VANDERBILT UNIVERSITY MEDICAL CENTER

Guideline: Adult Burn Nutrition

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I. Purpose:

Successful burn treatment can be challenged by the metabolic consequences observed in patients with severe burns. Metabolic rates of burn patients can exceed twice that of baseline and clinically significant muscle wasting. [1]

Adequate nutritional support is an essential component of burn care which can reduce mortality and complications, optimize wound healing, reducing the effects of hypermetabolism and subsequent catabolism. [1]

II. Population:

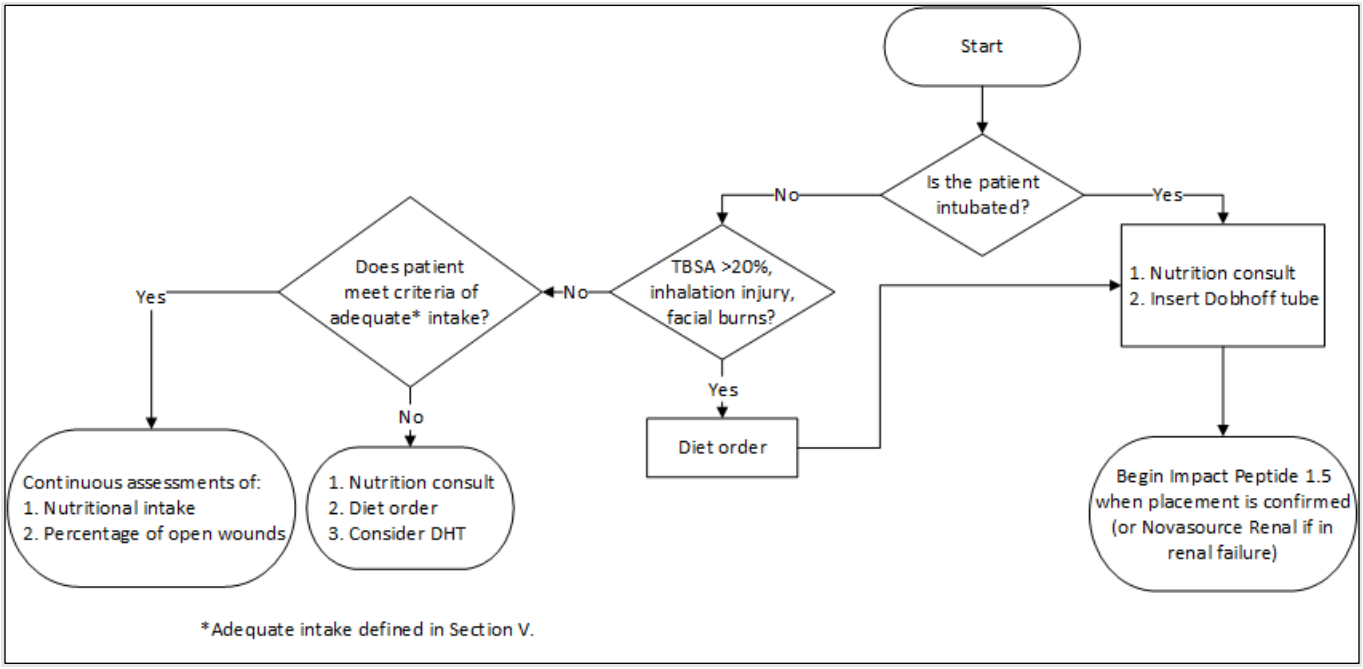
Adult burn patients

III. Definitions:

TBSA- Estimated total body surface area (TBSA) of partial and full thickness burns is needed to calculate fluid requirements. Superficial burns are not included in this calculation.

IV. Assessment:

Adult Burn Nutrition Assessment Tool



V. Intervention/Treatment:

Upon Admission

- All adult patients ≥ 20% TBSA will receive a nutrition consult and diet order unless NPO or contraindicated.
- The following patients should receive a DHT:
  - All intubated patients
  - Patient's with >20% TBSA burns, unless anticipated extubation less than 24 hours
  - Patients with inhalation or upper airway injury
  - Any burns to face/oropharynx
  - Any patient with baseline risk factors for severe malnutrition
    - >5% weight loss in last month, ≤50% energy intake for ≥5 days, moderate-severe muscle mass or fat depletion, moderate to severe fluid accumulation (including peripheral, mesenteric, pulmonary)

Initiation of Enteral Nutrition (EN):

Enteral nutrition can be started safely within hours of injury in patients of all ages, reducing the accumulated 'calorie deficit' and improving overall nutrition.[2-4]

