

Anesthesiology Critical Care Training at the University of Michigan



Orientation to Anesthesiology & Surgical Critical Care Rotations

1. Cardio-thoracic Vascular ICU {CVC ICU}
2. General Surgical ICU {SICU}

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I. Introduction

Critical Care is an integral part of daily anesthesiology practice. The American Board of Anesthesiology has been increasing the required time spent during anesthesiology training in formal critical care rotations. It is the goal of the University of Michigan Anesthesiology Residency, that graduates will have a significantly higher than average command of both clinical ICU experience and knowledge of critical care literature so that they will be able to manage the most complex, acutely ill patients in their practice. The critical care training at the UM will consist of, at least, 6 months of critical care rotations during the 4 years of internship through CA-3 year. The critical care training will progress from a junior to a more senior level resident in both the Cardio-Thoracic ICU (TICU/CVC) as well as the General Surgical ICU (SICU). Beginning in July 2007, Interns will rotate through the CVC ICU for 2 months as well as significant Neurosurgical critical care training in the NICU during their neurosurgery month. CA-1s will spend 1 month in the SICU, managing typical patients encountered in the operating rooms during the CA-1 year. CA-2 residents will spend 2 months in the CVC gaining advanced cardio-thoracic & vascular critical care training that will compliment the operative rotations in the corresponding anesthesiology specialties. The CVC senior rotation will also give residents the opportunity to mentor Anesthesiology interns and prepare them for when they return as CA-2s. Finally, CA-3 residents will obtain advanced surgical critical care training as the senior ICU resident in the SICU also, overseeing CA-1 residents. Anesthesiology critical care faculty will attend at least half the months in both CVC and SICU.

It is the Critical Care Faculty's very sincere wish to make your critical care rotations the most rewarding educational experience of your residency. To that end we will do everything we can to provide you with the materials and experiences that will dramatically increase your understanding of and ability to manage critically ill patients. At the same time, it is understood that these rotations will be quite challenging both intellectually as well as physically do to the work required in order to provide exceptional care to these patients. The key to succeeding in this rotation is to work as a team, especially with each other, as well as your faculty, the surgeons, the critical care nurse practitioners, ICU nurses, Respiratory therapists and consultants.

II. Surgical ICUs at the University of Michigan

There are 2 primary surgical ICUs that Anesthesiology residents will rotate through (CVC ICU & SICU) as well as two other ICUs where patients requiring operations will be cared for (TBICU & NICU). All together, there are 70 adult Surgical ICU beds, accounting for over 4000 admissions/year. The complete range of operations are represented by this population, often including complex 're-do' operations, repairs/reconstructions after previous surgeries, transfers from other institutions. Experience will also be obtained by consulting on, or caring for patients in the 20 bed Medical ICU (MICU), or the 10 bed Cardiology ICU (CICU) who may require emergent airway management or who may be going to the ORs.

CVC ICU

The CVC ICU is a 24 bed unit where patients recovering from or requiring cardiac, thoracic, vascular operations will be cared for. There are approximately 1200 admissions/year to this unit. Patient and disease categories include post cardiectomy, major thoracic operations of the lung, esophagus, mediastinum, acute aortic dissections, the entire array of aortic and major vascular reconstructions, mechanical assist devices for acute and chronic heart failure including ventricular assist devices, total artificial hearts, ECMO, and transplantation of heart and lung.

The ICU is divided into two teams of residents, ICU Physician extenders (NPs & Pas) Intensivists as well as a complete compliment of ancillary medical providers. Fellows from Critical Care, Cardiac Anesthesiology and Cardiology compliment the teams. These two teams combine for night coverage with in-house call averaging every fourth night for residents.

SICU

The SICU is a 20 bed unit where patients from all the major branches of surgery are cared for. The SICU admits over 1500 cases/year. The SICU also accepts overflow patients from other adult ICUs including medical ICUs. The SICU team is comprised of both Anesthesiology and Surgery residents, fellows and faculty. There is always a junior and senior resident as well as an in-house fellow on call. In house call averages every fourth night.

III. Organizational Structure

The ICU staff intensivists (either anesthesiologist or surgeons) are responsible for the supervision, direction and coordination of clinical activities in the ICU. Patients admitted to the TICU/SICU continue to be under the care of the admitting surgeon/surgical services and there is the possibility for confusion regarding patient management to occur. In order to avoid confusion, all ICU orders other than highly specialized ones such as immunosuppression, specific wound management etc will only be written by the ICU team. It is vital that residents be completely up-to-date on their patients and be able to communicate effectively with surgeons and consultants. It is most important, however, to notify the ICU faculty or critical care fellow of any significant changes in a patient's condition. It is also our policy to notify the attending surgeon or surgical residents/fellow when any major change in a patient's status has occurred. Communication is absolutely key, if you have any doubts at all, CALL!!!!

The ICU attending is present in the ICU on a daily basis and is available at night by phone and pager. This coverage is provided on a weekly basis from Monday to Monday. In the CVC ICU, anesthesiology residents provide the majority of house staff coverage, with rotating cardiology, cardiac anesthesiology and critical care fellows providing some in-house coverage from time to time. Anesthesiology residents provide half the in-house coverage in the SICU with junior and senior surgery residents from a variety of services sharing the other half. Ideally, on-call teams in the SICU comprise an anesthesiology with a surgery resident. Critical Care fellows provide in-house coverage in the SICU and 24/7 beeper coverage in the CVC ICU. ICU Nurse Practitioners and Physician Assistants augment both day time work and night call 24/7 in the CVC ICU.

IV. Beginning the ICU Rotations

A. Pre-Rotation

1. The critical care coordinator (Ann Nadeau 936-7241) will contact you prior to your rotation to pick up education materials (ICU Orientation packet – this document & CVC ICU protocol Book) and be briefed on ICU expectations and procedures.
2. Check the relevant ICU Call schedule {generally created by Chief residents(CVC ICU) or Senior Surgery Resident (SICU) during prior month - SICU call schedule has predetermined Anesthesia and Surgery call days determined for the entire year}
3. Visit the ICU prior to your first day on the rotation. Ask one of the current ICU residents or physician extenders {NPs or PAs} to show you around and see how things work

B. Recommended Clinical and Education Materials for ICU Rotation

1. Stethoscope
2. Pen-light
3. Pocket pharmacopeia/clinical handbook; Tarascon, Epocrates, Washington Manual, Ferri's guide, MGH pocket Anesth, Sanford's guide to antimicrobial therapy
4. Note cards or some form of note taking pads/device

C. First Day in ICU

1. Pick-up your patients from Post-call resident (0645 or 0700 at latest).
2. Pre-rounds; evaluate events of previous night, current condition and plans for your patients. Discharge orders for patients scheduled to leave ICU-check with post-call resident.
3. Daily note for your patients (0645 to 0800).
4. Orientation prior to rounds (0800).
5. Morning Rounds {see times for morning rounds below}

D. Daily Schedule Note: these times are a general outline of the day in either CVC ICU or SICU. The actual times may vary a bit depending on work load and events which are occurring in the ICU.

0645-0800: Pre-rounds; discuss issues with surgical teams during their morning rounds; generate lists of surgery teams' concerns, plans, and suggestions.

0800-0820: X-ray rounds

0830-1130: Morning work-teaching rounds

1530-Afternoon work rounds

-----Other-----

Tuesday & Thursday 1100-1200: CA-2 & CA-3 Resident tutorials

Tuesday 1130-1230: SICU Critical Care journal club

Wednesday 1130-1300: SICU Core Lecture Series.

Thursday 0700-0800: Anesthesia & Surgery Weekly Grand Rounds.

E. Weekend/Holiday Schedule (post & On-call residents only)

0700-0800 Pre-rounds

0800 X-ray rounds

0815-1100 Work Rounds

V. Resident Responsibilities

1. It is expected that house staff arriving in the morning will:
 - review their patients previous nights' events with the on call resident.
 - pick-up new patients from the on-call resident {check ICU board for resident initials by patient's name}
 - review patient's course with the nurses
 - examine patients, record all relevant data from bed-side charts and CareWeb on a daily note sheet or CareWeb Work tool
 - formulate a general plan of action
 - prepare patients who are ready for discharge {discharge orders}
2. During daily rounds, the previous day's admissions are presented and further plans are devised.
3. Rounds will in general take about 3 hours.
4. The post-call resident is vital to efficient transmission of important clinical information from the previous day and night and therefore is required to be present for morning rounds. Team work is essential to help each other. You will all need each other during this rotation, and helping one another is critical.
5. There are no set 'rules' as to when residents should leave for the day. The post-call residents are the only ones who will leave after morning rounds or ICU Core Lecture. The ICU teams generally create a 'late resident' (this may be the pre-call resident if they do not have to be at morning rounds in the am when on call) If the ICU is very busy, all the other residents may stay late to help out, there is no set time for residents to leave.
House staff are required to sign-out to the on call resident prior to leaving the hospital for the day.
Please check with the On call resident or Attending prior to leaving especially if the ICU census is high or the team is busy, or if post-operative patients are expected in the late afternoon. There is an obvious balance between exposure to patients and events that can happen anytime during the day and just sitting around with nothing to do. Our desire is that you be exposed to as much clinical decision making as you can or use the time during the day to study critical care reading/education material.
6. **The purpose of afternoon rounds;....** is 2-fold. The first, is to evaluate the success with which the team has achieved the goals set out during morning rounds....The second, (pause) is to create a box (figuratively) in which the patient resides, such that any deviations outside that box will result in an *immediate phone call* to the fellow or faculty so that by morning rounds there are no surprises!!(you may be asked to recite this verbatim by one of the ICU faculty!). Evening rounds are also meant to review new admissions, plan for late admissions, possible problems expected during the night and to discuss bed availability and discharge plans for the next day.

