

The Surgical ICU Survival Guide:

Avinash B Kumar MD
Assistant Professor Anesthesiology and Critical Care
Dec 2006

Disclaimer:

This survival guide is meant as an educational resource for Residents, Fellows and Medical students during their SICU rotation. All efforts have been made to accurately depict information. This is just a guideline and you still have to exercise good and safe clinical judgment and discuss management with your Staff on call before you treat critically ill patients. The sources for the information are listed at the bottom of each page.

Acknowledgements:

1. Chad Laurich MD (Resident General Surgery)
2. Dr Joss Thomas MD, PhD, MPH: Associate Critical Care medicine and Anesthesiology
3. Harry Zwez. Computer support
4. Kelly Cowen. Administrative Assistant

Format reviews and suggestions:

1. Rebecca DeLong MD (Resident in Anesthesiology)
2. Scot Paulsen MD (Resident in Anesthesiology)
3. Jonathan Simmons DO (Associate Fellowship Director)
4. Steven Hata MD (Director SICU)

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SICU Survival Guide:

Welcome to the Surgical Intensive Care Unit at the University of Iowa Hospitals and clinics.

Timeline in the ICU

| | |
|--|---------------------|
| ICU call begins | 0700 |
| Fellow Lectures and Journal Clubs | 0715 - 0800 |
| Radiology Rounds (Dept of Radiology) | 0815 |
| Bedside Rounds in Individual Bays | 0845 onwards |
| Noon Lecture series | 1200 |
| SICU "Check out" rounds | 1400 |

Important Telephone Numbers

| | |
|--------------------------------|-----------------------|
| Surgical ICU Front Desk | 64141 |
| SICU Bay 1 | 37410 |
| SICU Bay 2 | 37420 |
| SICU Bay 3 | 37430 |
| SICU Bay 4 | 37440 |
| SICU Conference Room | 60777 or 60778 |

Useful list of Beeper and Phone numbers outside the ICU

Neurosurgery resident on Call : 3268
Neuro IR resident on call : 4381
Neurology resident on call : 3319
EEG : 1-6733

OR front desk : 6-2403
Anesthesiology Code beeper : 3911

General Surgery senior: 4930

IPCU: 3262
Medicine Admissions Triage Pager : 4633
ECHO lab : 6-2811
EKG : 6-2328

Admission Orders

- **All orders have to be cosigned by the ICU team.**
- Always cross check the admit orders from the primary team.
- Prophylaxis for Ventilator associated pneumonia, Deep vein thrombosis; ICU insulin protocol should be accounted for.
- Fever prophylaxis
- PRN for lytes to be replaced.
- Pain medicine orders.
- IV fluid rates
- Labs and X rays
- PRN electrolyte orders:
 - Mg Sulfate 2gm IV prn for Mg <2.0
 - KCl 20-40 mEq IV/PO prn for K<4.0 (unless in renal failure)
 - **Do not** write for a prn order for phosphate. You have to know the sodium and potassium levels prior to supplementing phosphate as KPhos or Sodium phosphate

PRN BP meds should have Hold parameters:

PRN BP order:

- Metoprolol 5mg IV q 2hr. Hold for SBP<90, hold for HR<60 bpm or
- Labetalol 10mg IV q 30min. Hold for SBP<90 hold for HR<60bpm or
- Hydralazine 10-20mg q30min and hold for SBP<90mm Hg

Daily Labs: Please be prudent in ordering labs.

- CBC, lytes (Na, K, Cl, CO₂, BUN, Cr, Mg, PO₄, Ca),
- ABG, lactate on admit and q AM; you may want to follow ABG, lactate and/or H/H more frequently in some pts especially those with suspected ongoing blood loss.
- Anti-emetics: Zofran 4mgIV q4hr prn and or Metoclopramide 10mg IV/PO q6hr prn.

Prophylaxis: Please account for the following in every ICU admission

Pulmonary prophylaxis / Ventilator Associated Pneumonia

- Head of bed to 30 degrees,
- Oral chlorhexidine (pre-printed orders),
- Sub-glottic suction endotracheal tubes,
- Incentive spirometry post-extubation

DVT Prophylaxis:

- Early ambulation
- Always confirm to see that there are no contraindications to SQ Heparin (esp Neurosurgery patients)
- Ted stockings and Kendalls (pneumatic compression devices‘),
- SQ Heparin 5,000 units BID (common dose),
- Early ambulation if possible,
- Low molecular weight heparin (Lovenox) 40mg SQ Daily,
- IVC filters in certain cases;

GI Ulcer Prophylaxis:

- Lansoprazole(Proton Pump Inhibitor) 30mg IV/PO daily,
- **Early** use the gut for nutrition if at all possible, or at least trophic feeds‘ to help maintain gut mucosal integrity.

Fever Prophylaxis: Acetaminophen 650mg PO/PR Q 6 hrs PRN

Cardiovascular: Perioperative Beta-blockers, most commonly scheduled is metoprolol IV or PO

Tight glucose control: Keep 80-110 with SICU insulin protocol (Preprinted order sheet to be signed)

- A source of glucose has to be present when you start an insulin gtt. (i.e. have D5NS/ D5LR or tube feeds running)

Hold sedation daily to assess neuro function: Can be done early in the am prior to rounds.

Spontaneous breathing trials if appropriate

Monitor alarms: should always be current. **Never turn off the alarms.**

Pain Control: The 5th Vital sign:

All patients should have pain medications available; if on a vent or unable to communicate effectively, pain meds should be scheduled.

Commonly used meds/modalities are:

- **Epidural catheters:** placed and managed by Anesthesia/Pain service. Please page the Pain service for problems with the epidural pump and medicines.
- **Fentanyl gtt:** 25-100mcg/hour. **Do not use in NON intubated patients.**
- **Morphine PCA:** 1mg q 6-15 minutes, no basal rate
- **Morphine** 2-4mg q4hr IV prn
- **Dilaudid** 2-4mg q4hr PO prn
- **Dilaudid PCA:** 0.2 mg Q 8-12 mins No Basal Rate.
- **Do not use PCA's on intubated /sedated patients.**

Always turn off the opioid infusions following extubation. Please switch to more appropriate dosing regimes.

Evaluation for management of Acute Pain in the ICU

The Anesthesiology Pain Service offers valuable resources to help you better manage pain in ICU patients.

Please consult their team after speaking with the Attending SICU Staff for interventions such as Continuous nerve block catheter placements or even advise your team with complex opioid use patients.

