Chart 2 – Major skin substitutes available in the world market and their classification according to location, time of permanence, and origin criteria.

Product	Classification	Composition
Cadaver skin (non-commercial product)	C P b	Human skin, allogeneic, without cells, preserved in glycerol
Integra®	C P bs	Acellular and bilaminar: bovine collagen matrix and chondroitin-6-sulphate (dermal analogous), recovered with a thin lamina of silicone
Biobrane®	C P bs	Bilaminar: nylon mesh filled with type I porcine collagen and covered by a thin lamina of silicone
Apligraft®	C P bs	Bilaminar: bovine collagen I populated by live neonatal fibroblasts and covered with a layer of epithelial cells (neonatal keratinocytes)
Orcel®	C P b	Keratinocytes and human fibroblasts cultivated separately in type I bovine collagen
Alloderm®	D P b	Acellular dermal matrix derived from human skin of cadaver
Amnio preserved in glycerol (non-commercial product)	D P b	Collagen matrix of dermal substitution
Dermagraft®	D P b	Produced from human newborn foreskin fibroblasts
OASIS®	D T b	Matrix of dermal regeneration derived from swine jejunum submucosa
Permacol®	D T b	Derivative from porcine dermis collagen and elastin
Matriderm®	D P b	Three-dimensional matrix of collagen and elastin
Epidex®	E P b	Generated by autologous cultured keratinocyte from scalp hair follicles
Culture of autogenous human keratinocytes (non-commercial product)	E P b	Autogenous human keratinocytes cultivated and transported in fibrin mesh

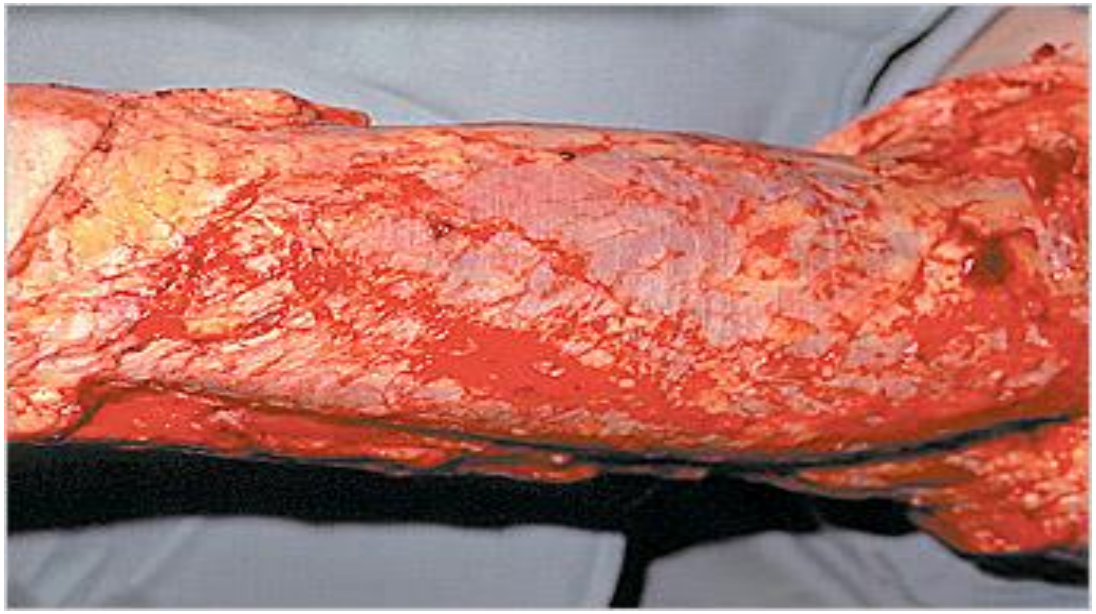
b = biological; bs = biosynthetic; C = composed; D = dermis; E = epidermis; P = permanent; T = temporary.