VI. Call Schedules

A. CVC ICU:

House staff assigned to the CVC ICU rotation share in the daily work and night call. The on call team will begin their call days at 1130am in the ICU and can expect to finish call around 1130am the next day. It is expected that the call team review the issues and plans discussed during morning rounds, take over work from the post call team and be prepared for afternoon rounds. Ideally, the ‘late’ residents will be the team on call the next day as they do not have to arrive early in the morning of call. Weekend call teams will begin at the usual 0700 for morning rounds as there is only 1 daily rounds on weekends.

Interns and CA-2 residents will be on call, on average, every 4th night during their rotation. This ratio may vary somewhat depending on the number of residents, vacation schedules, and resident preferences i.e. some residents prefer to do a few every other night calls or to cover a weekend. All interns and residents will have 1 free weekend/month. Fellows from cardiology, cardiac anesthesiology will do some in-house call averaging 1 in 7 day i.e. 4 calls during a 4 week month. This may include one Friday and a Saturday during the month. During the occasional 5 week month there will be 5 calls. If there are holidays during the rotation {especially around Thanksgiving/Christmas} the total numbers of weekend call days may be more, though the proportions will stay the same.

The call schedules are currently made by one of the chief residents. In case of illness, the first attempt to find coverage is with another ICU resident, in order to be able to equitably distribute call among ICU house staff. In case of questions, notify the chief resident/resident who made the schedule. If there are persistent problems with the schedule, please see the program coordinator/director.

B. SICU:

House staff assigned to the SICU rotation share in the daily work and night call. The on call team will begin their call days at 0700 in the SICU and can expect to finish call around 1130am the next day. Post call residents will finish work rounds and have both the post call as well as the post-post call day off. Therefore, there will not be completely free weekends during the SICU rotation. Weekend call teams will begin at the usual 0700 for morning rounds as there is only 1 daily rounds on weekends.

CA-1s and CA-3 residents will be on call, on average, every 4th night during their rotation. This ratio may vary somewhat depending on the number of residents, vacation schedules, and resident preferences ie some residents prefer to do a few every other night calls or to cover a weekend. If there are holidays during the rotation {especially around Thanksgiving/Christmas} the total numbers of weekend call days may be more, though the proportions will stay the same.

The call schedules are assigned to either ‘Anesthesiology or Surgery’ every other day for the entire year. The administrative fellow or senior surgery resident from the previous SICU month will make the subsequent SICU rotation schedule. Residents may trade days with each other after this schedule is made. In case of illness it is expected that a SICU resident will cover for another SICU resident in order to be able to equitably distribute call among SICU house staff. In case of questions, notify the administrative fellow or chief residents.

VII. Pearls of Wisdom Pertaining to the CVC ICU Rotation

Managing CVC ICU patients in a shared model of critical care

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The UMHS CVC ICU is a shared model of critical care. This model offers opportunities for active care and input from multiple specialties: Critical Care, Cardiac surgery, Thoracic Surgery, Vascular Surgery and Critical Care – Anesthesia. This document creates understandings and principles and process for collaborative care between admitting surgeons and intensivists. This means that both the admitting surgeon and the intensivist team co-manage the care of the patient while in the ICU. This model of care can be very good, harnessing the talents and views of many people, but obviously poses challenges for how decisions are made, executed, and communicated between the two groups. The overriding theme is that the TICU/CVC ICU is a multidisciplinary collaboration of people from different medical disciplines; it is not ‘owned’ by any group or individual. Therefore, exceptionally good communication between attending surgeon and intensivist is expected. All attending faculty (Anesthesiology & Surgical) want and expect to be notified of significant deviations from the expectations set out when patients are admitted to the ICU or discussed each day.

A. Guiding principles:

1. Surgical patients who require ICU care are admitted under an attending surgical faculty who retain ultimate responsibility for their patients.
2. Daily clinical care should be directed and coordinated by an intensivist led critical care team. Data from multiple studies suggest that critical care provided by an intensivist improves outcomes and efficiency.
3. The ICU team should be led by an intensivist and include fellows, nurse practitioners (NPs), physician assistants, residents and medical students. Multidisciplinary rounds should always include the bedside nurse, the ICU pharmacist, respiratory therapist, nutritionist, and when possible, the charge nurse.
4. Ideally discussions between surgical and ICU faculty should occur at least once a day on all ICU patients whether in person, by page or phone call.
5. To avoid competing orders, confusion and possible mistakes, **the ICU team should write ALL standard ICU orders**. Admission orders should be written by the surgical team.
6. Physical presence and availability is one of the mechanisms whereby critical care teams improve outcomes. To that end, all efforts are to be made to have at least one member of the critical care team physically in the ICU at all times to respond to acute situations and to be available to communicate with surgical teams, consultants and families. Surgical teams should be able to find this person at all times with whom they can communicate goals and plans.
7. Highly specialized peri-operative care {VAD preparation, post-op VAD parameter settings, anticoagulation for devices/stents etc} as well as specific surgical related protocols {feeding after bowel/esophageal surgeries, wound management, drains and tubes etc} should be directed by and/or discussed with the surgical service to establish expectations and plans. Ideally, even these specialized orders primarily written by members of the ICU team under the direction of the surgical service.
8. Immunosuppression and other extremely specialized orders should be written by the surgical service members or specifically trained members of the ICU team such as the NPs to avoid miscommunication.

B. Guidelines for improving communication in ICUs

1. The first line of communication for any clinical problems is the ICU intensivist. If in doubt about whom to contact regarding a clinical issue, **call the intensivist first**.
2. If a surgeon is concerned about specific issues, i.e. bleeding, wounds, etc..., and asks to be notified about these, please communicate with them but the intensivist should also be notified. When significant clinical deviations occur, the intensivist and ICU team will discuss the issue and notify the surgeon of their plans. If a surgeon makes a change in clinical care, the intensivist needs to be made aware of this in a timely manner.
3. A member of the ICU team will always be available to communicate with surgical teams and consultants. While the critical care nurse practitioners, physician assistants and ICU fellow are excellent sources of continuity, the ICU faculty request attending to attending communication for significant concerns, plans and expectations.
4. The intensivist should be contacted by the surgical team directly to discuss unstable patients admitted emergently from the ED, the floor or another hospital.
5. Afternoon rounds will also include planning for the next day's bed needs and anticipated discharges. The ICU team will contact the surgical team to notify them of expected ICU transfers if these discussions have not already occurred during the day.
6. Significant deviations in the clinical course need to be communicated to the intensivist and surgical attending. These would include, but not be limited to new organ dysfunction or failure, addition of new vasopressors, significant bleeding, implementation of new life support or device (intubation, dialysis, etc).
7. All patient admissions, readmissions or deaths need to be directly communicated to the faculty intensivist and surgical attending either in person, by phone or text page.

Other CVC ICU issue:

1. As a resident in the ICU, please remember that ***you are a guest in the unit***, this is the home for the staff and nurses that work there.
2. Please take the time to get to know the staff. Nurses, techs, clerks and RT work together with the ICU service as a team. Don't hesitate to ask for information and or assistance.
3. The Clinical Nurse Specialist is a very good person for you to introduce yourself to. She is the primary person to go to in order to learn about nursing and other ICU protocols, questions regarding nursing care and any concerns you may have regarding how the ICU is performing (along with your faculty).
4. Nursing shifts in CVC ICU are generally 7 to 7. At the end of each of the shifts nurses will be finishing notes, charting as well as reporting off to the oncoming shift. They need to have the flow sheets and MARs for the process. Please try to avoid taking the flowsheets, MARs at the end of shift.
5. If you need to look at the flow sheet or MAR, please be considerate of the nurses and ask for it, don't simply take it, as they may be in the middle of charting information but looking up a physiology value or lab value from the monitor/computer.