Contact information: Beeper: 3832

Sedation in the ICU:

Sedation scales commonly used are:

1. Riker scale
2. Ramsey scale

Modified Ramsey Sedation Scale

| | |
|----------|---|
| 1 | <i>Anxious, Agitated, Restless</i> |
| 2 | <i>Cooperative, Oriented, Tranquil .Accepts mechanical ventilation.</i> |
| 3 | <i>Responds to commands only</i> |
| 4 | <i>Brisk response to light glabellar tap or loud noise.</i> |
| 5 | <i>Sluggish response to light glabellar tap or loud noise.</i> |
| 6 | <i>No Response.</i> |

Riker Sedation Score:

| # | Riker | Description |
|---|----------------------|--|
| 1 | Unarousable | Minimal or no response to noxious stimuli |
| 2 | Very Sedated | Arouses to physical stimuli but does not communicate or follow commands |
| 3 | Sedate | Difficult to arouse but awakens to verbal stimuli or gentle shaking |
| 4 | Calm/Cooperative | Follows commands, easily arousable, Calm |
| 5 | Agitated | Anxious or physically agitated, calms to verbal instructions |
| 6 | Very agitated | Requiring restraint and frequent verbal reminding of limits, biting ETT |
| 7 | Dangerously agitated | Pulling at ET tube, trying to remove catheters, climbing over bedrail, striking at staff, thrashing side-to-side |

<http://www.mit.edu/~gari/papers/cinc2005Janz.pdf>

Commonly used agents for ICU sedation:

Please account for analgesia in ICU patients prior to placing them on sedation. Often you may have to use a combination of Analgesics and other classes of sedation medicines.

- **Propofol gtt** –common titrate to Riker 3
- **Lorazepam:** 1mg q6-8hr IV/PO or as a prn. Maybe used as an infusion in certain cases.
- **Haloperidol (Haldol)** 5mg IV q6hr prn
- **Dexmedetomidine** (the dosing is in mcg/kg/hr) **up to 24 hrs only.**
- **Morphine gtt: Start at 1 mg/hr. Caution in Renal failure.**
- **Fentanyl gtt : Between 25 mcg to 100 mcg/hr**

Silent Killers in the ICU:

These are specific markers, indices and seemingly trivial data points but have an impact on ICU morbidity and mortality.

- **Head of Bed:** seems trivial but this decreases the rate of development of VAP and on average a single episode of VAP can cost up to \$40,000.
- **IV Fluids:** You have to know the daily Inputs and Outputs. Iatrogenic fluid overload is a common problem in ICU patients.
- **Metabolic alkalosis:** you have to account for the development of significant metabolic alkalosis in any ICU patient.
- **Lactic acidosis:** must be approached as being secondary to hypoperfusion until proven otherwise.
- **Tachypnea:** Unexplained tachypnea is a red flag and should always be addressed especially in a mechanically ventilated patient.
- **Silent myocardial Ischemia:** always pay attention to the indices of myocardial ischemia as the typical signs may not be evident in ICU patients.

The SOFA score: Sequential Organ Failure Score

| | 0 | 1 | 2 | 3 | 4 |
|--------------------------------------|------|------------|--|-----------------------------------|----------------|
| Respiratory P: F ratio | >400 | 400 | 300 | 200 | 100 |
| Coagulation Platelet count | >150 | 150 | 100 | 50 | 20 |
| Liver BILIRUBIN mg/dL | <1.2 | 1.2-1.9 | 2.0-5.9 | 6.0-11.9 | >12 |
| Cardiovascular Hypotension | None | MAP<70mmHg | Dobutamine Or Dopamine <5 mcg | Dopamine>5mcg Or NorEpi/Epi | Epi/Norepi>0.1 |
| CNS Glasgow Coma Score | 15 | 13-14 | 10-12 | 6-9 | <6 |
| Renal Creatinine mg/dL | <1.2 | 1.3-1.9 | 2.0-3.4 | 3.5-4.9 | >5.0 |

Reference: Textbook of Critical Care. M Fink, JLVincent. 5th edn. Pg: 1261.

Infectious Diseases:

| | Gram positive | Gram negative |
|---------|-------------------------------------|--------------------------------|
| Cocci | <u>Staphylococcus (in clusters)</u> | Neisseria (in pairs) |
| | Streptococcus (in chains) | Moraxella (in pairs) |
| | | |
| Bacilli | Listeria | Enterobacteriaceae (coliforms) |
| | <u>Bacillus</u> | <u>Escherichia coli</u> |
| | Corynebacterium | Klebsiella |
| | | <u>Salmonella</u> |
| | | Shigella |
| | | Proteus |
| | | <u>Pseudomonas</u> |
| | | Haemophilus |
| | | Bordetella |
| | | Legionella |
| | | Campylobacter (spiral) |
| | | Helicobacter (spiral) |
| | Clostridium (anaerobic) | Bacteroides (anaerobic) |

This is just an introduction to ICU microbiology and some of the common antibiotics that are available at UIHC.

CHOICE of ANTIBIOTICS and SPECTRUM of COVERAGE

Reference:

<http://www.healthcare.uiowa.edu/pharmacy/formulary/Pocketguide/antiinfectivetherapy.pdf>

Table 2. Activity of selected antibiotic agents versus Gram-positive cocci

| Organism (number tested): January through December 2005 | Percent Susceptible | | | | | | | | | | |
|--|---------------------|------------|------------------------|-----------------|---------------------------|-------------|------------------------|------------|-----------------|-----------------|---------------------------|
| | Penicillin | Ampicillin | Oxacillin ^a | Ceftriaxone | Erythromycin ^b | Clindamycin | Linezolid ^c | Vancomycin | Gentamicin | Streptomycin | Levofloxacin ^c |
| <i>Staphylococcus aureus</i> (1331) | 0 | - | 63 | - | 46 | 49 | 100 | 100 | 97 | - | - |
| Non-aureus staphylococci (538) | 0 | - | 39 | - | 39 | 17 | 100 | 100 | 79 | - | - |
| <i>Enterococcus</i> species (722) | - | 83 | - | - | - | - | 95 | 86 | 71 ^d | 74 ^d | - |
| <i>Streptococcus pneumoniae</i> (160) | 85 ^e | - | - | 99 ^e | 51 | 89 | - | 100 | - | - | 96 |
| Group B β -hemolytic streptococci (35) | 97 | 100 | - | 100 | 65 | 81 | - | 100 | - | - | - |
| <i>Streptococcus milleri</i> group (17) | 94 | 100 | - | 100 | 86 | 79 | - | 94 | - | - | - |
| <i>Bacillus</i> species (20) | 20 | - | - | - | 60 | 59 | - | 95 | 100 | - | - |
| Aerobic diphtheroids (36) | 32 | - | - | - | 35 | - | - | 100 | 91 | - | - |
| <i>Propionibacterium acnes</i> (30) | 100 | - | - | - | 64 | 87 | - | 100 | - | - | - |

^aOxacillin accurately predicts the activity of all semi-synthetic penicillins, β -lactamase inhibitor combinations and cephalosporins versus both *S. aureus* and non-aureus staphylococci.

^bErythromycin predicts the activity of azithromycin and clarithromycin for all of these Gram positive bacteria.

^cLinezolid and levofloxacin IV are protocol drugs. Oral levofloxacin is not a protocol drug.

^dThese percentages refer to strains that will be treated synergistically with either gentamicin or streptomycin plus ampicillin.

^eThese percentages are relevant to patients with pneumococcal meningitis. [Cefotaxime and ceftriaxone are essentially equivalent for this organism.] The percentages of isolates of *S. pneumoniae* from patients with infections of the respiratory tract which are susceptible to these agents are: penicillin - 94% and ceftriaxone - 97%.