- Because of repeated need for sedation and wound care in significant burns, post pyloric placement of DHT is recommended, placed with Cortrak by credentialed staff.
- Use a maximum of two attempts to place tube post-pyloric; alternatively, gastric DHT may be used.
- Confirm appropriate DHT placement and start EN within 6 hrs of hospital admission. TF may be initiated into a gastric DHT.
- Start at continuous rate (20 mL/hr). Choice of tube feeds: start with Impact Peptide® 1.5 unless in renal failure; in this situation start NOVASOURCE® RENAL
- Advance incrementally (20-25mL/hr) to estimated goal, preferably within 24 hours after arrival unless below relative contraindications are present:
  - Patient is hemodynamically unstable (MAP < 60 mm Hg despite treatment).
  - Patient is not tolerating tube feedings (see below)
- Utilize volume-based feeding chart after feeding stoppages for sedations and procedures.

- Strategies to manage EN intolerance
  - Abdominal distention, nausea/vomiting
    - Evaluate for constipation and increase bowel regimen if present
    - Change from bolus feeds to continuous feeds
    - Decrease EN rate by 20 ml/hr
    - Change to low-fat, low-fiber, and/or isotonic formula
    - Prokinetic agents
      - Metoclopramide
        - Dosing: 10 mg IV q 8 hrs; if renal dysfunction 5 mg IV q 68hrs
        - Risk of tardive dyskinesia, QT prolongation- check QTc before starting and monitor daily especially

if on concomitant medications that prolong QTc
- Erythromycin:
  - Dosing: 500 mg PO TID
  - Tachyphylaxis common
  - Increased risk of QT prolongation- check QTc before starting and monitor daily especially if on concomitant medications that prolong QTc
- Discontinue prokinetic agents as soon as possible after goal EN rate is achieved, as many incidences of gastric dysmotility in critical illness are transient and will not require prolonged prokinetic therapy
- Change to post-pyloric feeding

- Diarrhea (>3 liquid BM in 24 hrs or need for placement of BMS)
  - Ensure bowel regimen is held or has been discontinued
  - Evaluate medications- liquid formulations often cause diarrhea due to high sorbitol content
  - Add scheduled antidiarrheals if C. diff negative
  - Change to isotonic or peptide based EN formula
  - If diarrhea prolonged and unable to tolerate goal EN, parenteral nutrition should be considered

Indications for Parenteral Nutrition (PN):

- Enteral nutrition is preferred but if patients are not meeting >60% goal EN after 7 days, PN should be started to prevent worsening of caloric deficits.
- If patients have contraindications to EN, PN should be started immediately
- Supplemental PN (SPN) can be used in combination with EN in patients tolerating lower than goal volumes of EN
- Consult Adult Nutrition Support Team to evaluate for appropriateness of PN
- Central IV access is preferred for PN, particularly in patients with high nutritional or electrolyte needs
  - Femoral access not preferred for PN administration due to infection and thrombosis risks and because the catheter tip of a central line must be adjacent to the right atrium for safe administration of a central PN formula. If femoral access is the only option, PN will be formulated as a peripheral formula which will not contain adequate energy/protein for burn ICU patients.

Diet orders

All patients, including those receiving enteral nutrition, will be ordered a diet unless NPO or contraindicated.

Open Wounds: The percentage of open wound, should be updated weekly at the multi-disciplinary rounds meeting. Caloric and protein goals will be recalculated by dietitian on a weekly basis to avoid over feeding as the patient heals.

Dietary Intake: Adult less than 20% TBSA but meeting the criteria of "probably inadequate" intake x2 days will receive a nutrition consult.

Nutrition – Usual food intake pattern[6]
Very Poor: Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2servings or less of protein (meat or dairy products) per day. **Probably inadequate:** Rarely eats a complete meal and generally eats only about ½ of any foodoffered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take dietary supplement OR receives less than optimum amount of liquid diet or tube feeding. **Adequate:** Eats over half of most meats. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal but will usually take a supplement if offered.

