Evidence-Based Guideline — Acute Burn Management

Paul Wisniewski, DO
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Trauma Medical director
Providence St Mary Medical center

Disclosures

None

Purpose and Scope

Comprehensive Burn Management

Guideline covers assessment, resuscitation, wound care, and surgical treatment for thermal, electrical, and chemical burns to ensure effective patient care.

Fluid Resuscitation and Burn Size Estimation

Includes guidance on estimating burn size and fluid resuscitation using the Parkland formula to optimize patient outcomes.

Surgical and Triage Principles

Outlines operative techniques like split-thickness skin grafting and triage pathways based on total body surface area affected.

Special Patient Considerations

Addresses tailored care for pediatric, elderly, and inhalation injury patients to enhance treatment effectiveness.

Key Principles of Burn Management

Burn Size Estimation

Accurate Total Body Surface Area (TBSA) estimation is essential for triage and management decisions in burn patients.

Burn Center Referral Criteria

ABA criteria guide referral, especially for partial-thickness burns over 10% TBSA and burns on critical areas like face and joints.

Fluid Resuscitation Protocol

The modified Parkland formula directs lactated Ringer's solution administration for initial fluid resuscitation based on weight and TBSA.

Zone of Stasis Importance

Early interventions target the zone of stasis to preserve tissue and reduce burn progression.

Classification and Pathophysiology

Zones of Injury and Their Clinical Significance

Zone of Coagulation

The central zone with irreversible cell death caused by necrosis represents the most severe tissue damage.

Zone of Stasis

Surrounding tissue with decreased perfusion, viable but vulnerable, requiring early intervention to prevent necrosis.