Table 1. Activity of selected antibiotic agents versus Gram-negative bacilli

| Organism (number tested): January through December 2005 | Percent Susceptible | | | | | | | | | | | | |
|--|---------------------|--------------------------|------------------------|------------|-------------------------|-----------------|-----------------------------|----------|-----------|-----------------|-----------------------------------|------------------------------|-----------------------------|
| | Cefazolin | Ceftriaxone ^a | Cefotetan ^b | Ampicillin | Ampicillin/ Subactam | Piperacillin | Piperacillin/ Tazobactam | Cefepime | Meropenem | Gentamicin | Trimethoprim/ Sulfamethoxazole | Ciprofloxacin ^{c,d} | Levofloxacin ^{c,d} |
| <i>Citrobacter freundii</i> (73) | 0 | 89 | 4 | 5 | 7 | 90 | 82 | 100 | 100 | 93 | 78 | 95 | 94 |
| <i>Citrobacter koseri</i> (29) | 79 | 100 | 100 | 0 | 100 | 0 | 89 | 100 | 100 | 100 | 100 | 100 | 97 |
| <i>Enterobacter aerogenes</i> (77) | 1 | 82 | 0 | 0 | 0 | 80 | 83 | 100 | 99 | 99 | 100 | 100 | 100 |
| <i>Enterobacter cloacae</i> (176) | 1 | 89 | 4 | 16 | 28 | 92 | 91 | 98 | 99 | 97 | 94 | 95 | 97 |
| <i>Escherichia coli</i> (1256) | 86 | 99 | 99 | 61 | 71 | 73 | 99 | 99 | 100 | 96 | 82 | 91 | 90 |
| <i>Klebsiella oxytoca</i> (96) | 76 | 99 | 100 | 0 | 83 | 0 | 95 | 99 | 100 | 98 | 93 | 96 | 97 |
| <i>Klebsiella pneumoniae</i> (364) | 89 | 99 | 100 | 0 | 83 | 0 | 98 | 99 | 100 | 99 | 95 | 97 | 98 |
| <i>Morganella morganii</i> (27) | 0 | 100 | 93 | 0 | 4 | 92 | 100 | 100 | 100 | 81 | 70 | 74 | 74 |
| <i>Proteus mirabilis</i> (155) | 96 | 99 | 99 | 81 | 93 | 94 | 100 | 99 | 100 | 88 | 86 | 86 | 89 |
| <i>Proteus vulgaris</i> (11) | 0 | 91 | 100 | 18 | 73 | 88 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| <i>Serratia marcescens</i> (67) | 0 | 98 | 95 | 0 | 0 | 98 | 98 | 100 | 97 | 99 | 100 | 96 | 98 |
| <i>Acinetobacter</i> species (32) | 0 | 7 | 3 | 7 | 93 | 100 | 86 | 88 | 100 | 100 | 97 | 100 | 100 |
| <i>Pseudomonas aeruginosa</i> (737) | 0 | 0 | 0 | 0 | 0 | 92 ^e | 94 ^e | 89 | 91 | 84 ^f | 8 | 78 | 69 |
| <i>Stenotrophomonas maltophilia</i> (88) | - | - | - | - | - | 4 | 25 | 11 | 0 | 20 | 93 | 27 | 57 |
| <i>Achromobacter xylosoxidans</i> (12) | - | - | - | - | - | 100 | 100 | 0 | 92 | 8 | 58 | 0 | 0 |

^aAztreonam does not offer an advantage over ceftriaxone with respect to gram negative coverage; in fact, it is inferior for certain organisms, e.g., *C. freundii* and *E. aerogenes*.

^bCefotetan is no longer manufactured. Cefoxitin is the only 2nd generation cephalosporin available. With a few exceptions, the activity of cefoxitin is generally predicted by the activity of cefotetan.

^cWith the exception of *Stenotrophomonas maltophilia*, ciprofloxacin is always a superior choice than levofloxacin when a fluoroquinolone is to be used in the management of infections caused by these Gram negative bacilli.

^dIntravenous levofloxacin is a protocol drug. Intravenous ciprofloxacin is non-formulary. Oral ciprofloxacin and levofloxacin are not protocol drugs.

^ePreferred therapy for *Pseudomonas aeruginosa* would be a combination of piperacillin or piperacillin/tazobactam or ceftazidime plus either gentamicin or tobramycin.

^f93% of *P. aeruginosa* were susceptible to tobramycin. In most cases, tobramycin and gentamicin have comparable activity when combined with beta-lactam antibiotics for synergy.

BiPap and Non-invasive ventilation (NIV):

General Criteria

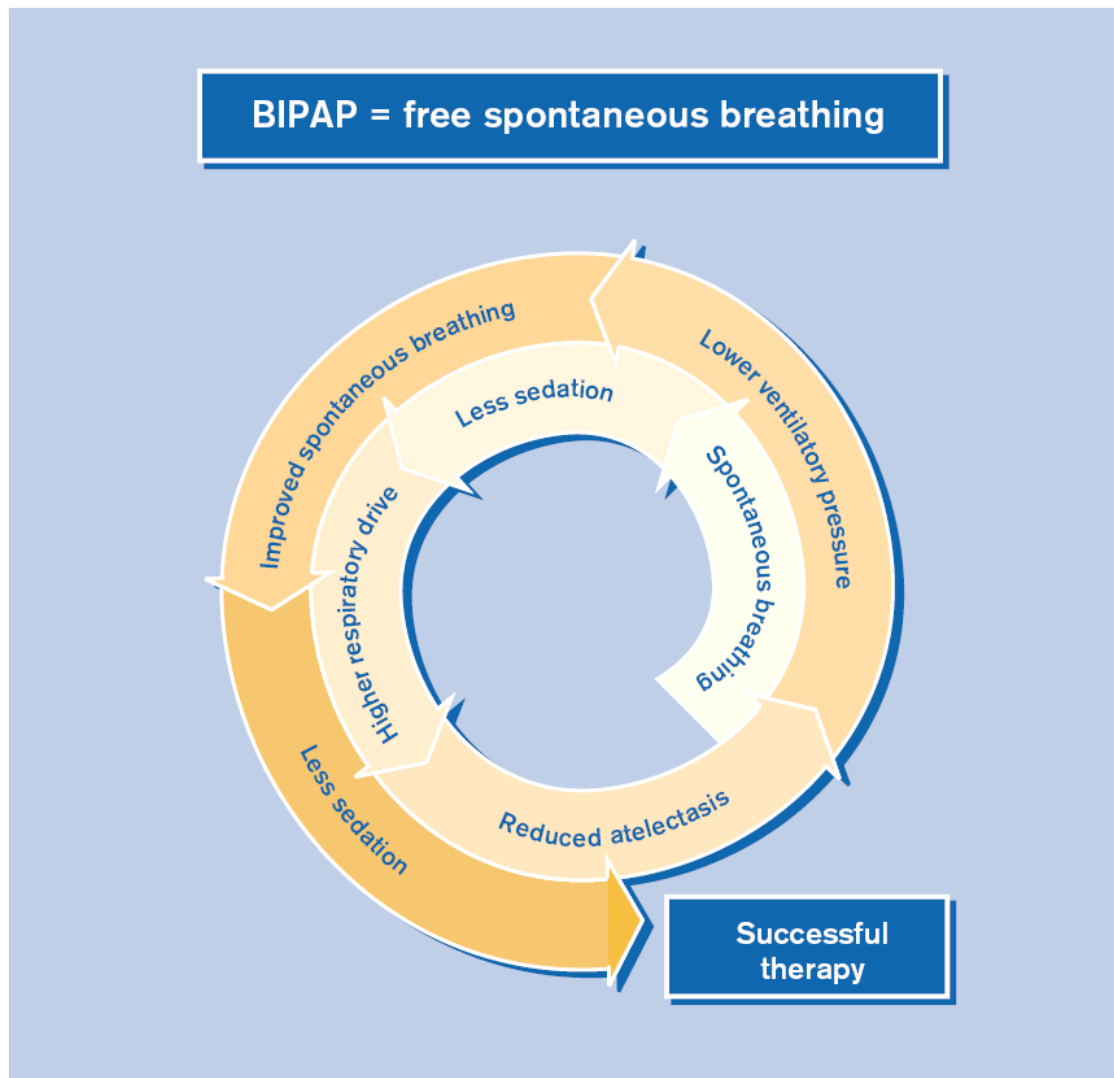
Patient selection for Non Invasive Ventilation:

Basic general criteria:

1. Alert and cooperative patient
2. Hemodynamic stability and not on pressors.
3. Intact gag and cough reflexes.
4. Airway suctioning needs greater than every 2hours.
5. No active facial trauma or facial fractures

Failure of non-invasive ventilation and need for endotracheal intubation:

1. Inability to improve gas exchange or dyspnea. The dyspnea should improve within 30 mins to consider the NIV mode successful.
2. Poor patient compliance.
3. Worsening airway secretions and increasing need for suctioning (more frequent than Q 2 hours).
4. Development of conditions requiring intubation to protect the airways (coma or seizure)
5. Hemodynamic or EKG instability (ischemia or significant ventricular arrhythmias)



Reference:

1. Diagram from: <http://www.draeger-medical.com>

Suggested Settings to Initiate BiPap:

1. IPAP 8-10 cm H₂O
2. EPAP: 3 - 5 cm H₂O
3. FiO₂: start at least at 50%.
4. BPM: Match current rate +/- 2

Additional Notes:

1. **IPAP** Increase the IPAP in increments of 2 cm H₂O

Increasing the "*pressure boost*" may; increase alveolar ventilation, help off load the respiratory muscles and eases dyspnea and decrease the use of accessory muscles.

2. **EPAP** Increase the EPAP in increments of 2 cm H₂O-

Increasing the Functional Residual Capacity may improve the patient's oxygenation.

3. Supplemental oxygen can be titrated into the nasal mask to obtain an acceptable PaO₂ and PaCO₂-

Hemodynamic Monitoring:

Systolic Pressure Variation (SPV):

Prerequisite conditions:

1. Mechanical ventilation
2. About equal tidal volumes
3. Arterial line present
4. Recording speed $<6.5\text{mm/s}$

Set up as follows

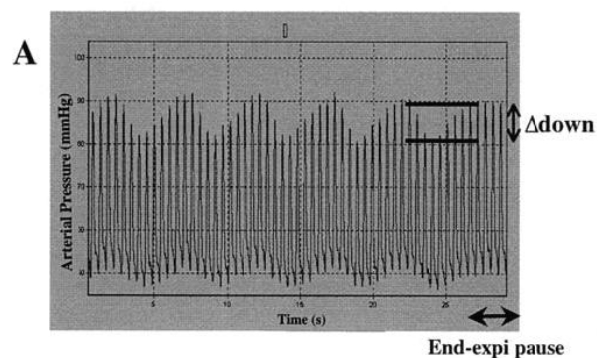
1. Plug in the bedside printer module (usually located near the central core work area in the bays.)
2. Select ABP (arterial line tracing) on the Phillips monitors
3. Select the sampling speed to 6.5 mm/s
4. Start recording the waveform.

Interpretation:

When the Peak to trough of the waveform $>10\text{mmHg}$ then the patient is likely to be fluid responsive.

Limited Reliability:

1. Atrial fibrillation
2. Dilated cardiomyopathy

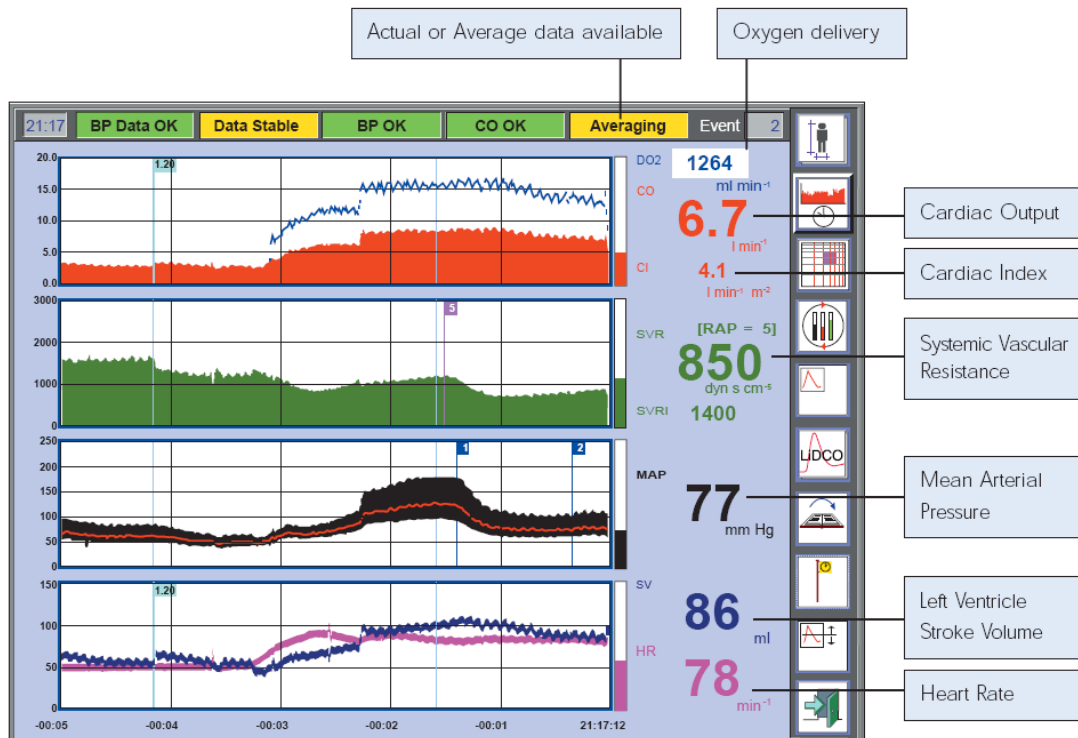


References:

- Anesthesiology. 1998 Dec; 89(6): 1313-21
- 0 h 's intensive Care Manual. 5th edn. Pg 81.