6. All orders need to be written or co-signed if done verbally. If you simply tell medical staff to take a verbal order and don't sign it, you will lose that privilege very quickly and have to sign any order before it is carried out.
7. The medical staff/nurses are strongly encouraged to question medical orders/decisions that they do not understand or appear to be different than usual practice. Please respect this as a sign of excellent care, not a challenge. (Remember point #1). Please explain the reasoning behind your decisions i.e. things we discussed on rounds, the physiologic or pathophysiologic basis for the clinical intervention etc... If there is still a question, go up the chain of command. Over time, with more experience and with more people knowing you, this will probably be required less often.
8. It is imperative that you keep very clear lists of things to do (more experienced clinicians can help you w/ this vital task) and that you frequently refer to your lists, round on patients often, scan flow sheets and communicate deviations from expectations immediately. Do NOT rely on nurses or others to bring to your attention all changes in a patients' condition. Low urine outputs, increases in vasopressor use, slow rises or falls in critical hemodynamic values are the frequent reason for "why didn't anyone call me about this" in the morning.
9. Plans for the next day's bed needs will be discussed during afternoon rounds as well as first thing in the morning prior to morning rounds. Please bring to the charge nurse/NP/Fellow/Intensivist any issues that will affect the availability of beds for the scheduled cases/transfers.
10. BEFORE the intensivist team begins radiology report rounds, the ICU charge nurse and the intensivist will have a brief face-to-face meeting so the Charge Nurse may tell the attending any "urgent" patient care of family matters or bed availability issues. These are not emergency situations, which would be handled as true emergencies regardless of the timing of rounds. The morning ICU charge nurse must communicate with the night shift charge nurse and all of the day shift nursing staff before 0800 to ensure he or she knows of any urgent issues to communicate to the intensivist. An example of "urgent" situations may be the patient in room 10 who has been on flow-by since the surgeons rounded earlier in the morning and the patient is tiring. This patient may do better with an assessment and extubation before rounds start rather than waiting for the team to arrive at room #10 when he/she is really fatigued. There are other examples of patients the far corners of the ICU that might require a quick review of the chart and patient before rounds begin.
11. Examples of clinical issues that should prompt notification of TICU and/or cardiac surgery attending/fellow:
 - Cardiac Index < 1.8 on 2 consecutive readings or significant decreases in CI
 - DC cardioversion for hemodynamically significant rhythms
 - Chest tube output >200 cc/hr for 2 consecutive hours or >400 in 1 hour.
 - Significant new focal neurological findings
 - Urine output < 0.5 cc /kg /hr for 2 consecutive hours (ie <30 cc/hr for 2 hours)
 - Significantly increased CVP, hypotension and decreased urine output
 - Doubling of serum creatinine
 - Initiation of CPR
 - Reintubation
 - Withdrawal of support
 - Doubling of inotropes and /or when second inotrope is added
 - Lumbar drain – Sustained readings >18
 - Heart Transplant / LVAD patients – Sustained increase in CVP > 18

Assist Device Patients

 - Rising CVP >15 (volume overload vs right heart failure)
 - LVAD patients – decrease in flows < 3.5 L/ min or unexplained device alarms
 - Tandem Heart patients – loss of pulsatility of arterial line tracing
 - Heartmate II patients – pulsatility index consistently <2.0 or >4.5

VIII. TICU Triaging during High Occupancy & Overflow Processes

- Other than during extraordinary circumstances, the TICU team will manage no more than 17 patients among no more than three geographically separate ICUs. This number is at the discretion of the ICU intensivist and may be fewer depending on the acuity of the patients in the TICU and the personnel resources available.
- It is the role of the ICU team and the chief of adult cardiac surgery to administer the ICU in a way that all scheduled surgeries and transfers from outside institutions are able to be accommodated.
- When ICU beds are/will be filled and it is uncertain that either scheduled cases or transfers may not have a TICU bed, the TICU attending and individual CT/Vascular surgeons will evaluate current TICU patients to determine eligibility for Step-down, transfer to other service etc. (see patient classification below)
- If no General Care patients can transfer, contact SICU's charge nurse/fellow/attending to determine SICU bed availability.
- If no SICU beds, see grid below and Consult the UH Bed Manager (33159 M-F 8am- 6pm) or Nursing Services House Manager (pager 7136 all other hours) if unable to obtain a bed on the first overflow unit (SICU).
- If no ICU beds available, elective surgery will be deferred to accommodate the patients requiring immediate intensive care.
- The office of clinical affairs may be useful to help make bed accommodations to accept transfer patients, or to mediate issues of concern by the ICU team during periods of extremely high acuity and patient overflow into other ICUs.
- Telemetry patients follow similar overflow procedure.

<u>SERVICE</u>	<u>FIRST</u>	<u>1st OVERFLOW</u>	<u>2nd OVERFLOW</u>	<u>3rd OVERFLOW</u>
General Surgery	5D SICU	TICU/NICU	TBICU	CCMU/CICU
Neuro Surgery	4D NICU	SICU	TICU/TBICU	CCMU/CICU
STC/STG	4D TICU	SICU	NICU/CICU	CCMU
Trauma Burn SVC	TBICU	SICU	NICU/TICU	CCMU/CICU
Other Surgical Service	5D SICU	NICU	TICU/TBICU	CICU/CCMU
Otolaryngology	4D NICU	5D SICU	TICU/TBICU	CICU/CCMU
Critical Care Medicine	CCMU	CICU	SICU	NICU/TICU/TBICU
Cardiology	CICU	CCMU	TICU	SICU/TBICU/NICU
Neurology	NICU	CCMU/CICU	SICU	TICU/TBICU

****NOTE: STG patients who overflow to SICU will be managed by SCC (SICU) service. CTS patients will be managed by the SCC service on a case by case basis.***

Patient Acuity Classification

Class 1. Critically ill, ICU required

Examples:

- Patient is hemodynamically unstable; receiving IV medications that require continuous monitoring (e.g., Vasopressin, Norepinephrine, Propofol, Amiodarone, etc.).
- Patient who has an external temporary pacemaker or transcutaneous pacing pads who has no underlying heart rhythm and is pacemaker dependent.
- Patient with unstable angina.
- Patients awaiting AICD placement. Patients that have undergone implantation of an Automatic Defibrillator Lead or a Pacemaker Lead and are considered pacemaker dependent should be monitored for 12-24 hours after implantation.
- Patients that have been resuscitated from recent cardiac or respiratory arrest or those documented directly or indirectly to have a history of arrhythmias that put them at risk for cardiac arrest (e.g., sustained ventricular tachycardia, Mobitz type II heart block or greater, new onset high degree heart block, or new onset intraventricular conduction defects) within previous 72 hours.
- Patient who is not completely recovered from conscious sedation (refer to discharge criteria listed in the University of Michigan Hospitals and Health Centers Guidelines for the Use of Sedation Analgesia).
- Transfer of the critical patient to another intra-hospital ICU or inter-hospital transport.

Class 2. Intermediate care, low-risk monitor, Stable, frequent monitoring or extensive care required

Examples:

- a. Myocardial infarction suspected, continuous EKG
- b. Multiple injuries, EKG and frequent vital signs required
- c. Major operation in a patient at risk for organ failure
- d. Major wound care (packed open abdomen)
- e. Frequent tracheal suctioning required
- f. Patient who is hemodynamically stable and has a VAD, LVAD or other cardiac device.
- g. Patient who is on minimal cardiac medications or sedation.
- h. Patient still requires ventilatory support or has a difficult airway.
- i. Continuous EKG monitoring with central readout and alarm capability.
- j. Continuous EKG monitoring indwelling arterial and/or pulmonary artery catheter in a non-intubated hemodynamically stable patient.
- k. Continuous EKG monitoring, intravascular catheters, in a non-intubated patient who requires continuous infusion of vasoactive drugs, anti-arrhythmic drugs, fibrinolytic drugs, or other medications which currently mandate intensive care.
- l. Difficult ventilator weaning or chronic ventilator management in a stable chronic patient.
- m. No monitoring required but high nursing intensity (large difficult dressings, frequent suctioning, and frequent neurologic checks).
- n. No specific care required but at risk for physiologic complications because of age or conditions.

Class 3. Stable, no special monitoring required

Examples:

- a. Patients who are Class 3 status should be discharged from the ICU within 24-48 hours.
- b. Patient is General Care status, awaiting a bed placement.
- c. Patient is ambulating in CVICU and eating well.

Floor status: Stable patients in ICU because no general care beds are available.

- a. includes Class 3 patients who have been Class 3 > 48 hours

IX. Presentations and Electronic Documentation in the ICU.

1. There is a great deal of importance placed on accurately measuring and documenting the enormous amount of information for each patient in daily progress notes.
2. It is also an invaluable skill to be able to concisely present this information during work rounds, to other physicians and during phone calls.
 - Review the daily progress and admission note forms in the TICU Handout
 - In general present a patient by major physiologic systems;
 1. Start with a brief, one sentence bullet describing the ICU day/post op day and what was done to the patient or why they were admitted ex “This is ICU day 4, post op day 2 for this 87 yo man who had a-fib following a 2 vessel CABG.”
 2. Then state any significant 24 Hr. events from the previous day/night.
 3. The two most common methods to present the rest of the information is either;
 - go by major physiologic systems (Neuro, Cardiac, Resp, Renal, ID, GI, Endo, Others- including previous events, physical exam, vitals, bed-side chart and lab data followed by plan for each system
 - or-----
 - Review Vitals, hemodynamics, physical exam by system, labs, radiology, other studies then a plan for each system.

A. Creating an Electronic Work Sheet and Careweb Note in TICU/CVC ICU

Electronic work sheets and notes (admission and progress) are done in the UMMC CareWeb system. {note; Procedure notes are done either directly in centrlicity or CareWeb depending on wether the ICU faculty is Anesthesiology-Centricity, or Surgery –CareWeb}. Notes are generated from the Workflow tool created/maintained in the Inpatient Records section of CareWeb under the TICU Rounding List.

Each patient in the ICU will be part of the rounding list, and all updated information will be maintained in this list, from which notes will be generated after plans for each system/problem has been inputted. A method of doing this is described below, but prior to beginning your rotation in the ICU, familiarize yourself with this process by having a current ICU resident/NP show you how to do the following;

TICU/CVC DOCUMENTATION AND COMMUNICATION USING CAREWEB

Created 11-27-06, Author; Tracey Romans NP

- UMHS CareWeb system is used to generate rounding lists (sometimes called work flow tools), progress notes and admission notes.
- The rounding list provides a means of communication and quick reference for all team members. It is updated daily (at least) with information including labs, cultures, consultations, procedures, complications, studies, etc. Progress notes are also generated from this data base.
- Note that *procedure* notes are completed in Centrlicity for anesthesia faculty or CareWeb for Surgery Faculty.
- All TICU patients are members of the TICU list, which is a public list.
- Computer responsibilities are shared between NPs, residents and medical students. During rounds, one team member writes orders, another will update the rounding list and another will complete the progress note. This is a very flexible, collaborative process that is adapted depending upon staffing and unit conditions.