Escharotomy

- Loss of pulses is an early sign
- Goal is to create a ‘flail’ segment
- **Incise just to subcutaneous fat**
- ‘Fascial’ incisions complicate reconstruction

Early excision

- Patient's die from burn induced SIRS and SIRS related complications
- Excision of all Full Thickness & Deep Partial burns within 7 days. OK to leave special areas
- Burn wounds make you sick, not loss of skin or lack of skin grafts
- Early excision aborts the systemic inflammatory response
- Tangential excision is preferable, but fascial excision should remain in the tool box



Early excision strategy

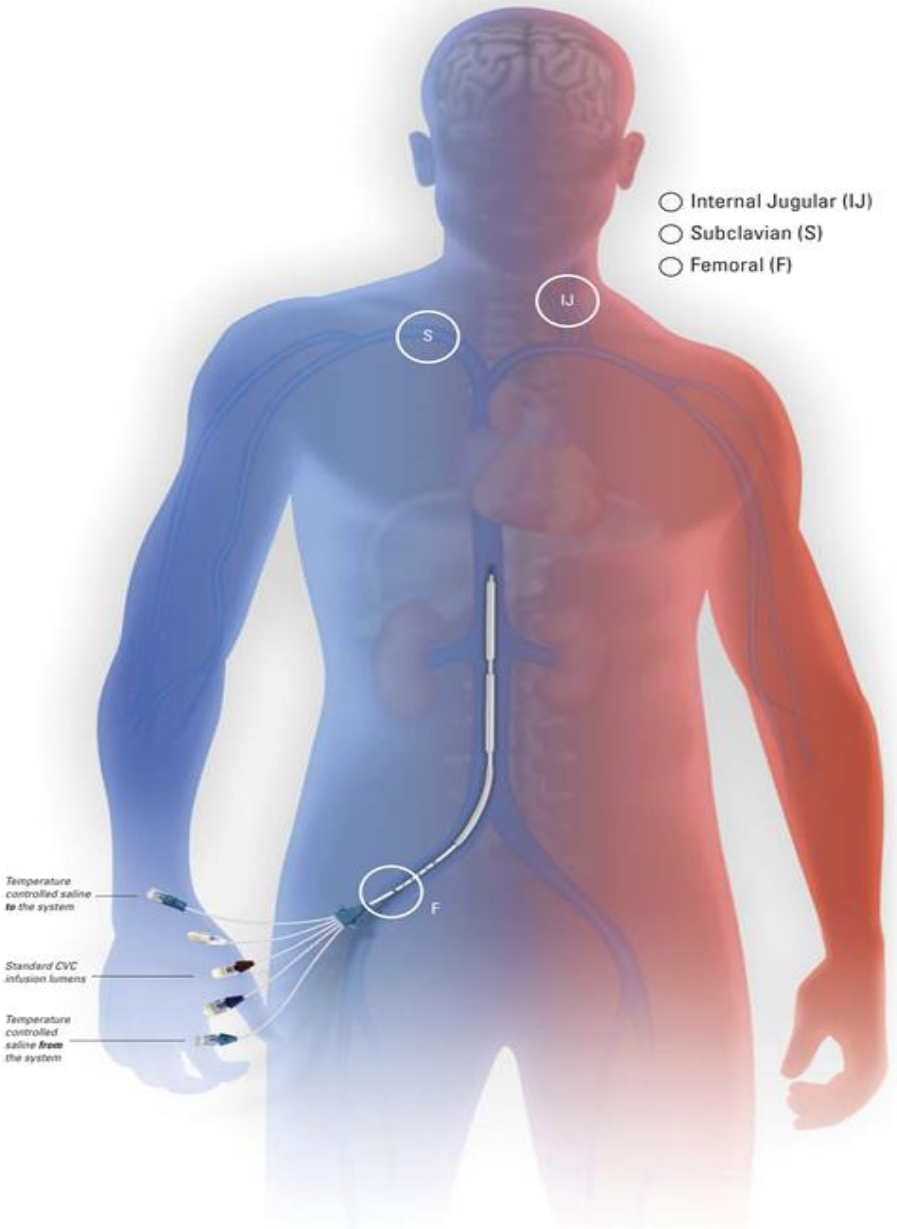
- Goal: Excise as much as possible in 2 hours of anesthesia time (15% per day rule)
- Continue ICU fluid resuscitation protocol
- **Abort procedure early if unable to maintain core body temperature above 35 degrees**
- Donor sites create more wounds. Avoid autografting until after excision
- Anesthesia: Slow infusion of Blood/FFP in 1:1 ratio
- Anesthesia: Watch temperature. **Vasopressin PRN**