VI. Procedural Considerations:

Elective Procedures

Best practice to minimize the risk of pneumonitis due to aspiration of particulate and/or acidic gastric contents is to fast all elective surgery patients prior to administration of drugs that may impair the patient's airway protection. Based on currently available evidence, the required duration of fasting before an elective anesthetic of any type (with no distinction between general, regional and sedation) has been standardized across VUMC, as follows:

- Clear liquids: 2 hours
- Everything else in the stomach (solids, non-clear liquids): 6 hours

For Non- intubated Patients:

- Breast milk in pediatric patients: 4 hours
- Infant formula in pediatric patients: 6 hours
- G-tube feeds in non-intubated patients: 6 hours
- Post Pyloric feeds in non-intubated patients: 6 hours

Notes:

- Gum and hard candy, if not swallowed: No wait time

Urgent or Emergent Procedures

There is little evidence of benefit to any delay before anesthesia in the setting of an urgent or emergent procedure. It is believed that gastric emptying is impaired in patients who have a medical or surgical emergency. Therefore, the putative benefit of delaying an urgent or emergent case with the expectation that the risk of aspiration of gastric contents would be lower in a few hours is not established. The final decision about timing of an urgent or emergent procedure should be made collaboratively by the consultant anesthesiologist and surgeon.

Post Procedure: Utilize volume-based feeding chart. For patients deemed appropriate for bolus feeds, see bolus feeding algorithm.

Feeding Documentation: RN to chart feeding volume every 6 hours as % prescribed feeds received is continuously monitored with the goal of patients receiving at least 75% of prescribed feeds over the course of their hospital stay.

VII. Considerations:

Documentation
In burn patients, it is important that documentation of all caloric intake is accurate. Educate patient and family and designate a method of communicating these occurrences.

For accurate EN intake, clear the volume on feeding pump twice a shift and chart the volume twice a shift for more accurate intake.

Restarting Diets
Burn patients are often NPO daily for procedures. Restart per volume based protocol to make up for lost feed volumes.

"Normalizing"
Patients should be encouraged to take medications and consume food by mouth as much as possible. This expedites the removal of the DHT and also prepares them for home.

DHT discontinuation criteria:
Must meet all three requirements:

1. Patient has less than 15% TBSA (as documented by the provider) remaining open
2. Consistently meets "adequate intake", as defined above, for >3 days
3. Surgical course complete- future operations are not anticipate

Micronutrients

Product	Dosing	Monitoring
<20% TBSA		
Multivitamin w/ minerals	1 tab PO daily	N/A
Ascorbic acid (Vit C)	500 mg PO BID	Not routinely recommended
Cholecalciferol (Vit D)	Not initially recommended	Check level upon admission, start repletion if <30
≥20% TBSA		
Multivitamin w/ minerals	1 PO daily	N/A
Retinol (Vit A)	10,000 IU daily x 21 days or until <10% TBSA	Not routinely recommended
Thiamine (Vit B1)	In multivitamin *If history of alcohol use or risk of refeeding syndrome- 100 mg PO/IV daily x 5 days	Not routinely recommended
Ascorbic acid (Vit C)	500 mg TID	Not routinely recommended
Cholecalciferol (Vit D)	1000 IU daily	Q 2 weeks
Vitamin E	400 IU daily	Not routinely recommended
Copper	In multivitamin	Q 2 weeks- start repletion if low
Selenium	400 mcg PO x 5 days	Q 2 weeks- restart repletion if low
Zinc	50 mg PO daily	Q 2 weeks- if low increase dose

*when <10% TBSA remaining open, discontinue vitamin A, vitamin E, and zinc. Decrease vitamin C to 500 mg daily.

Initial micronutrient laboratory monitoring:

- Vitamin D

Biweekly micronutrient laboratory monitoring (start on Monday following hospital day #14)

- CRP
- Vitamin D
- Vitamin A (serum retinol and retinol binding protein)
- Copper
- Selenium
- Zinc

Guidance for micronutrient level interpretation

Micronutrient	Impact of Inflammation	General Dosing
Cholecalciferol (Vit D)	Serum levels decreased	Wide dosing range Initially: 1000 IU PO daily, up to 50,000 IU weekly
Copper	Serum levels increased • <75 µm/dL, CRP >20 mg/L- Deficiency likely, consider repletion • <50 µm/dL w/ or w/o elevated CRP- Repletion recommended	Oral: 2-4 mg daily IV: 2-4 mg IV daily, infused over 4 hours x 5-7 days
Selenium	Serum levels decreased	100-400 mcg PO daily if repeat levels low
Zinc	Serum levels decreased	50 mg elemental Zn PO daily; increase to 50 mg BID if repeat levels low *Excessive Zn repletion can induce Cu deficiency

Serum micronutrients may take several weeks to normalize. When obtaining biweekly levels, look for upward trend with repletion (with respect to CRP changes for micronutrients impacted by inflammation). If severe deficiencies noted or suspected, burn pharmacist can assist with micronutrient recommendations and/or non-formulary requests for IV micronutrient repletion.

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