The following information was compiled for your reference. Additionally you will meet with a TICU resident or NP prior to your rotation for a demonstration of these procedures.

Add the “TICU LIST” to your personal lists.

1. In CareWeb, click on the yellow “Patient Lists” button on the left side.
2. At the bottom, click on the “Find Lists” button
3. Type in “TICU” for the list name and click on “Find Now”.
4. Click on the box next to “TICU” and then click on “Add List/s to my Lists”. The TICU list can subsequently be accessed by clicking on “Patient Lists”.
5. Note that the TICU list includes all STC patients, not just TICU patients. Do not delete any patients from the list.

Creating and Printing A TICU Rounding List

1. Click on the yellow “Inpatient Reports” button.
2. From the drop down box next to “Patient List Search,” select “TICU,” then click on “Search.”
3. Click on the boxes next to the names for all the patients in TICU North (4DN) and TICU South (4CI).
4. From the drop down box under “Select a Current Rounding List,” select CVC.
5. Click on “Produce Rounding List.”
6. In the boxes next to the names, type the numbers 1-14 according to the order in which the patients will be seen (i.e. beds 1-14).
7. Click on “View and print rounding sheets.”
8. Once that window finishes loading, right click inside that window and choose “Print.”
9. Select the number of copies to be printed.
10. Under “Preferences,” choose “Landscape,” then click “OK,” then click “Print.”

Updating the Rounding List

1. Repeat steps 1 and 2 as above.
2. Select the name/s of the patient/s you wish to update.
3. From the drop down box under “Select a Current Rounding List,” select the 3rd TICU from the list of 10
4. Click “Produce rounding list”.
5. Click directly on the patient name for which you wish to update information. Fill in the data as desired, remembering to click on “Update” to save all new data before navigating through other tabs. If you navigate to other parts of CareWeb while in Inpatient Reports, you will need to repeat some of these steps. This can be avoided by opening another CareWeb session and navigating between the two.

Subscribing to the TICU workgroup

1. Open CareWeb and click on the yellow “My Inbox” button, then click on the “Notifications” tab.
2. Click on the “Subscribe to Workgroup” button, then type “surg” in the box for Workgroup Name and click search. Check the box next to “SURG-TS-TICU” and click update. You are now a member of the TICU workgroup (congratulations!).

Saving the “Admission H&P Template” in your CareWeb.

1. Open CareWeb and select a patient.
2. Select “DOCUMENTS” from the menu on the left, then click on “Create Docs” from the tabs along the top.
3. Click on “New Template.”
4. In a new window, open the email with document templates, open the template Microsoft Word files, then highlight and copy the entire text for the “ADM HIST & PHYS.”
5. Go back to the CareWeb window and right click inside the big, white box that says, “Document Text,” and paste the H&P text that you just copied.
6. Now, at the top of the window, change the department to “ANES,” the service to “CCS,” and the doc type to “ADM HIST & PHYS”. The signer ID can be left blank as it will change according to who is your attending for the week.
7. Lastly, go to the bottom of the page and name your note as TICU Admit Note or whatever you like. Then click “Save Template”.
8. To edit a template that you have already created, select that template from the drop down box next to “Edit template.” Edit the template as desired then click “Save Template.”

Admitting a patient to TICU: Starting the rounding list and admit note

In general, we try to complete the rounding list and outline of the history and physical at least one day before patients are admitted to TICU. If time allows, looking up patients for the upcoming few days makes life easier when you might not have time to look up those patients later.

a) Add Patients to TICU List:

1. First you must log in to MorCare for the OR schedule. Sort by the “CARD” service and look at the appropriate date. Write down the registration numbers for the patients to be operated on that day.
2. Now open a CareWeb window. As these patients are not yet in the TICU, they will not be on the TICU list, so they must be added.
3. Click on the yellow “Patient Lists” button and then click on TICU list. Don’t check the box next to the word “TICU,” actually click on the word “TICU.”
4. Click the “Add” button at the bottom and enter the registration numbers for the new patients you just looked up in the OR schedule, hitting the enter key after each registration number. Then click “Add” to finish. Now that these patients have been added to the list, their info must be updated.

b) Update the Rounding List for New Patients

5. Complete steps 1-5 as described above under “Updating the rounding list”.
6. Most of the information that will be required can be found in the patient’s pre-op H&P, which can be found in CareWeb. To access it, open a new CareWeb window and find the patient’s pre-op H&P under that patient’s documents.
7. Fill in all of the boxes under the “History” tab by cutting and pasting from the H&P. Edit/delete as appropriate. The patient’s anticipated procedure can be entered under the “Notes” tab. Leave the procedure date blank, as the system will not let you put in a future date. Remember, though, to put in the correct date and update the procedure once the patient is admitted.
8. All pre-op studies should be included in the boxes under the “Studies” tab. It is important to at least include ECHO and Cath results if available. It is also good to include results from any EKG, CXR, CT, MRI, carotid dopplers, etc... if relevant.
9. Remember to click “Update” before navigating to any other tabs of the rounding list or to any other part of CareWeb.

c) Begin H&P

10. Open CareWeb and select a patient.
11. Select “DOCUMENTS” from the menu on the left, then click on “Create Docs” from the tabs along the top.
12. Click on the drop down box that says “My templates” and select template for Admit H/P.
13. For “Signer ID” at the top, fill in the doctor number for the ICU attending that week.
14. Fill in the blanks as necessary, making sure to delete any pre written text that is not relevant to your patient.
15. While working on your note, intermittently scroll to the bottom of the page and click on “Quick Save,” to ensure that you do not lose any unsaved work. Also quick save before you navigate to any other CareWeb page.
16. Opening a second session of CareWeb permits convenient navigation between the note and data that you need.
17. If you leave the screen containing your admit note, you can return to it by clicking “Documents” then “Create Doc” (if only a short time has elapsed) or via your Inbox. To access via your Inbox, click “My Inbox,” then click on the “Notifications” tab on the top right. If you ever think that you lost your note, it can most likely be found here. If you ever have to leave in the middle of typing a note, just click on “Quick Save” and the next time you log on to CareWeb, the note will be in your notifications inbox. As long as you have clicked “Quick Save” at least once while completing a note, it will be here.
18. When your note is complete, review it for accuracy.

19. Scroll to the bottom of the note and click on “Save and Forward.”
20. Fill in your doctor number for the “Provider #.”
21. Now click on the “My Favorites” button. For “Workgroup Name” type “surg” and click find.
22. Click the “Add” button next to “SURG-TS-TICU.” The TICU workgroup has now been added to your favorites list. Exit out of that window, and go back to the forward document screen.
23. Now you can select “SURG-TS-TICU” from the drop down box next to “Forward To:”
24. Once that is selected, click “Send/Go to Notifications.” The note has now been sent to the TICU Workgroup. The person who admits the patient will retrieve this note, complete it and submit it has his or her own.
25. To view notes that are in the TICU Workgroup inbox, go to your “Inbox”, and then click “Notifications”. Click on the drop-down box next to Owner and select SURG-TS-TICU. You are now viewing the contents of the TICU Workgroup inbox. Notes here are accessible by all. Notes in your own Notifications are viewable only by you. Notes that have been sent to “Edit/Sign” are published in CareWeb and viewable by anyone with access to CareWeb.

Moving Admit H&Ps Out of the TICU Workgroup Inbox

1. If you are admitting a patient for whom the Admit H&P has already been started, you will need to retrieve that note from the TICU Workgroup.
2. Access the workgroup by clicking “Inbox”, then “Notifications”, then clicking “SURG-TS-TICU in the drop-down box under “Owner”.
3. Click on the box next to the note that you would like to transfer, then click on the box that says “Move to My Notifications.”
4. Return to your Inbox/Notification, and select your name from the drop-down box next to Owner. From your own inbox, the note can be opened and edited as you like and will not be forwarded back to the TICU Workgroup.
5. When the note is complete, click on “Send to Edit/Sign” at the bottom of the note. An information summary box will pop up on the screen. Verify that the information is correct, and then click “OK.” After 15-20 minutes, the note can be found in your inbox under the “Edit/Sign” tab. It will also appear in the “signer’s” box (your attending). Once in your edit/sign box, the note needs to be reviewed and signed by you. Any changes you make to the note while in your edit/sign box will also be reflected in the note in the attending’s inbox, UNTIL it is signed by the attending. Once the note has been signed by the attending, changes can only be made by him with an addendum.

* **Note for medical students:

All medical student notes should have the medical student’s addendum at the bottom of the note. The addendum is as follows:

The above note was scribed for me by Medical Student <____>. I, <____> MD, personally obtained the complete History of Present Illness, performed the Physical Exam and formulated the Medical Decision Making. The documentation as annotated and corrected is mine.