Golden Rule

Excision → Wound closure → Reconstruction

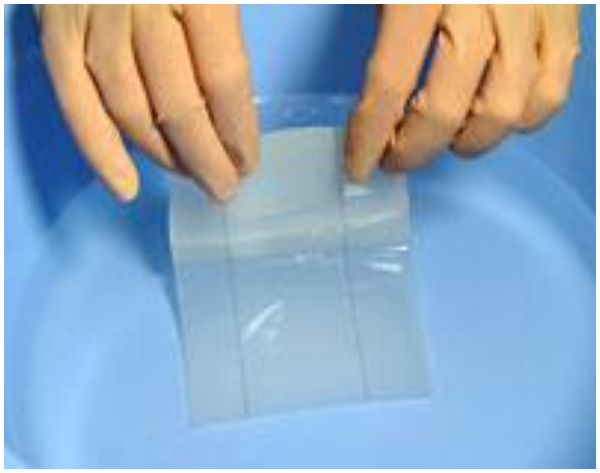
Temperature Regulation

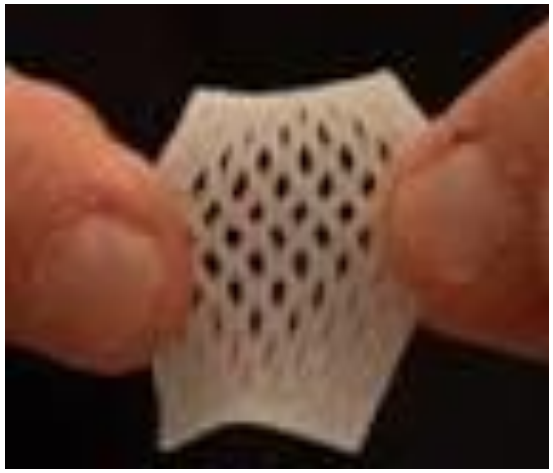
- Why? – Bleeding complications
- Temp < 34.5°C causes >70% platelet dysfunction
- Associated with wound and graft infections
- Mortality risk – All trauma patients



Acute Wound Closure

- Primary
- Xeroform/Dressings
- Xenograft vs. allograft
- Other skin substitutes → Integra, Primatrix, Alloderm