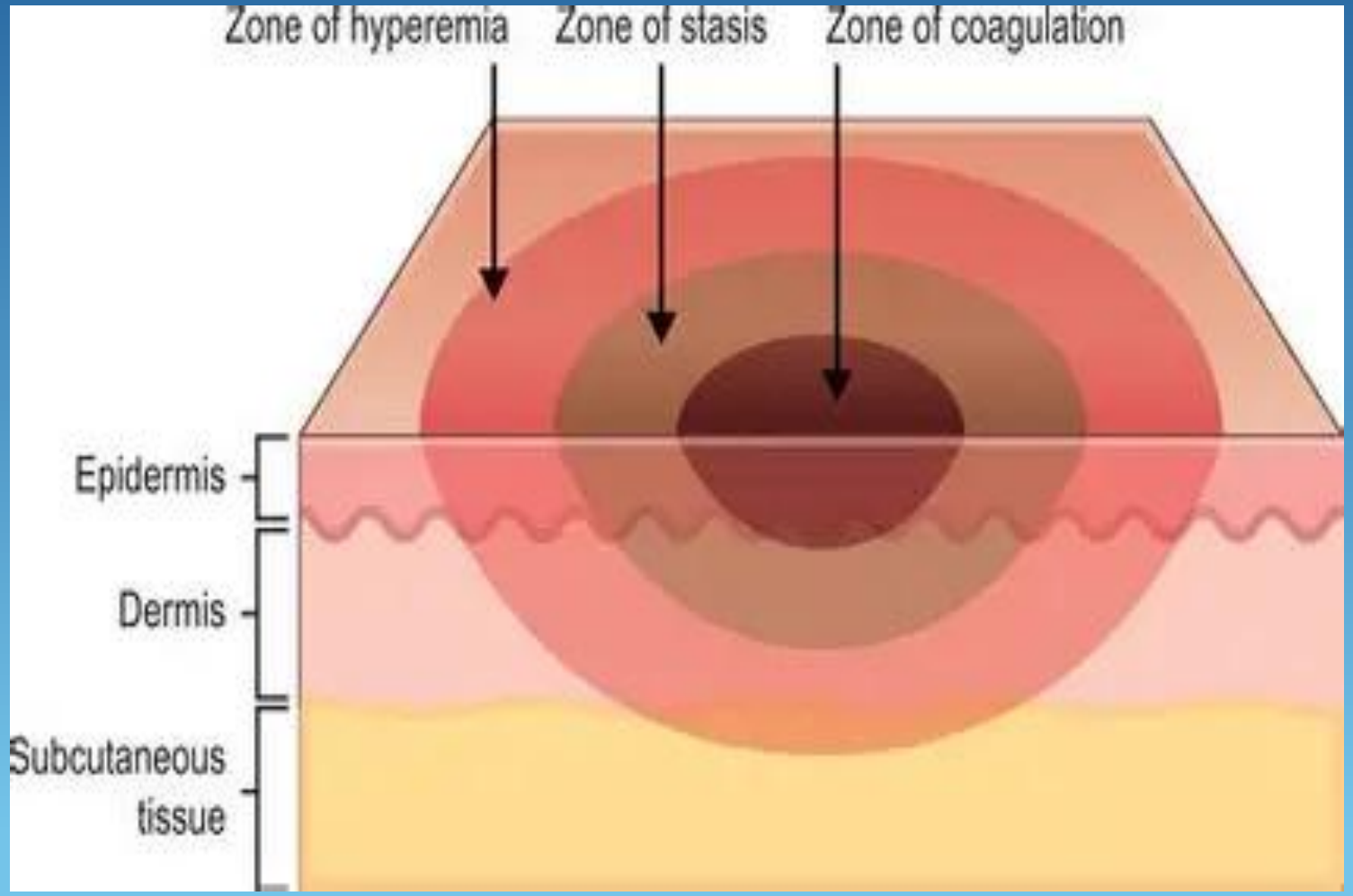
Zone of Hyperemia

Outermost zone with increased perfusion that usually recovers with minimal intervention and healthy tissue regeneration.

Clinical Importance

Preserving the zone of stasis is essential for healing and reducing surgical needs in burn treatment.

Zones of Injury



Assessment and Resuscitation

Initial Assessment and Fluid Resuscitation

Primary Burn Patient Assessment

Assessment follows airway, breathing, circulation, disability, and exposure protocol with emphasis on airway management in inhalation injury cases.

Burn Size Estimation

Total Body Surface Area (TBSA) is estimated using Rule of Nines for adults and Lund-Browder chart for children to guide treatment.