--Med Student Name --, M3 or M4

The Signer ID on the note should be the attending and the Reviewer ID should be the resident to whom you are going to forward the note. When the note is complete, review it for accuracy and click “Save and Forward.” The Provider # is supposed to be the doctor number of the person sending the note, but since medical students do not have numbers, the student can fill in the number of the resident to whom they are sending the note. The provider # cannot be left blank. The student must also fill in who the note will be forwarded to. In the box to the right of “User (username),” the student should fill in their resident’s username. If the username is not known, it can be looked up by clicking the “Find” button and searching by name. The student should inform their resident that the note has been sent and that it needs to be signed.

Creating a Progress Note

Daily progress notes are drawn from information in the rounding list. They are usually completed during rounds.

1. Click on the yellow “Inpatient Reports” button.
2. From the drop down box next to “Patient List Search,” select “TICU,” then click on “Search.”
3. Click on the box next to the desired patient.
4. From the drop down box under “Select a Current Rounding List,” select the 3rd TICU from the list of 10.
5. Click on “Produce Rounding List.”
6. Click “document” on the far right side of the screen.
7. You will see that various elements of the progress note are checked; review this list, then click draft.
8. The note will be drafted and will subsequently be available in your Inbox under “Notifications” (click “quick save” at least once, and at regular intervals as you are completing the note).
9. Review/edit department, “service”, note type, signer, reviewer and date.
10. Enter data into your progress note as appropriate, reviewing the automatically entered data for accuracy and relevance.
11. When the note is complete, click “send to edit/sign”.
12. The note will appear in your Edit/sign box 15-20 minutes later. See number 5 under “Moving admit H&P”.

Editing/Deleting Notes

If after opening a note, you no longer want to keep that note, click on either of the “Cancel” buttons at the bottom of the note. If the note has already been saved, clicking “Cancel” will negate any changes you have made since the note was last saved, but it will not delete the note. (Keep in mind that notes auto-save every few minutes, so that even if you don’t click the save button, the note *may* still be in your notifications inbox.) If you would like to delete a note on which you are working, click on either of the “Delete” buttons at the bottom. Notes can be deleted from your notifications inbox by clicking on and opening that note, then clicking on either of the “Delete” buttons at the bottom.

X. Surgical Critical Care (SCC) Organization, Resident Schedule and Responsibilities/ Expectations while rotating in the SICU

The SICU functions as a closed unit model (with collaborative care provided by both the SCC team and primary surgical service) initiated on July 7, 2005. The SCC service (including SCC attending, two SCC fellows and 4 SCC residents – surgery (PG-Y 2&3, and anesthesiology (PG-Y 2 & 4) will be responsible for the clinical care of all patients admitted to the SICU. Clinical care will, however, be rendered in a collaborative model together with the primary surgical service.

- All orders will be written by the SCC team
- If the primary team desires specific orders, they should communicate with the SICU team
- Any significant change in patient’s clinical status will be communicated directly to the primary surgical team (Senior Resident, Fellow) by the SCC team (SCC attending, fellow or resident).
- No procedures will be performed on SCC patients (except for emergent intubation, emergent or routine venous or arterial access) without the knowledge of the primary surgical team.
- The SCC Fellow will communicate daily (0700-0800am) with the Transplant and Vascular Surgery Fellows regarding the care of these complex patients and establish a treatment plan.
- Every effort will be made to round jointly with the primary surgical team at established times if so desired by the primary surgical team

- SCC Attending and Fellows will be available at all times to discuss patient care issues
- SCC Fellow office is Room 5714, adjacent to SICU Nurse Manager office.
- Admitting orders to the SICU for patients coming from the OR will be written by the primary surgical team. For patients directly admitted to the SICU (ED, transfers) the SCC team will write admission orders if the primary surgical team requests.
- Patient discharge will be decided jointly with the SICU and primary surgical team. Upon patient discharge, the SCC team will review the SICU course with the accepting resident.
- Patients that die in the SICU will have death summaries dictated by the SCC team

SCC Resident Call and Coverage

- Residents will take call every fourth night.
- Surgery and Anesthesiology alternate on-call every other night.
- The on call resident will arrive in the SICU at 8am for AM rounds. They will not have any patients to “pick up.” They will not pre-round. Their job will be to keep track of all work items for the day. They will be personally responsible for completion (or delegation) and follow-up on all patient care activities for the day. They will ultimately write notes on new admissions that day.
- The post-call resident will stay for morning rounds with the team. They are dismissed at the conclusion of rounds. They are not expected to stay to do work, but they must complete their notes/documentation before departure.
- The person who is “post-post call” will have a day off. This will result in 7 days off per resident per month. Residents should be happy with 7 days off.
- The person who is “pre-call” or the “wedge” should arrive at 6AM to pre-round – this will allow you enough time before rounds to appropriately assess your patients. You are expected to examine patients, obtain all clinical information, and present a cohesive plan for the day on rounds. The “wedge” resident should stay until the conclusion of evening rounds. If the on call person is a surgeon, then the pre-call person will necessarily be an anesthesiologist, and vice-versa.

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
On-call	S-1	A-1	S-2	A-2	S-1	A-1	S-2
Post-call		S-1	A-1	S-2	A-2	S-1	A-1
Off			S-1	A-1	S-2	A-2	S-1
Wedge				S-1	A-1	S-2	A-2

SCC Resident Responsibilities/Expectations

1. The SICU Resident is responsible for the daily care of all patients in the SICU.
2. Please communicate with primary surgical team daily (in A.M. prior to rounds if possible) to coordinate collaborative care of the patient in the SICU. The primary surgical teams round in the SICU in the early morning.
3. Communicate all procedures or major changes in care to primary surgical team, before being done, if possible.

4. Within the SCC service, to the extent possible, communicate all decisions and orders to the resident assigned to care for that patient, especially if it is something substantially different from the plan delineated on rounds.
5. It is paramount to maintain professionalism in your interactions with all staff in the SICU. It is always appropriate to introduce yourself to those you work with whenever feasible. Please introduce yourself to the SICU nurses and other SICU staff including respiratory therapy and pharmacy. They are all an important part of our surgical critical care team.
6. This is a busy clinical service with lots of time spent rounding and reviewing clinical data (x-rays, labs); therefore it is paramount that you use your time efficiently.
7. Morning rounds in the SICU are as follows:

Weekday morning rounds:	8:00am – start in Radiology PACS room to review morning x-rays
Thursday morning rounds:	9:00am – after Grand Rounds, M&M, (no surgical residents)
Weekend morning rounds:	8:00am
8. Presentations on SCC morning rounds must be complete and concise. The entire SCC team needs to hear the information presented, so please speak clearly. Presentations are to be made in the following format:
 - a. Events of the last 24 hours (presented by the on-call resident)
 - b. ICU or Postop Day #, procedure performed or diagnosis
 - c. T-max, T-current, vitals, 24-hour intake/output (including NGT, stool, drains, tubes)
 - d. Physical examination
 - e. List of current medications
 - f. Plan by systems: Neuro, Cardiac, Pulmonary, GI, GU, ID, FEN, Prophylaxis (DVT, GI)
 - g. PLEASE do not deviate from this format, and do not interject “plan” into portions of the physical exam, for example. We will not interrupt the resident during presentation, until the “plan” portion of each presentation. SCC Attending or Fellow may interrupt for education.
9. Attend SCC educational conferences on Tuesday, Wednesday and Thursdays at 11:30am-1:00pm.
10. Write daily system based notes on each of your assigned patients. There is a template in CareWeb for Adult Surgical Critical Care that is preferred. If a patient is not to be followed beyond the am, a note need not be written. Note should be thorough, but not windy. Be careful when cutting and pasting to delete no longer relevant information. Please do not continue to carry forward every detail. Adequate notes are important, but are not to detract too much time from giving care. Be brief where possible.
11. All procedures that are performed (including central venous and arterial lines) require a procedure note in CareWeb. The note must be forwarded to the SICU Attending for signature.
12. There are line carts available for insertion of all central venous lines and arterial lines. All central venous lines must be inserted with full sterile technique (gown, mask, cap, gloves, and large sterile drape). All personnel in the room while these lines are being inserted must wear a mask.
13. Transfer orders, stating to transfer the patient to the floor/tele/etc should be written by the SCC service after conferring with the primary team that transfer is appropriate. Both the SCC and primary surgical team must agree that the patient can be transferred out of the SICU.
14. Once a patient is floor status, the SCC resident must communicate (“sign-out”) with the primary surgical team resident to be certain that they are aware of all current issues. The primary surgical team will assume care for the patient, even if the patient remains in the SICU due to lack of availability of a surgical floor bed.
15. All admissions must be communicated to the SCC fellow regardless of time or acuity. If the fellow does not respond, inform the SCC attending of the admission.

16. It is expected that we will facilitate good relations between the primary team and patient family members. Communicate with families, and assure the primary team is aware of all “issues.”
17. When in doubt, ask. Ask the SCC Fellow, ask the SCC Attending. You will never get in trouble for asking.