Reconstruction

Autografting

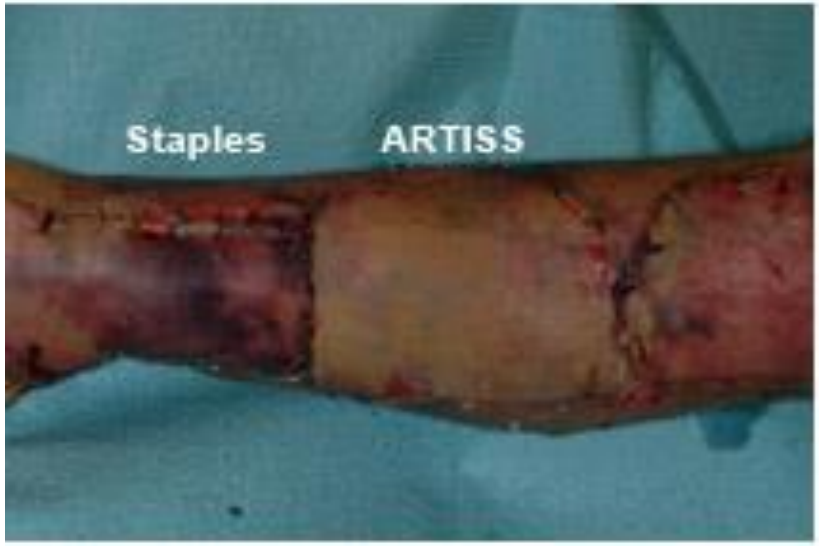
- Lowest on the priority list. Can be extended over several weeks
- Harvest @ 10-12/1000th inch
- Sheet (unmeshed) is standard of care for face, neck, hands & feet
- **Mesh options: 1:1, 1.5:1, 2:1, 3:1, 4:1. Consider overlay with xeno vs. allo for 3:1 & greater to maintain wound closure**
- **MEEK technique usually used for expansion > 4:1**

NEVER LAY AUTOGRAFT ADJACENT TO BURN ESCHAR OR SILVADENE

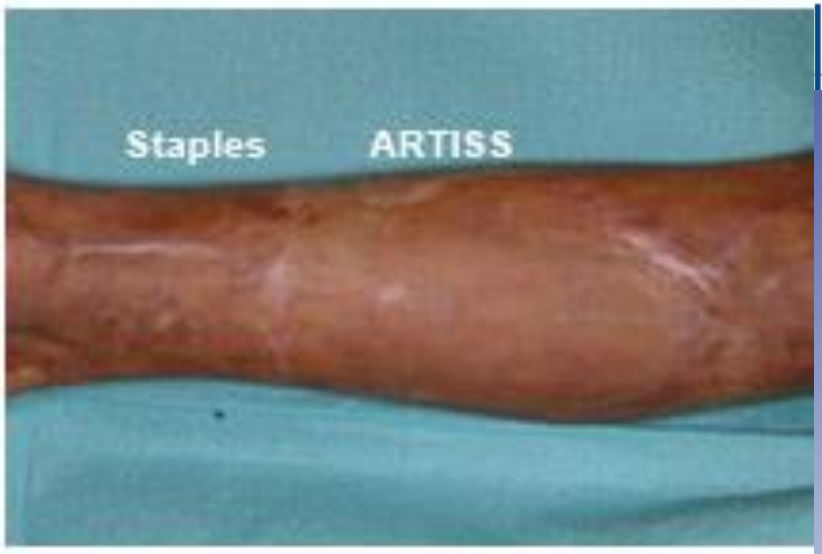
OR Equipment

Hemostasis & Graft fixation

Comparison to Staples[3]



Day 1



Month 6

Burn Care Philosophical Points

- With modern burn care, survival is an expectation
- Long term functional outcomes have become the hallmark of quality burn care
- Approaching burn wound reconstruction & rehabilitation separately from acute burn management leads to the best long term functional outcomes
- Aggressive pain management decreases PTSD, anxiety disorders & increases patient cooperation in rehabilitation long term

Other Considerations

- Ophthalmology Consultation
- Oxandrolone
- Propranolol
- Methadone as background pain control
- Use of Ketamine & Dexmedetomidine
- Gabapentin
- Melatonin
- Bolus vs. continuous tube feeds