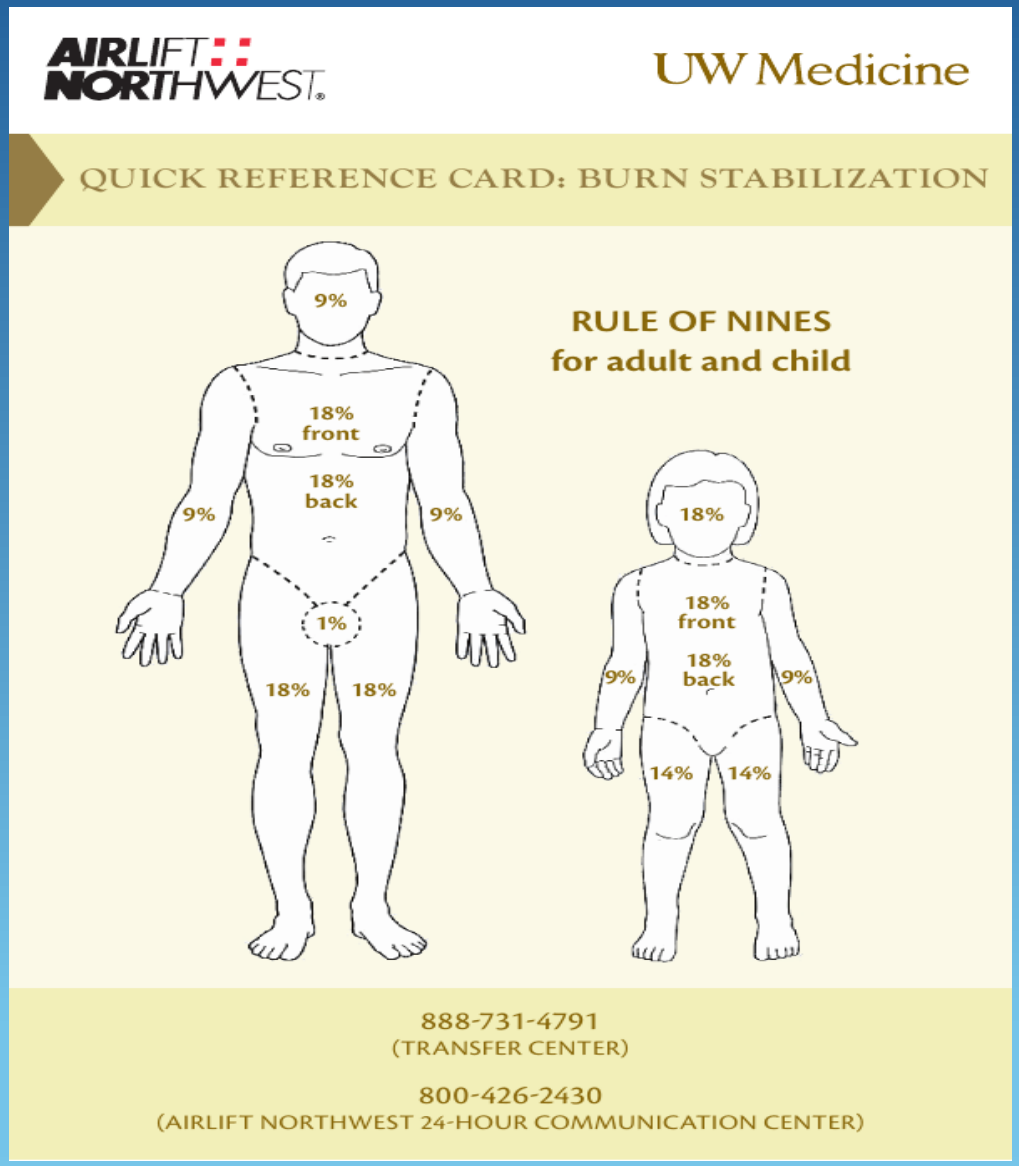
Fluid Resuscitation Guidelines

Modified Parkland formula guides fluid resuscitation, adjusted for inhalation injury, electrical burns, and delayed treatment to prevent complications.

Electrical Burn Monitoring

Electrical burns require close cardiac and biochemical monitoring with increased fluid goals to prevent kidney injury from rhabdomyolysis.

Rule of Nines Lund-Browder Chart



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Wound Care and Surgical Management

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Topical Agents and Dressing Strategies

Early Wound Care Steps

Start with cooling burns, removing debris, and maintaining a moist antimicrobial environment for effective healing.

Common Topical Agents

Silver sulfadiazine, mafenide acetate, and bacitracin ointments are widely used for various burn types and depths.

Advanced Dressing Options

Silver-impregnated, honey, collagen, and biosynthetic dressings provide sustained antimicrobial effects and tailored wound management.

Systemic Antibiotic Use

Systemic antibiotics are reserved for documented infections; topical agents effectively reduce local bacteria.