SCC Fellowship: ACGME approval for 6 fellows, 5 fellows for 2005-2006

Graduated Fellows;
 Paul Maggio MD-Sept 2005
 Martin Spoor MD-July 2006

SCC Fellow Responsibilities:

1. The SICU Fellow is responsible for direct oversight of resident staff in the care of patients and in the performance of all procedures. SCC Fellow office is Room 5714.
2. The SICU Fellow is to perform an independent assessment of each patient which is admitted to the SICU, and develop a plan of care for each individual patient.
3. The SICU Fellow communicates each morning with the Transplant and Vascular Surgery fellows to provide coordinated care of these complex patients.
4. The SICU Fellow also assists in communication with the primary teams in three specific circumstances:
 - a. When patient condition deteriorates and new treatments are instituted.
 - b. When condition changes and diagnostic studies are necessary to determine etiology.
 - c. When the resident has been unable to adequately clarify issues which are of concern.
5. SICU Fellow night call responsibility alternates between the two SICU Fellows:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
F-1	F-1	F-2	F-2	F-1	F-1	F-1
F-2	F-2	F-1	F-1	F-2	F-2	F-2

The SICU Fellow is responsible for evaluation and initiation of critical care to patients in the PACU during off hours (nights and weekends) if they become unstable. The SICU Fellow is to contact the SICU Attending to inform them of this change in patient condition.

Neuro-ICU, CCMU, CCU and other medical patients may “overflow” to the SICU; these patients are cared for by their primary critical care service.

SCC Attending Responsibilities:

1. The SICU attending (surgery or anesthesiology staff) is ultimately responsible for all care rendered to patients in the SICU. A surgeon will always provide backup to anesthesiology SICU attendings for surgical procedures required in the SICU.
2. Prior to starting morning rounds, the SICU Attending and the SICU fellow who was on the night before will decide which patients are likely stable for transfer out of the SICU to the floor. Immediately after morning rounds, the SICU Attending or the SICU Fellow will discuss with the charge nurse the final plans for which patients are to be transferred out, which patients are accepted for admission to SICU, and prioritization of which patients are to be admitted first. This will be written on the SICU board for clarification.
3. The SICU Attending is responsible for communication between the SCC and primary surgical teams when there is confusion or controversy that cannot be reconciled between the resident and fellow teams.

XI. Education Goals, Objectives & Evaluation policy of the ICU Rotations

The Goals and objectives of the University of Michigan Critical Care Training Program are based on the Guidelines for critical care medicine training and continuing medical education developed by the American College of Critical Care Medicine {Crit. Care Med. 2004;32:263-272}. On completion of an ACGME-approved graduate education program in a clinical specialty of medicine such as anesthesiology, each resident physician will have developed a measurable quantity of knowledge, learned a set of observable skills, demonstrated adequate decision making, and possess a caring and compassionate attitude for patients who are critically ill. Attainment of these goals is not to be necessarily misconstrued as conveying the ability to be an independent practitioner for critically ill or injured patients. Specifically, on completion of an ACGME-approved graduate education program, each resident physician will be able to perform the following:

General Goals of the Critical Care Rotations:

Medical Student:

1. Familiarize yourself with the cognitive and procedural skills necessary to provide optimal care to patients admitted to an Intensive Care Unit and/or patients with severe physiologic derangements in the perioperative setting.
2. Gain experience with acquiring and presenting clinical data through the direct management of hospitalized patients.

Anesthesia Intern & CA-1 Level:

1. Develop the cognitive and procedural skills necessary to provide optimal care to patients admitted to an Intensive Care Unit and/or patients with severe physiologic derangements in the perioperative setting.
2. Achieve proficiency in the acquisition and presentation of complex clinical data for groups of patients.
3. Achieve proficiency in the recognition and management of problems commonly encountered in the ICU.
4. Gain experience with longitudinal care for patients with complex medical conditions.

CA-2 & CA-3 Level:

1. Refine proficiency in the recognition and management of problems commonly encountered in the ICU.
2. Refine ability to provide longitudinal care for cohorts of patients with complex medical conditions.
3. Gain experience with the supervision of a team of health care providers; ie medical students, residents, nurses, respiratory therapists etc.
4. Develop more sophisticated knowledge of critical care principles, monitoring and therapeutic technologies, and specifically improved understanding of peri-operative management for cardio-thoracic patients.
5. Provide opportunities to develop teaching and research skills.

Specific Goals and Educational Objectives;

Clinical.

1. Identify when a patient requires treatment best delivered in an ICU under the direction of a qualified intensivist.
2. Diagnose and stabilize patients with impending organ failure (respiratory, cardiac, neurologic, hepatic, gastrointestinal, hematologic, renal, etc.).
3. Identify the need for and initiate cardiopulmonary resuscitation
4. Diagnose and prevent hemodynamic instability and/or initiate treatment for cardiogenic, traumatic, hypovolemic, and distributive shock.
5. Identify and initiate treatment for life-threatening electrolyte and acid-base disturbances.
6. Use data from appropriate invasive and noninvasive monitoring devices to titrate therapy in an ICU.
7. Understand basic infection control techniques.
8. Understand basic nutrition support principles.
9. Understand basic sedation and analgesia principles.
10. Understand basic concepts of therapeutic decision making and medication safety.
11. Consider ethical issues and patients' wishes in making treatment decisions including end of life and quality of life issues.

Administrative.

1. Communicate effectively with families and all members of the healthcare team about ICU capabilities and patient-specific issues.
2. Communicate with and support patients, their families, and all members of the healthcare team through the physical and psychological complexities of critical illness.
3. Seek consultation, when appropriate, with specialty physicians in managing complex ICU problems.
4. Recognize, use, and help integrate the unique skills of ICU nurses and ancillary personnel in caring for critically ill patients into the multiple-professional team model.
5. Maintain good relationships with other healthcare providers.
6. Understand the need for patient safety monitoring and error reduction strategies.
7. Familiarize with compliance with institutional and unit policies and procedures as well as regulatory policies from accreditors, regulators, and payers.

Technical Skills;

In addition to practical training in the following procedural skills, the resident must have an understanding of the indications, contraindications, complications, and pitfalls of these interventions. Due to the variability of individual training programs, practical experience may be limited for some procedures.

- A. Airway Management
 - a. Maintenance of an open airway in the nonintubated patient
 - b. Ventilation by bag-mask
 - c. Tracheal intubation including use of specialized airway techniques including LMAs, Bougies, Light Wands, Fiberoptic intubation as well as Airway issues unique to critical care (tracheostomy management)
 - d. Management of pneumothorax
- B. Circulation
 - a. Arterial puncture and cannulation
 - b. Insertion of central venous catheters including temporary dialysis catheters
 - c. Pulmonary artery catheterization
 - d. Temporary transvenous pacer catheters
 - e. Dynamic electrocardiogram interpretation
 - f. Cardioversion and defibrillation
 - g. Transcutaneous pacing
 - h. Electrocardiographic monitoring
 - i. ACLS Algorithms and managing acute 'code' situations as the ICU code team leader

----Additional Procedures----

- j. Thoracentesis
- k. Paracentesis
- l. Bronchoscopy
- m. Pericardiocentesis in acute tamponade
- n. Opening a fresh sternotomy during a post cardiac 'code' situation

XII. Evaluation Policy for Anesthesiology Residents participating in the critical care training program

The Core Curriculum will promote a broad educational objective based on the content including the ACGME Core Competencies: a. Practice-Based Learning & Improvement b. System-Based Practice c. Patient Care d. Medical Knowledge e. Interpersonal and Communication Skills f. Professionalism.

Critical Care Faculty Assessment of Anesthesiology Critical Care Medicine Fellows

The following questions will be used to provide a means for the critical care faculty, and others an opportunity to evaluate the Anesthesiology Residents in several clinical, interpersonal and administrative ‘competencies during their critical care rotations. The 6 competencies with brief descriptions are meant to define the specific knowledge, skills, attitudes and behaviors that we expect our residents should master by the end of their training. These evaluations will serve as data with which the anesthesiology program director will use to counsel the residents. The evaluations will be done at the end of the month in the Anesthesiology Centricity Evaluation system for Anesthesiology residents and the Med-Hub system for non-anesthesiology residents/fellows.

1. Is the resident’s **Patient Care** compassionate, appropriate and effective?
2. How would you rate the resident’s current state of their **Medical Knowledge** and their ability to apply it to patient care?
3. How do you consider the resident’s **Medical Knowledge** to be progressing?
4. Please rate the resident’s **interpersonal and communication skills**; do they effectively acquire and exchange information with the health care team, families and the patients’ themselves?
5. Is the resident demonstrating appropriate **professional attributes** such as their appearance, behavior during difficult moments. Do they demonstrate ethical and/or culturally sensitive behavior?
6. Does the resident assimilate information regarding their clinical **practice**, the practice of the team, and **evidence based** information to improve their practice?
7. Does the resident demonstrate **a health systems-based awareness** of how their ICU practice fits into the larger medical system including using the medical center’s resources to deliver optimum care, such as managing limited ICU resources, arrainging transfers, accommodating emergency admissions etc.?

*****Resident Evaluations of the Critical Care Rotations and Faculty**

It is required that residents evaluate both the ICU faculty as well as the specific rotations, ideally by the week or month using the Anesthesiology Centricity Evaluation tool. We, the faculty, are extremely interested in your feedback and take your evaluations and comments very seriously. We will modify and work to improve the education and work environment as well as tailor the education to specific rotations and level of residents based on feedback. These evaluations will also help the Department Chair and Program Director better direct their efforts to improve the education and work environment.

XIII. Critical Care Knowledge Content List

Acquisition of the following cognitive skills by trainees could be ensured by the critical care faculty through the use of any of a number of techniques, including didactic lectures, journal club sessions, and illustrative case reports.