Burn Survivor Support Services

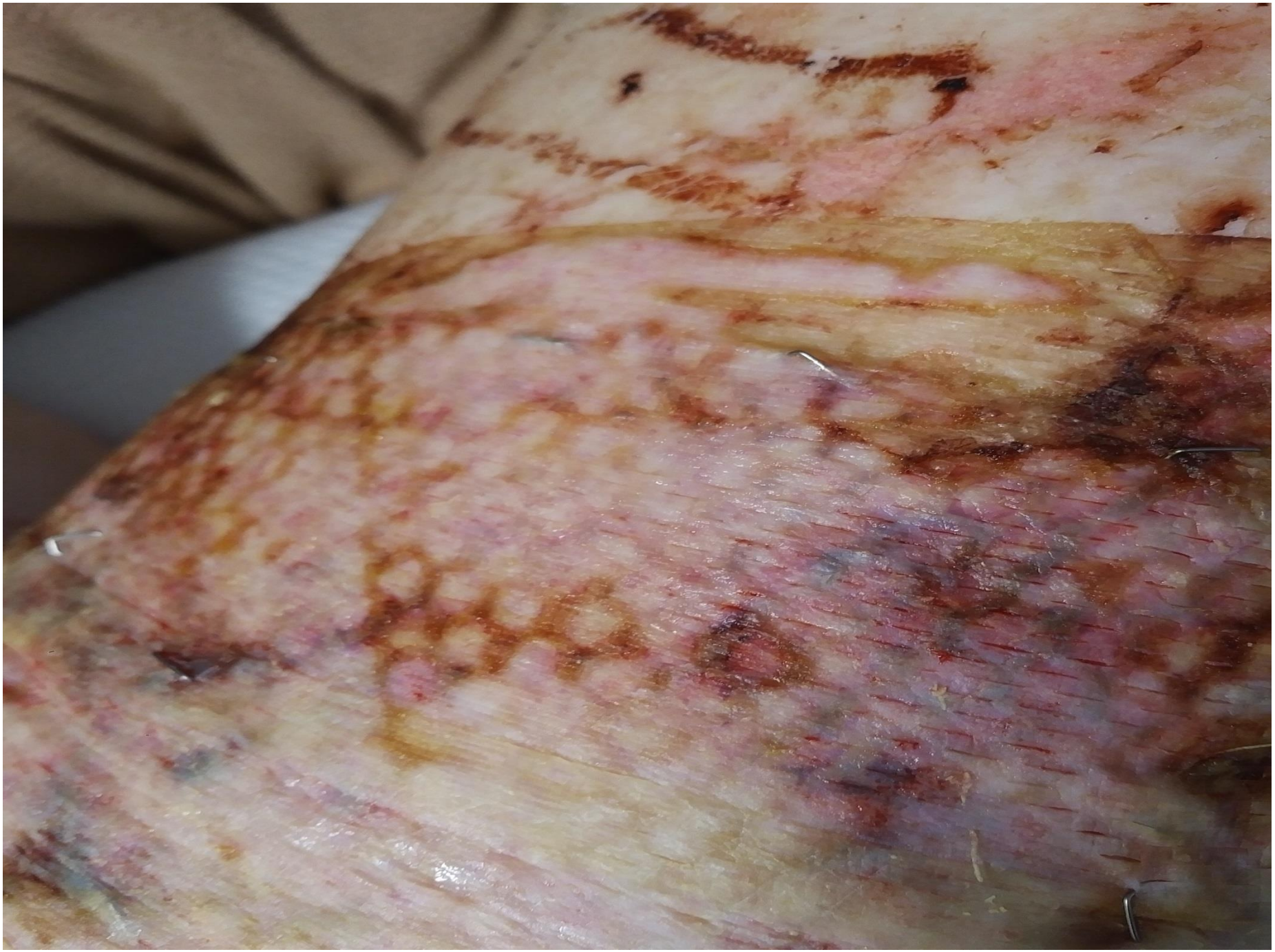
The goal of the **Portland Firefighters Children's Burn Foundation** is to provide relief to burn survivors and their families, to prevent burn injuries through education and training, and to help facilitate education about burn injuries and burn recovery to the People and Fire and Medical Professionals in the State of Maine.