The Lidco Monitor

This is screenshot of the type of data the Lidco displays.



Key Points:

Uses Lithium dilution curves for determining CO/CI

You need the patient's height (cm), weight (kg), serum Na and Hemoglobin prior to calibration of the Lidco.

Must not have neuromuscular blockade on board as the large molecular size interferes with the Lidco sensors during calibration.

Needs to be recalibrated Q 12 hours.

Parameters that can be measured and trends followed up to 24 hrs are:

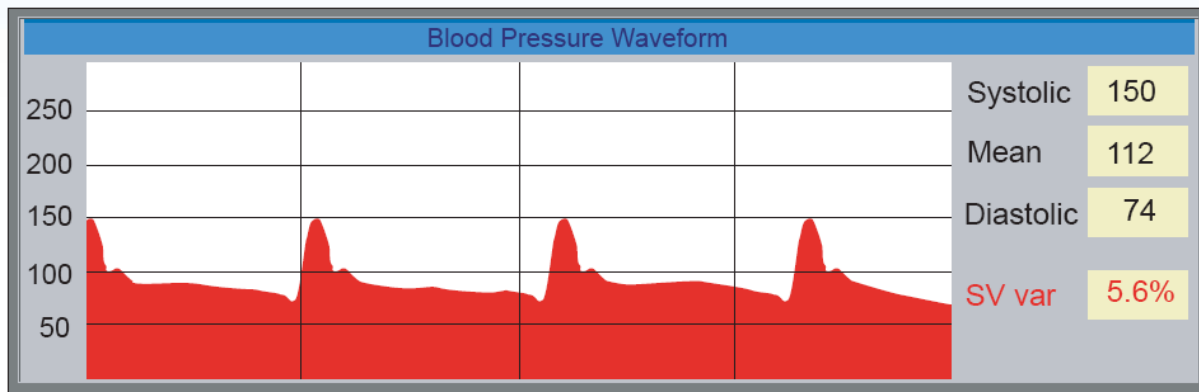
Systolic, Diastolic, Mean arterial pressures (MAP)

Cardiac index and Cardiac output and Systemic Vascular Resistance (SVR).

Pulse pressure variation (PPV) and Systolic pressure variation (SPV)

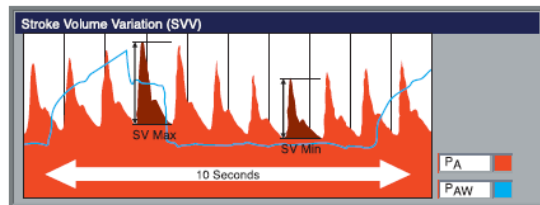
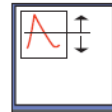
Real time Oxygen Delivery

Using the Lidco to measure Systolic Pressure Variation (SPV) and Stroke Volume Variation (SVV) as indices for Volume Responsiveness:



This Blood Pressure Waveform window is used to check the patient's systolic, diastolic and mean pressure. The pressure waveform shape and values should equate to those displayed on the primary blood pressure monitor.

This window also provides you with the preload determination values or volume status indicators of: Systolic Pressure Variation (SPV), Pulse Pressure Variation (PPV%) or Stroke Volume Variation (SVV%).



$$\text{SVV \%} = \frac{(\text{SV max} - \text{SV min})}{[(\text{SV max} + \text{SV min})/2]} \times 100$$

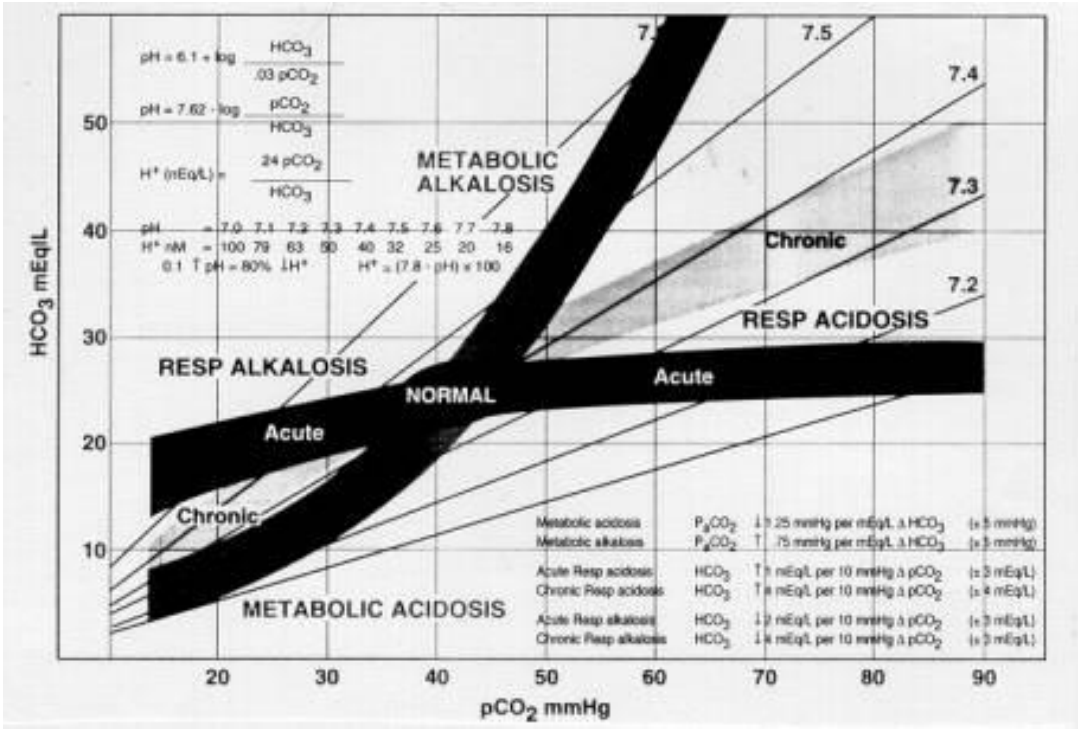
Patient with SVV less than 10% unlikely to be preload responsive.

Reference: <http://www.lidco.com/docs/Brochure.pdf>

Rapid Analysis of Arterial Blood Gases (ABG's)

This is meant only as a start. You have to still be able to systematically interpret ABG
There are several useful websites that are useful to learn about ABG's.