Wound Depth and treatment

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Burn Depth and Treatment Summary

Burn Depth	Initial Treatment	Final Treatment (include whether surgery & grafting needed)
1st-degree (Superficial) — epidermis only	• Cool with lukewarm water 10–20 min • Remove jewelry/clothing if not adherent • Analgesia (acetaminophen/NSAID) • Gentle cleaning, apply emollient or simple sterile dressing • Tetanus as indicated	• Heals in 3–7 days, no scarring • No surgery required • Moisturize, sun protection, and follow-up
2nd-degree (Partial-thickness) Superficial vs. Deep	• Cool 10–20 min, analgesia, tetanus • Clean wound, debride large/contaminated blisters • Apply topical antimicrobial dressing • Fluid resuscitation if >10–20% TBSA • Elevate limb, early physiotherapy	• Superficial partial: heals 7–21 days, no grafting • Deep partial: >21 days, often requires surgical excision ± split-thickness graft • Long-term scar management
3rd-degree (Full-thickness) — epidermis & dermis destroyed	• Stop burn, airway assessment • Avoid prolonged cooling • IV access, large-bore • Analgesia, tetanus, fluid resuscitation • Escharotomy if circulation/ventilation compromised	• Requires surgery: tangential/fascial excision + split-thickness autograft • May need staged grafting or synthetic dressings • Rehab, scar revision, reconstructive surgery
4th-degree — into subcutaneous tissue, muscle, bone	• ABCs, major trauma management • Aggressive resuscitation • Early burn center transfer • Assess for compartment syndrome, fasciotomy/escharotomy as needed	• Surgery mandatory: extensive excision/debridement • Reconstruction: muscle flaps, free tissue transfer, grafting • Possible amputation, prolonged rehab & infection control

Operative Management and Graft Physiology

Early Excision and Grafting

Early excision and grafting treat burns unlikely to heal within 14 to 21 days, improving recovery outcomes.