Xenograft

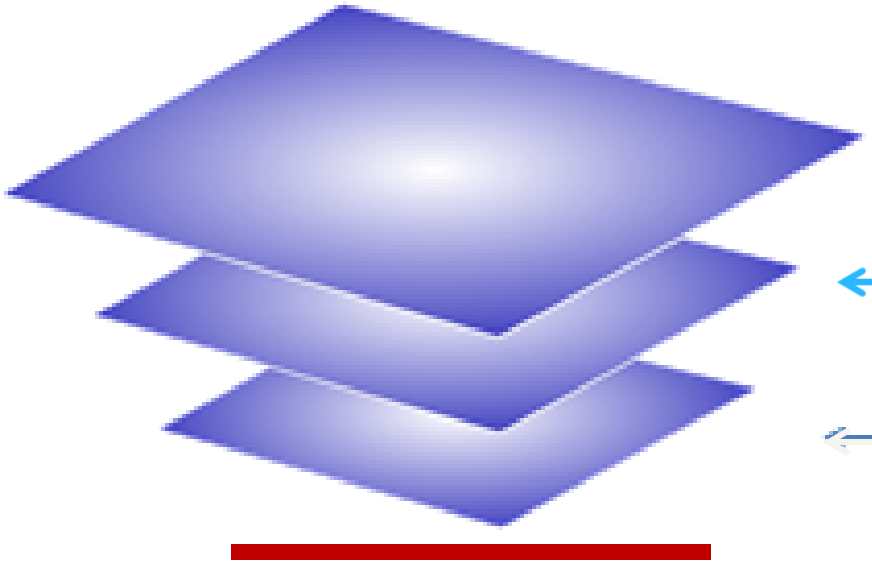
- Porcine skin (usually)
- Useful for temporary wound closure – Primary & overlay
- Can use as biologic dressing on partial thickness wounds
- Can be secured & affixed in similar manner to autograft or allograft
- Reduces pain as donor site dressing

ADVANTAGE

- **Cost**
- **Uniform sizes**
- **Adherance without graft 'take'**



Post-op Dressing



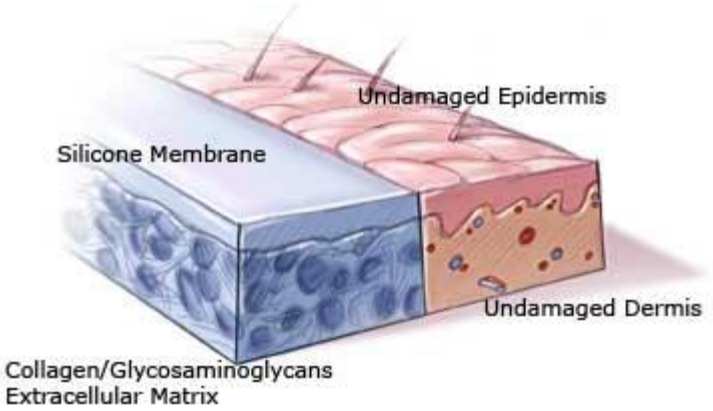
Gauze dressing,
Multi-layer "bolster"
to larger areas
***often wet w/ antimicrobial solution*

Conformant dressing
(clear "veil") *or* xeroform

Graft (secured with
tape or staples)
***if wide mesh, may be covered with xeno*

Integra©

- Bovine collagen (Dermal Regeneration Matrix)
- 2 layer (Silastic covering)
- Requires 10-14 days for ‘incorporation’
- Can be secured in same manner as autograft