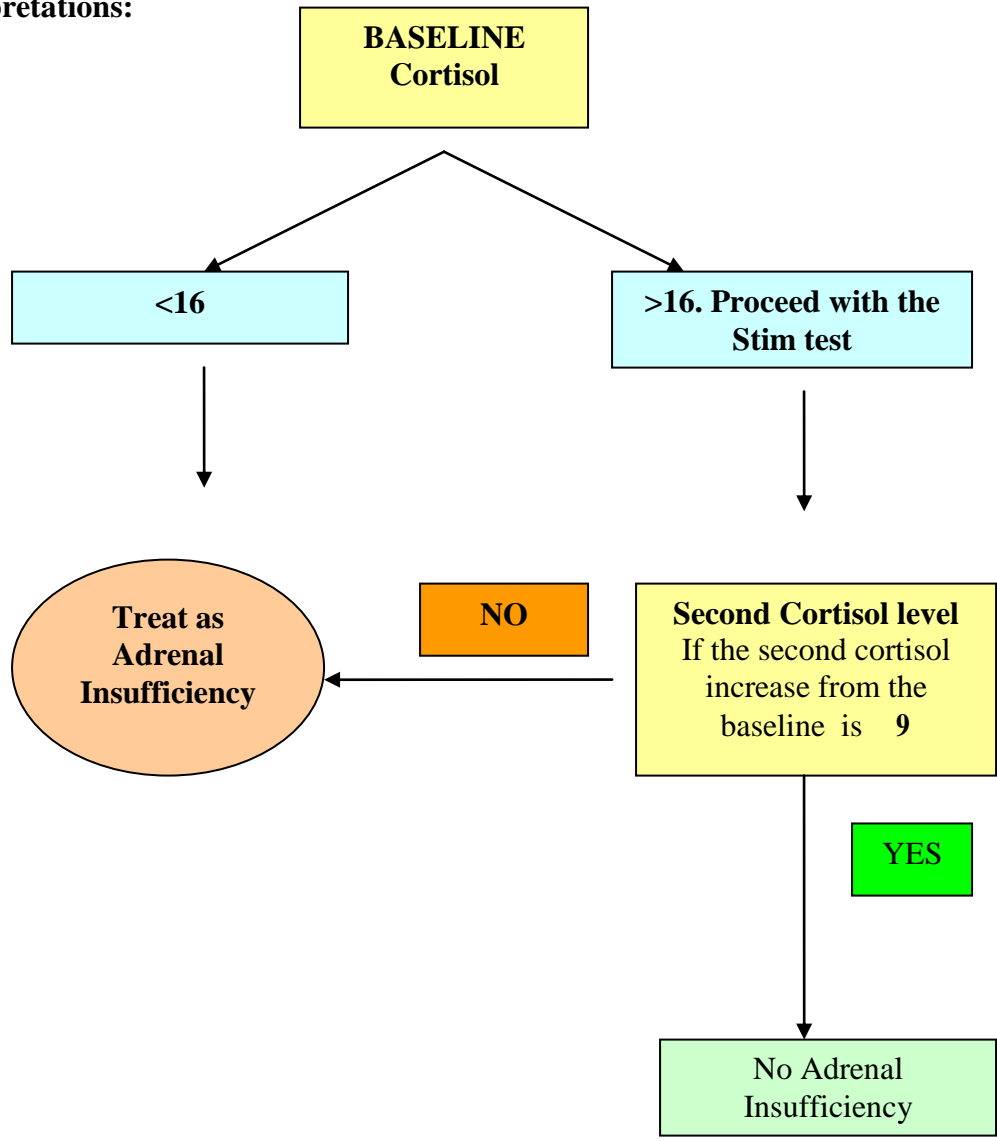
<http://www.acid-base.com/>



The Cosyntropin Stim Test for Adrenal insufficiency:

Please order the Cosyntropin prior to drawing the baseline sample.
Have the Cosyntropin dose at the bedside.
Draw the Baseline cortisol level
Administer the **1 mcg Cosyntropin dose.**
Draw the second level in **60 mins.**

Interpretations:



Nutrition Support in the SICU

SICU Dietitian: Stephanie Proud, RD, LD, CNSD : Pager 3128

Introduction

Nutrition support is a vital component of the medical therapy provided to a critically ill patient. Delivering exogenous substrates has been shown to blunt the hypercatabolic response, maintain visceral protein status, decrease rate of infection, and provide the patient with a more favorable outcome. It is important to understand how to evaluate your patient's metabolic demands, select the appropriate route for nutrition, and provide adequate nutrients.

Estimating Nutritional Requirements

Assessing Energy Needs– General Guidelines

- Harris-Benedict Equation– estimates basal energy expenditure

Males: $66 + (13.8 \times \text{wt (kg)}) + (5 \times \text{ht (cm)}) - (6.8 \times \text{age})$

Females: $655 + (9.6 \times \text{wt (kg)}) + (1.8 \times \text{ht (cm)}) - (4.7 \times \text{age})$

Then Multiply By Injury/Stress Factor

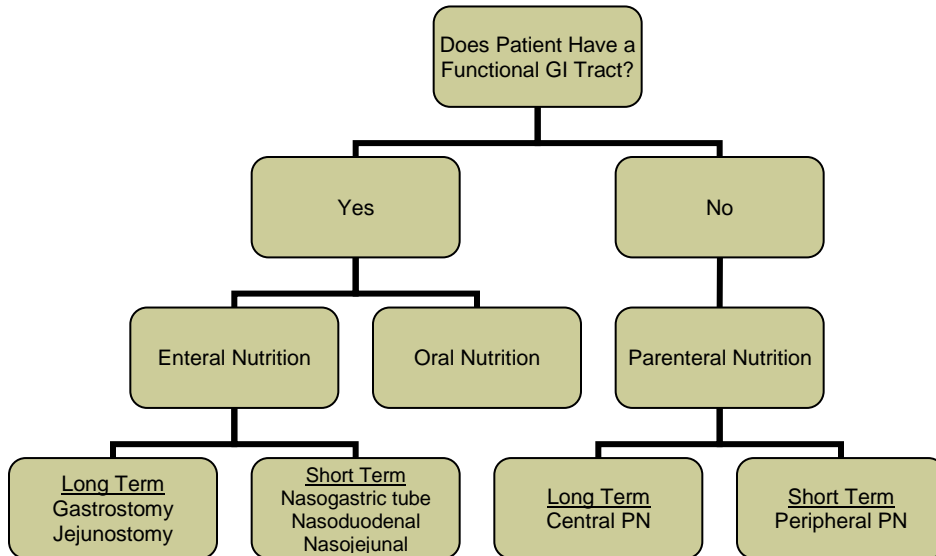
- 1.0-1.2 elective surgery
- 1.2-1.4 minor surgery/ventilated/bed rest
- 1.3-1.5 major surgery/ trauma/ sepsis
- 1.4-1.6 multi trauma/ SIRS
- 1.6-2.0 burns (depending on size)

- Simplified Kcal/kg
 - Patients of normal body size use~ 25-30 kcal/kg
 - Obese patients 18-21 kcal/kg actual weight OR use adjusted weight and estimate near ~25 kcal/kg of adjusted wt

Assessing Protein Needs:

| | |
|-----------------|----------------|
| Normal | .8 g/kg/d |
| Mild Stress | 1.2-1.4 g/kg/d |
| Moderate Stress | 1.4-1.6 g/kg/d |
| Severe Stress | 1.6-2.0 g/kg/d |
| CRF– no HD | .6-.8 g/kg/d |
| CRF with HD | 1.2-1.4 g/kg/d |
| ARF | 1.2-1.5 g/kg/d |
| Liver Disease | 1.5 g/kg/d |