A. Cardiovascular Physiology, Pathology, Pathophysiology, and Therapy

- i. Shock (hypovolemic, neurogenic, septic, cardiogenic) and its complications
- ii. Myocardial infarction and its complications
- iii. Cardiac rhythm and conduction disturbances
- iv. Indications for and types of pacemakers
- v. Pulmonary embolism—thrombus, air, fat, amniotic
- vi. Pulmonary edema—cardiogenic, noncardiogenic
- vii. Cardiac tamponade and other acute pericardial diseases
- viii. Acute and chronic life-threatening valvular disorders
- ix. Acute aortic and peripheral vascular disorders, including arteriovenous fistulas
- x. Acute complications of cardiomyopathies and myocarditis
- xi. Vasoactive and inotropic therapy
- xii. Pulmonary hypertension and cor pulmonale
- xiii. Complications of angioplasty
- xiv. Principles of oxygen transport and utilization
- xv. Hemodynamic effects caused by ventilatory assist devices
- xvi. Thrombolytic and anticoagulant therapy
- xvii. Perioperative management of patient undergoing cardiovascular surgery
- xviii. Recognition, evaluation, and management of hypertensive emergencies and urgencies
- xix. Congenital heart disease and the physiologic alterations with surgical repair

B. Methods of cardiac output assessment

- i. (i.e., aortic Doppler, indicator dilution techniques, etc.)
- ii. Invasive hemodynamic monitoring
- iii.a. Principles of strain gauge transducers
 - b. Signal conditioners, calibration, gain, adjustment
 - c. Display techniques
 - d. Principles of arterial, central venous, and pulmonary artery pressure catheterization and monitoring
 - e. Assessment of cardiac function and derived hemodynamic variables
- iv. Noninvasive hemodynamic monitoring

C. Respiratory Physiology, Pathology, Pathophysiology, and Therapy

- i. Acute respiratory failure
- ii. a. Hypoxemic respiratory failure including acute respiratory distress syndrome
- b. Hypercapnic respiratory failure
- c. Acute on chronic respiratory failure
- iii. Status asthmaticus
- iv. Smoke inhalation, airway burns
- v. Aspiration
- vi. Chest trauma (e.g., flail chest, pulmonary contusion, rib fractures)
- vii. Bronchopulmonary infections including bronchiolitis
- viii. Upper airway obstruction
- ix. Near drowning
- x. Bronchopleural fistulas
- xi. Pulmonary mechanics and gas exchange
- xii. Oxygen therapy
- xiii. Hyperbaric oxygenation
- xiv. Respiratory monitoring (airway pressure, intrathoracic pressure, tidal volume, pulse oximetry, dead-space/ tidal volume ratio, compliance, resistance, capnography, pneumotachography)
- xv. Metabolic monitoring (oxygen consumption, carbon dioxide production, respiratory quotient, indirect calorimetry)

- D. Mechanical ventilation
- i. Pressure and volume modes of mechanical ventilators
 - ii. Positive end-expiratory pressure, intermittent mandatory ventilation, continuous positive airway pressure, high-frequency ventilation, inverse ratio ventilation, pressure-support ventilation, volume support (airway pressure release ventilation, pressure-regulated volume control ventilation), negative pressure ventilation, differential lung ventilation, pressure control and noninvasive ventilation, split lung ventilation, one-lung ventilation
 - iii. Indications for and hazards of mechanical ventilation
 - iv. Barotrauma and volutrauma
 - v. Criteria for extubation and weaning techniques
 - vi. Extracorporeal membrane oxygenation
 - vii. Permissive hypercapnia
 - viii. Liquid ventilation
 - ix. Pulmonary surfactant therapy
 - x. High-frequency oscillatory ventilation
 - a. Nitric oxide and prostaglandin therapies
 - b. Noninvasive ventilation
 - c. Ventilatory muscle physiology, pathophysiology, and therapy, including polyneuropathy of the critically ill and prolonged effect of neuromuscular blockers
 - d. Positional therapy (i.e., prone position, rotational therapy)
- E. Airway maintenance
- i. Emergency airway management
 - ii. Endotracheal intubation
 - iii. Tracheostomy, open and percutaneous
 - iv. Long-term intubation vs. tracheostomy
- F. Pleural diseases Empyema
- i. Pleural effusion
 - ii. Pneumothorax
 - iii. Hemothorax
- G. Pulmonary chylothorax, hemorrhage, and hemoptysis
- H. Renal Physiology, Pathology, Pathophysiology, and Therapy
- i. Renal regulation of fluid balance and electrolytes
 - ii. Renal failure: Prerenal, renal, and postrenal
 - iii. Derangements secondary to alterations in osmolality and electrolytes
 - iv. Acid-base disorders and their management
 - v. Principles of renal replacement therapy and associated methodologies (hemodialysis, peritoneal dialysis, ultrafiltration, continuous arteriovenous hemofiltration, and continuous veno-venous hemofiltration)
 - vi. Interpretation of urine electrolytes
 - vii. Evaluation of oliguria
 - viii. Drug dosing in renal failure
 - ix. Rhabdomyolysis
 - x. Systemic diseases that involve the kidney (thrombotic thrombocytopenic purpura, hemolytic uremic syndrome)
- I. Central Nervous System Physiology, Pathology, Pathophysiology, and Therapy
- i. Coma
 - ii.
 - a. Metabolic
 - b. Traumatic
 - c. Infectious
 - d. Mass lesions
 - e. Vascular-anoxic or ischemic
 - f. Drug induced
 - g. Assessment and prognosis

- iii. Hydrocephalus and shunt function and dysfunction
- iv. Psychiatric emergencies
- v. Perioperative management of patient undergoing neurologic surgery
- vi. Brain death evaluation and certification
- vii. Diagnosis and management of persistent vegetative states
- viii. Management of increased intracranial pressure, including intracranial pressure monitors
- ix. Status epilepticus
- x. Neuromuscular disease causing respiratory failure
- xi.
 - a. Guillain-Barré
 - b. Amyotrophic lateral sclerosis
 - c. Myasthenia gravis
 - d. Myopathies (Duchenne's, etc.)
 - e. Neuropathy of critical illness
- xii. Traumatic and nontraumatic intracranial bleed
- xiii.
 - a. Subarachnoid
 - b. Intracerebral
 - c. Epidural
 - d. Others (subdurals)
 - e. Traumatic brain injury
 - f. Axonal shear injury
- xiv. Conscious and deep sedation
- xv. Pain management: Intravenous, oral, transdermal, and regional and axial
- xvi. Neuromuscular blockade: Use, monitoring, and complications
- xvii. Central nervous system brain monitoring (intracranial pressure, cerebral blood flow, cerebral metabolic rate, electroencephalogram, jugular venous bulb oxygenation, transcranial Doppler)

J. Metabolic and Endocrine Effects of Critical Illness

- i. Colloid osmotic pressure
- ii. Nutritional support
- iii.
 - a. Enteral and parenteral
 - b. Evaluation of nutritional needs including indirect calorimetry
 - c. Immunonutrition and specialty formulas
- iv. Endocrine
- v.
 - a. Disorders of thyroid function (thyroid storm, myxedema coma, sick euthyroid syndrome)
 - b. Adrenal crisis and insufficiency (primary and secondary)
 - 1. adrenal insufficiency in sepsis.
- vi. Disorders of antidiuretic hormone metabolism
- vii. Diabetes mellitus
- viii. Ketotic and nonketotic hyperosmolar coma
- ix. Hypoglycemia
- x.
 - e. Pheochromocytoma
 - f. Insulinoma
 - g. Disorders of calcium, magnesium, and phosphate balance
- xi. Electrolyte disorders including Na, K, Mg, Ca, PO₄ .
- xii. Glucose management

K. Infectious Disease Physiology, Pathology, Pathophysiology, and Therapy

- i. Antibiotics
- ii.
 - a. Antibacterial agents including aminoglycosides, penicillins, cephalosporins, quinolones, and newer emerging classes of antibiotics
 - b. Antifungal agents
 - c. Antituberculosis agents
 - d. Antiviral agents
 - e. Agents for parasitic infections
- iii. Infection control for special care units

- iv. a. Development of antibiotic resistance
- b. Universal precautions
- c. Isolation and reverse isolation
- v. Anaerobic infections
- vi. Sepsis definitions (sepsis, severe sepsis, septic shock)
- vii. Systemic inflammatory response syndrome
- viii. Tetanus
- ix. Hospital-acquired and opportunistic infections in the critically ill
- x. Adverse reactions to antimicrobial agents
- xi. ICU support of the immunosuppressed patient
- xii. a. Acquired immunodeficiency syndrome
- b. Transplant
- c. Oncologic
- xiii. Infectious risks to healthcare workers
- xiv. Evaluation of fever in the ICU patient
- xv. Biological modifiers (activated protein C, tissue factor, etc.)
- xvi. Mechanisms of antibiotic resistance

L. Physiology, Pathology, Pathophysiology, and Therapy of Acute Hematologic and Oncologic Disorders

- i. Acute defects in hemostasis
- ii. a. Thrombocytopenia/thrombocytopeny
- b. Disseminated intravascular coagulation
- iii. Anticoagulation; fibrinolytic therapy
- iv. Principles of blood component therapy
- v. a. Packed red blood cell transfusions
- b. Fresh frozen plasma transfusions
- c. Platelet transfusions
- d. Cryoprecipitate transfusions
- e. Specific coagulation factor concentrates
- f. Albumin, plasma protein fraction
- g. Hemoglobin substitutes
- h. Pharmacologic agents that modify the need for transfusion (i.e., aminocaproic acid, aprotinin)
- i. Erythropoietin
- vi. Acute hemolytic disorders including thrombotic microangiopathies
- vii. Acute syndromes associated with neoplastic disease and antineoplastic therapy
- viii. Sickle cell crisis and acute chest syndrome
- ix. Plasmapheresis
- x. Prophylaxis against thromboembolic disease
- xi. ICU-acquired anemia