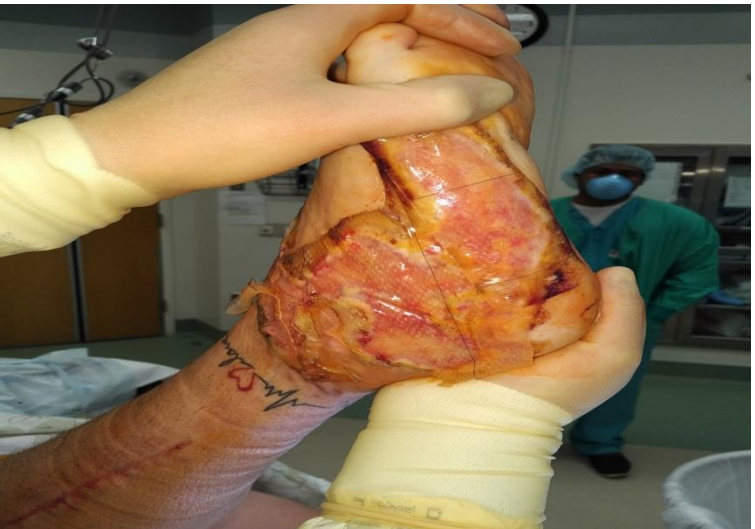


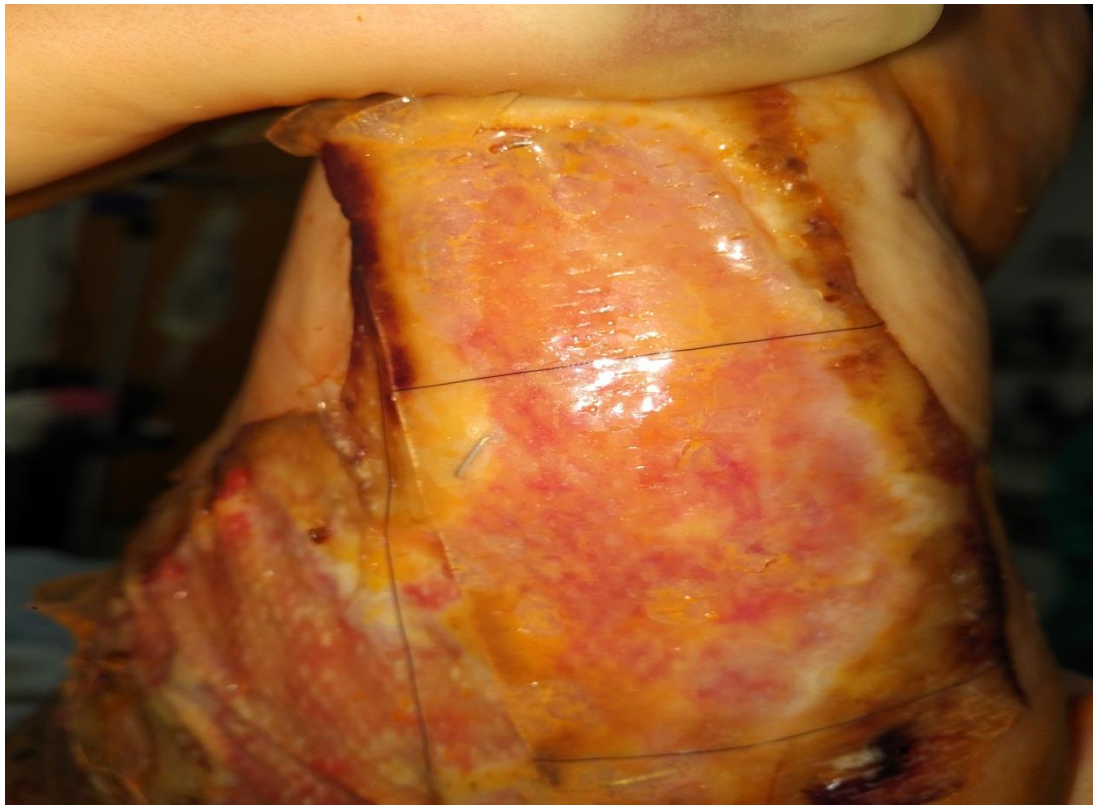
Advantages

- Can be used to cover bone, ligament, tendon
- Gives better ‘turgor’ to STSG
- Cosmesis in special areas

Disadvantages

- Cost
- Colonization
- 2 step procedure





Alloderm & Primatrix

Same indications as integra with ability to graft in single stage