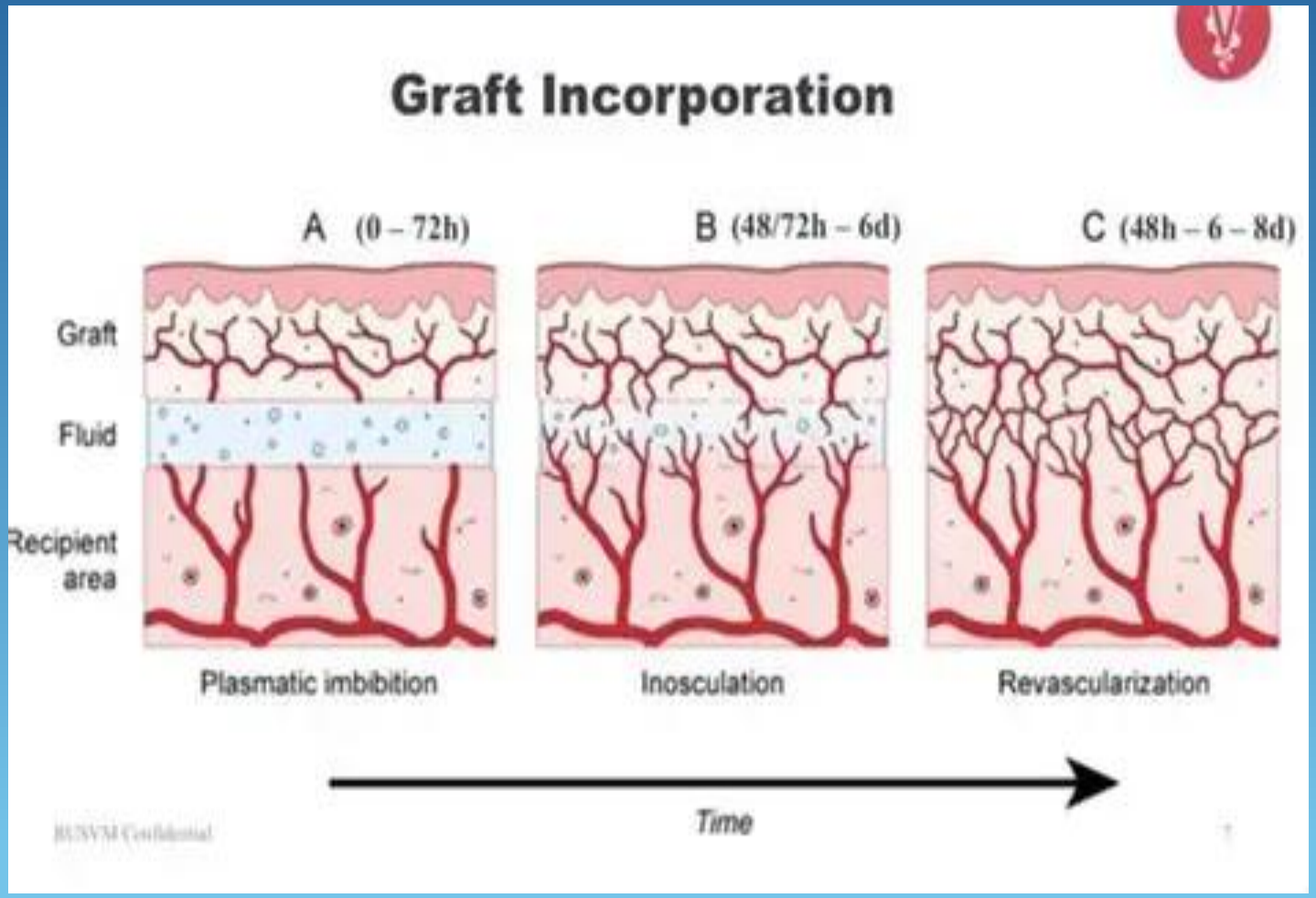
Phases of Skin Graft Survival

Skin graft survival involves plasmatic imbibition, inosculation, and neovascularization over the first week post-transplant.

Essential Care for Graft Success

Clean vascularized recipient beds, hemostasis, immobilization, and infection control are vital for graft survival.

Plasmatic Imbibition, Inosculation, and Neovascularization



Clinical and Operational Notes

- Partial-thickness burns: superficial vs deep affects surgical decision.
- Fluid resuscitation: adults ≥15–20% TBSA; use Parkland formula.
- Burn center referral: full-thickness, >10–20% TBSA, special areas (face, hands, feet, joints).
- Emergencies: inhalation injury, circumferential burns – early airway & escharotomy.
- Infection prevention: tetanus, sterile dressings, topical antimicrobials only.
- Rehabilitation: early mobilization, splinting, pressure therapy, scar management.

Triage and Transfer Criteria

TBSA-Based Management Pathways

Minor Burns Management

Burns under 10% TBSA can be managed outpatient with wound care, pain relief, and follow-up if superficial and not critical.

Moderate Burns Care

Burns involving 10–20% TBSA may need emergency observation or short hospital admission based on patient factors and burn depth.

Severe Burns Treatment

Burns over 20% TBSA require hospital admission, resuscitation, early wound excision, and multidisciplinary care for optimal recovery.

Critical Monitoring and Support

Monitoring for systemic inflammatory response and organ dysfunction is crucial, with early nutrition and DVT prevention in severe cases.

Indications for Burn Center Transfer

Burn Severity and Location

Partial-thickness burns over 10% TBSA and burns on face, hands, feet, genitalia, perineum, or major joints require burn center transfer.

Specialized Burn Types

Electrical and chemical burns, inhalation injuries, and burns with major trauma need specialized evaluation and care.

Additional Transfer Criteria

Patients with comorbidities or special rehabilitation needs should be transferred. Early consultation is advised if uncertain.

Special Populations and Outcomes

Considerations for Pediatrics and Elderly

Pediatric Burn Management

Children require lower admission thresholds and use the Lund-Browder chart for accurate TBSA estimation and fluid resuscitation.

Elderly Burn Patient Risks

Elderly have higher mortality at lower burn sizes, influenced by comorbidities and need early burn center involvement.

Inhalation Injury Management

Common in both groups, inhalation injuries require early intubation and increased fluid resuscitation for better outcomes.