Feeding Routes



Enteral Nutrition

- Formula Selection
 - Standard formulas
 - Jevity 1.2 (fiber containing) or Osmolite 1.2 (no fiber)
Moderate protein content, 1.2 calorie/cc standard formula
 - Promote with fiber (higher protein content, 1 calorie/cc)
Consider using with patients on propofol, use for trauma/surgery
 - Fluid restricted/ renal formulas: Two Cal HN, Nepro
 - Partially Predigested Formulas (Perative, Peptinex DT)
- Ordering and Administering
 - Once a feeding tube has been placed and confirmed for use, determine the formula type based on diagnosis, needs, and fluid status.
 - Isotonic formula (300-500 mOsm/L)– Start at 20-25 cc/hr, increase by 25 cc q 4-8 hours depending on pre-existing malnutrition, hemodynamic stability, or anticipated tolerance
 - Hypertonic formula (>500 mOsm/L)---Start at 15-20 cc/hr, increase by 20 cc q 8 hrs depending on above factors

Parenteral Nutrition (TPN)

Peripheral Nutrition (PVN): Short term

- Dextrose: 10% surgical **Good general rule for
- Amino Acids 4.25% or 5% fluid restriction pts is D20, 6% AA if no
- Lipids: 500 ml 10% lipids to run over 24 hrs restricted or D25, 7.5% AA if fluid
- Rate: between 75-100 cc unless FR needed
- Initiate: at goal rate

Central Nutrition (CVN):

- Dextrose: 10, 15, 20, 25, 30 or 35%
- Amino Acids: 4.25, 5, 6, 7.5%
- Lipids: 10% and 20% concentration, 250 ml or 500 ml. Lipids run over 10 hrs.
- Rate: Typically <100 cc/hr
- Initiate: 25 cc/hr, advance 25 cc q 6-8 hours until goal reached.

Micronutrients/ Additives

- Electrolytes– standard option (most pts) and electrolyte free option dependent upon individual pt needs.
- MVI and trace elements daily
- Selenium– trace element formulation does not contain selenium, therefore with pt on PN >2 weeks recommend adding 40 mcg daily.

Monitoring

- Blood glucose q 4 hours with initiation– less frequently once stable
- Electrolytes, BUN, creatinine, Mg, and Phos daily
- Fluid balance– concentration and rate of PN can be adjusted as needed
- Prealbumin weekly

** SICU Dietitian: Stephanie Proud, RD, LD, CNSD Pager: 3128

Brain Death and Organ Donation Protocol at UIHC

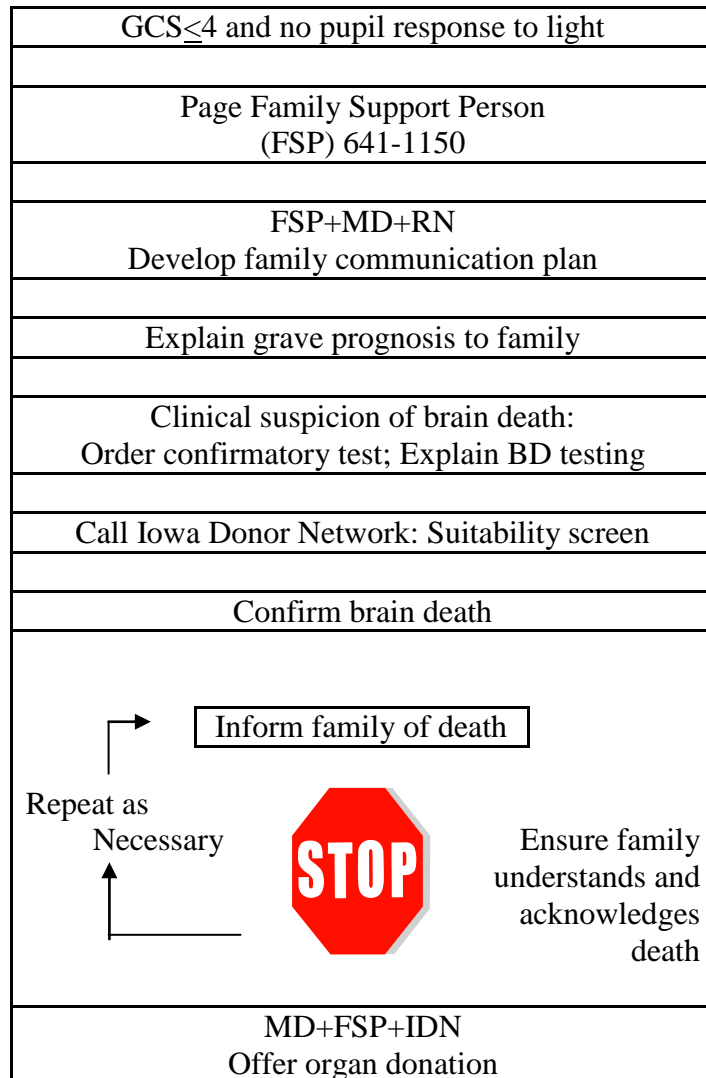
Roles:

FSP Family Support Person:

- Social Worker available 24 hours a day for family support and consultation. Pager 319-341-1150
- Coordinates with Iowa Donor Network (IDN) regarding suitability
- Coordinates with Medical Examiner

MDs:

- Page FSP when patient is GCS of 4 or less or withdrawal of care is being considered
- Explain grave prognosis, brain death, brain death testing with FSP present
- Organ donation is approached only after brain death and in collaboration with FSP



Social Work in the Surgical Intensive Care Unit

The Department of Social Service provides social work contact on every inpatient unit. We provide patient and family support, and address discharge planning needs. The Surgical Intensive Care Unit has a social worker dedicated to the four SICU bays during the weekdays, 8 a.m. to 5 p.m. An on-call social worker is available at all other times.

Please contact the SICU social worker when:

1. The patient has potential discharge planning needs. If you feel your patient may need inpatient rehabilitation, long-term placement for chronic care needs, or some form of home care, early social work involvement is needed to coordinate discharge planning.
2. The patient is from another acute care hospital and is expected to return there. Patients who come to UIHC for specialty care may not need to remain here for the duration of their care, particularly if the patient was transferred a long distance.
3. The patient or patient's family is in crisis. The social worker is available when patients and families are facing difficult times and need assistance. We often coordinate with other services, including Pastoral Care, Palliative Care, and Psych Nursing when addressing these complex needs.
4. The patient or family is asking about insurance. The social worker can typically address these concerns, especially if the patient has no insurance.
5. The patient appears to have no family or next-of-kin. The social worker may be able to assist in locating family when decisions need to be made. Also, we work with the Iowa Substitute Decision Making Board when legal decision-making power needs to be established.
6. Neglect or abuse of a patient is suspected. We will assist in evaluating and reporting cases to the appropriate entities.

From 8 a.m. to 5 p.m. Monday through Friday:
Page 7224 to reach Steve Cummings, LISW, ACSW
Other times: Dial '0' and ask for the on-call social worker.