Baux Score

- **Original Baux Score**

Formula:

$$\text{Baux Score} = \text{Age} + \%\text{Total Body Surface Area (TBSA) burned}$$

Interpretation:

- The score roughly estimates the **mortality percentage** for adult burn patients.
- Example:

  A 50-year-old with 40% TBSA burns → **Baux Score = 90** → **~90% mortality** (in older data before modern burn care improvements).

Revised Baux score

Revised Baux Score

Because burn care outcomes have improved significantly (especially with early excision, grafting, and critical care), the **Revised Baux Score** adds consideration for **inhalation injury**, which still worsens prognosis.

Formula:

$$\text{Revised Baux Score} = \text{Age} + \%\text{TBSA burned} + 17 \text{ (if inhalation injury present)}$$

Interpretation:

- This version more accurately reflects modern survival rates.
- For example:
  - A 40-year-old with 40% TBSA → **Revised Baux = 80** → **roughly 30–40% mortality** depending on comorbidities and burn center level.
  - If there's an inhalation injury, add 17 → **97** → **higher mortality risk.**

Summary Table

Parameter	Original Baux	Revised Baux	Meaning
Components	Age + %TBSA	Age + %TBSA + 17 (if inhalation injury)	Predicts burn mortality
Approximate Mortality	≈ Baux Score (%)	More accurate with modern data	Risk of death (%)
Limitations	Doesn't account for comorbidities or modern burn care	Better predictive accuracy	Still an estimate only

Revised Baux score Mortality

Age (yrs)	%TBSA Burned	Inhalation Injury (Add 17)	Revised Baux Score	Predicted Mortality (%)
20	20	No	40	2%
30	30	No	60	8%
40	40	No	80	30%
50	50	No	100	65%
60	60	No	120	90%
70	70	No	140	98%
40	40	Yes (+17)	97	55%
60	50	Yes (+17)	127	88%
70	60	Yes (+17)	147	99%

Morbidity and Mortality Predictors

TBSA and Mortality Risk

Total Body Surface Area burned is the primary predictor of mortality, with sharp increases around 40–50% TBSA in adults.

Advancements in Burn Care

Specialized burn care including early excision, grafting, and resuscitation has improved survival rates significantly.

Other Mortality Factors

Age, inhalation injury, and comorbidities also critically affect patient outcomes after burns.

Clinical Decision Making

Understanding predictors guides clinicians in treatment intensity and optimal resource allocation for burn patients.

Practical Tools and Limitations

Emergency Department Checklist

Primary Assessment and Burn Cooling

Conduct a primary survey focusing on airway protection and cool thermal burns with room-temperature water immediately.

Burn Size and Depth Evaluation

Estimate total body surface area and determine burn depth to guide resuscitation and treatment plans.

Intravenous Access and Fluid Resuscitation

Establish two large-bore IV lines and initiate lactated Ringer's solution for burns over 20% TBSA with urine output monitoring.

Additional Care and Consultation

Provide analgesia, update tetanus prophylaxis, apply topical care, and consult a burn center, as necessary.

Limitations and Practical Notes

Guideline Scope and Variability

Guidelines summarize broad evidence, but local protocols and resources may affect management decisions in practice.

Complex Care Scenarios

Specific cases like electrical injuries require consulting specialized burn center protocols for safe and effective treatment.

Adaptation for Individual Needs

Recognizing limitations allows adaptation of care to patient specifics and institution capabilities, improving outcomes.

Key points

- Large contemporary registries and reviews indicate improved survival over decades with specialized burn centers, early excision/grafting, improved resuscitation and critical care, though outcomes still depend on age, inhalation injury, comorbidity, and TBSA

- If >10% partial-thickness, any full-thickness, face/hands/feet/genitalia/joints, electrical, chemical or inhalation burns → consult and likely transfer to a burn center. (ABA).

- Use Parkland as a starting estimate (4 mL/kg/%TBSA LR) but titrate to urine output and avoid fluid creep.

- Preserve the zone of stasis — early resuscitation and infection control improves tissue salvage and outcomes.

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