Brain Death determination:

- Need to have 2 licensed physicians to make the determination. Usually one ICU staff and other e.g. Neurologist etc.
- Alert the Organ Donation Social Worker on patients trending towards the diagnosis of Brain Death. Sue Witte is the chief social worker who works with organ donor protocols. She can be reached at beeper:

You Must account for the following Prior to a Brain Death Examination:

The proximate cause must be known, and must be known to be irreversible. There must be clinical or neuroimaging evidence of an acute central nervous system catastrophe that is compatible with the clinical diagnosis of death by brain criteria. (In particular cases, e.g. in the acute setting after a cardiac arrest, a period of observation and repeat examination may be warranted; a period of 6 hours has been recommended, but this amount of time is arbitrary.)

Exclusion of complicating medical conditions that may confound the clinical assessment (acid-base or severe electrolyte disturbances, including hyperammonemia, or endocrine disturbances).

Serum toxicology screening with a demonstrated absent barbiturate level and no evidence of other drug intoxication or poisoning. If a barbiturate level is present, it must be < 10 mcg/ml. If significant doses of CNS depressing medications (e.g. narcotics, sedatives, hypnotics, anticholinergics, etc.) have been administered recently, the reliability of the clinical examination should be called into question, and ancillary testing should be considered.

Demonstrated absence of neuromuscular blockade (e.g. with train of four nerve stimulation) if the patient has received recent or prolonged use of Neuromuscular blocking agents.

Core temperature 36.5°C (96.8°F)

In the presence of confounding variables, brain death may still be determined with the aid of ancillary tests.

TABLE 1. CLINICAL CRITERIA FOR BRAIN DEATH IN ADULTS AND CHILDREN.

| |
|---|
| Coma |
| Absence of motor responses |
| Absence of pupillary responses to light and pupils at midposition with respect to dilatation (4–6 mm) |
| Absence of corneal reflexes |
| Absence of caloric responses |
| Absence of gag reflex |
| Absence of coughing in response to tracheal suctioning |
| Absence of sucking and rooting reflexes |
| Absence of respiratory drive at a PaCO ₂ that is 60 mm Hg or 20 mm Hg above normal base-line values* |
| Interval between two evaluations, according to patient's age |
| Term to 2 mo old, 48 hr |
| >2 mo to 1 yr old, 24 hr |
| >1 yr to <18 yr old, 12 hr |
| ≥18 yr old, interval optional |
| Confirmatory tests† |
| Term to 2 mo old, 2 confirmatory tests |
| >2 mo to 1 yr old, 1 confirmatory test |
| >1 yr to <18 yr old, optional |
| ≥18 yr old, optional |

*PaCO₂ denotes the partial pressure of arterial carbon dioxide.

†See Table 2 for descriptions of the available confirmatory tests. Tests may be required by law outside the United States.

TABLE 2. CONFIRMATORY TESTING FOR A DETERMINATION OF BRAIN DEATH.

Cerebral angiography

The contrast medium should be injected under high pressure in both anterior and posterior circulation.

No intracerebral filling should be detected at the level of entry of the carotid or vertebral artery to the skull.

The external carotid circulation should be patent.

The filling of the superior longitudinal sinus may be delayed.

Electroencephalography

A minimum of eight scalp electrodes should be used.

Interelectrode impedance should be between 100 and 10,000 Ω.

The integrity of the entire recording system should be tested.

The distance between electrodes should be at least 10 cm.

The sensitivity should be increased to at least 2 μV for 30 minutes with inclusion of appropriate calibrations.

The high-frequency filter setting should not be set below 30 Hz, and the low-frequency setting should not be above 1 Hz.

Electroencephalography should demonstrate a lack of reactivity to intense somatosensory or audiovisual stimuli.

Transcranial Doppler ultrasonography

There should be bilateral insonation. The probe should be placed at the temporal bone above the zygomatic arch or the vertebralbasilar arteries through the suboccipital transcranial window.

The abnormalities should include a lack of diastolic or reverberating flow and documentation of small systolic peaks in early systole. A finding of a complete absence of flow may not be reliable owing to inadequate transtemporal windows for insonation.

Cerebral scintigraphy (technetium Tc 99m hexametzime)

The isotope should be injected within 30 minutes after its reconstitution.

A static image of 500,000 counts should be obtained at several time points: immediately, between 30 and 60 minutes later, and at 2 hours.

A correct intravenous injection may be confirmed with additional images of the liver demonstrating uptake (optional).

REFERENCES:

- American Academy of Neurology. Practice Parameters http://aan.com/professionals/practice/pdfs/pdf_1995_thru_1998/1995.45.1012.pdf
- http://www.massgeneral.org/stopstroke/pdfs/brain_death.pdf
- NEJM 2001 APRIL 344. NO 16. Diagnosis of Brain Death. Eelco Wijdevicks.

Apnea-testing performed as follows:

a) Prerequisites

- Core temperature 36.5°C or 97°F
- Systolic blood pressure 90 mm Hg
- Euvolemia. *Option:* positive fluid balance in the previous 6 hours
- Normal PCO₂. *Option:* arterial PCO₂ 40 mm Hg
- Normal PO₂. *Option:* preoxygenation to obtain arterial PO₂ 200 mm Hg

b) Connect a pulse oximeter and disconnect the ventilator.

c) Deliver 100% O₂, 6 l/min, into the trachea.

d) Look closely for respiratory movements (abdominal or chest excursions that produce adequate tidal volumes).

e) Measure arterial PO₂, PCO₂, and pH after approximately 8 minutes and reconnect the ventilator.

f) If respiratory movements are absent and arterial PCO₂ is 60 mm Hg (*option:* 20 mm Hg increase in PCO₂ over a baseline normal PCO₂), the apnea test result is positive (i.e., it supports the diagnosis of brain death).

g) If respiratory movements are observed, the apnea test result is negative (ie, it does not support the clinical diagnosis of brain death), and the test should be repeated.

h) Connect the ventilator if, during testing, the systolic blood pressure becomes 90 mm Hg or the pulse oximeter indicates significant oxygen desaturation and cardiac arrhythmias are present; immediately draw an arterial blood sample and analyze arterial blood gas. If PCO₂ is 60 mm Hg or PCO₂ increase is 20 mm Hg over baseline normal PCO₂, the apnea test result is positive (it supports the clinical diagnosis of brain death); if PCO₂ is < 60 mm Hg or PCO₂ increase is < 20 mm Hg over baseline normal PCO₂, the result is indeterminate, and an additional confirmatory test can be considered.

Practical Points in the SICU:

- Before doing the Apnea test. Make sure that the ETCO₂ is close to 35-40 for at least 10 mins.
- Paging the resident/fellow on call can help set up the Nuclear medicine study in a timely manner.
- Speak to the SICU Staff about arterial line and central access for managing the potential donor.
- Sometimes the Apnea test cannot be completed and we have to go to the confirmatory test.
- Significant hemodynamic instability can occur during the Apnea Test.