M. Physiology, Pathology, Pathophysiology, and Therapy of Acute Gastrointestinal, Genitourinary, and Obstetrical-Gynecologic Disorders

- i. Acute pancreatitis with shock
- ii. Upper gastrointestinal bleeding, including variceal bleeding
- iii. Lower gastrointestinal bleeding
- iv. Acute and fulminant hepatic failure
- v. Toxic megacolon and pseudo-obstruction syndromes (i.e., Ogilvie's)
- vi. Acute perforations of the gastrointestinal tract
- vii. Ruptured esophagus
- viii. Acute inflammatory diseases of the intestine
- ix. Acute vascular disorders of the intestine, including mesenteric infarction
- x. Obstructive uropathy, acute urinary retention
- xi. Urinary tract bleeding
- xii. Toxemia of pregnancy, amniotic fluid embolism, HELLP (hemolysis, elevated liver function tests, and low platelet count) syndrome, ovarian hyperstimulation
- xiii. Hydatidiform mole
- xiv. Perioperative management of surgical patients

- xv. Stress ulcer prophylaxis
- xvi. Drug dosing in hepatic failure
- xvii. Acalculous cholecystitis
- xviii. Postoperative complications including fistulas, wound infection, and evisceration
- xix. Placenta previa and abruption
- xx. Peripartum cardiomyopathy

N. Environmental Hazards & Drug overdose and withdrawal

- i. a. Barbiturates
- b. Narcotics
- c. Salicylates
- d. Alcohols
- e. Cocaine
- f. Tricyclic antidepressants
- g. Acetaminophen
- h. Others
- ii. Temperature-Related Injuries
- iii. a. Hyperthermia, heat shock
- b. Hypothermia, frostbite
- iv. Envenomation
- v. Altitude sickness
- vi. Decompression sickness
- vii. Skin and wound care
- viii. Biological and chemical terrorism
- ix. Radiation exposure

O. Immunology and Transplantation

- i. Principles of transplantation (organ donation, procurement, preservation, transportation, allocation, implantation, maintenance of organ donors, national organization of transplantation activities)
- ii. Immunosuppression
- iii. Organ transplantation: Indications preoperative and postoperative care
- iv. Transplant-related infectious disease

P. Trauma, Burns

- i. Initial approach to the management of multiple system trauma
- ii. Central nervous system trauma (brain and spinal cord)
- iii. Skeletal trauma, including the spine and pelvis
- iv. Chest trauma, blunt and penetrating
- v. Abdominal trauma, blunt and penetrating
- vi. Crush injury
- vii. Burns
- viii. Electrical injury

Q. Others Issues;

- i. Prognostic indexes, severity, and therapeutic intervention scores
- ii. Use of computers in critical care units
- iii. Ethics-End-of-life decision making and care
- iv. Organ procurement
- v. Outcome and futility
- vi. Quality of end of life

XII. Policies and Protocols.

A. Transport Guidelines for CVICU Patients

I. Guideline Purpose

To determine the minimal standards that should be provided for the transport of any CVICU patient.

II. Definitions

Class - A Class is defined as a preset condition level for a patient that allows all staff and physicians to know what level of monitoring and documentation is appropriate for that patient. See examples in Appendix I.

Class I- Patient is at significant risk for immediate life-threatening arrhythmias. Patient will have cardiac monitoring at all times. Transport from one area to another will require patient to be accompanied by a licensed nurse experienced in arrhythmia recognition and portable monitor use.

Class II- Patient is at moderate risk for cardiac event. Patient will have cardiac monitoring at all times except for those situations specified by the physician/advance practice team.

Class III- Patient is at relatively low risk for a cardiac event or hemodynamic/respiratory instability but monitoring is considered of potentially high diagnostic value.

III. Guidelines:

Whenever feasible, diagnostic testing or simple procedures should be performed at the patient's bedside within the CVICU. When the patient must be transported, use the following guidelines:

1. Pretransport Coordination and Communication must occur.
 - a. The patient will be assessed and determined to be either Class I, Class II or Class III for the purpose of transportation. The patient's Class will determine the equipment and personnel utilized during transport.
 - b. Processes will be in place to provide for physician/NP/PA-to-physician/NP/PA and/or nurse-to-nurse communication regarding the patient's condition and treatment preceding and following transport, if the management of the patient will be assumed by a different team while the patient is away from CVICU. Processes must be included in CVICU physician, NP, PA and nursing staff orientation.
 - c. The CVICU intensivist/NP/PA will confirm that the area to which the patient is being transported (e.g., radiology, operating suite, nuclear medicine, etc.) is ready to receive the patient and immediately institute the procedure or test for which the patient is being transported.
 - d. The CVICU primary care nurse, or charge nurse if the primary care nurse is busy, will notify ancillary services (e.g., respiratory therapy, perfusionists, SWAT team, etc.) as to the timing of the transport and the equipment and/or support they will need to provide.
 - e. The CVICU NP/PA will notify the responsible intensivist/physician to either accompany the patient or be aware that the patient is out of the CVICU and may have an acute event in another area of the hospital.
 - f. The CVICU intensivist/NP/PA and primary care nurse will document transport in the medical record, the indications for transport and the patient's status during transport.

2. All Class I and Class II patients will be required to be accompanied by a minimum of two people:
 - a. One of whom shall be the critical care nurse assigned to the patient or a specifically trained critical care transport nurse (e.g., SWAT). The critical care nurses shall have completed a competency-based orientation and meet the standards for critical care nurses.
 - b. Additional personnel may include a respiratory therapist, registered nurse, critical care technician or physician/NP/PA.
 - c. A physician/NP/PA should accompany patients who have unstable physiology and might need acute interventions that are beyond the scope of standing orders or nursing practice.

3. All Class I and Class II patients will have the following equipment during transport:
 - a. Cardiac monitor/defibrillator.
 - b. Airway management equipment and resuscitation bag of proper size and fit for the patient.
 - c. Oxygen source of ample volume to provide the patient's needs for the projected time out of ICU, with an additional 30 minutes' reserve.
 - d. Standard resuscitation drugs such as epinephrine, lidocaine, atropine, sodium bicarbonate.
 - e. Blood pressure cuff.
 - f. Ample supply of the IV fluids and continuous drip medications (regulated by battery-operated infusion pumps) being administered to the patient.
 - g. Additional medications to provide the patient's scheduled intermittent medication doses and to meet anticipated needs (e.g., sedation), with appropriate orders to allow their administration if a physician is not present during transport.
 - h. For patients receiving mechanical support of ventilation, a device capable of delivering the same minute ventilation, pressure, fractional concentration of oxygen (Fio₂), and PEEP that the patient is receiving in CVICU.
 - i. A resuscitation cart and suction equipment need not accompany each patient being transported, but such equipment shall be stationed in areas used by critically ill patients and be readily available (within 4 minutes) by a predetermined mechanism for emergencies that might occur en route.

4. All Class I and Class II patients will be monitored during transport. The patient being transported should receive the same physiologic monitoring during transport as in the CVICU, if technologically possible. All critically ill patients being transported shall have as a minimum level of monitoring:
 - a. Continuous monitoring with periodic documentation of ECG and pulse oximetry.
 - b. Intermittent measurement/documentation of blood pressure, respiratory rate and pulse rate.
 - c. Selected patients, based on clinical status, may benefit from monitoring by capnography; continuous blood pressure measurement, pulmonary artery pressure, intracranial pressure (e.g., lumbar drains); and intermittent measurement of central venous pressure, wedge pressure, cardiac output, VAD device flow rates, etc.
 - d. Intubated patients receiving mechanical support of ventilation should have airway pressure monitored. If a transport ventilator is used, it should have alarms to indicate disconnects or excessively high airway pressures.

5. All Class III patients will be monitored while on the unit, but may be off the monitor for brief periods of time with a physician's/NP's/PA's written order. The patient may not be monitored during transport from CVICU to another unit, if the physician/NP/PA writes an order to discontinue cardiac monitoring.

Admission Note

UNIVERSITY OF MICHIGAN HOSPITAL & HEALTH CENTERS Thoracic Intensive Care Unit Anesthesia Critical Care Service ADMISSION NOTE Date _____ Time _____ am/pm		Birthdate Name Reg No
HISTORY OF PRESENT ILLNESS Chief Complaint: Postop Day #: Admit Diagnosis: Surgery:		INTRAOPERATIVE INFORMATION AIRWAY: <input type="checkbox"/> NL <input type="checkbox"/> MP MEDS: <input type="checkbox"/> FENT <input type="checkbox"/> MIDAZ <input type="checkbox"/> PANC <input type="checkbox"/> OTHER Times: CPB _____ NL _____ CA _____ LABS: K _____ Ca _____ FLUIDS: Crystalloid _____ FFP _____ Hct _____ Gic _____ Albumin _____ Pits _____ Lact/COCl _____ PRBC _____ U/O _____ ABG _____ Intra-op events _____ DRIPS: <input type="checkbox"/> Milrinone <input type="checkbox"/> Vasopressin <input type="checkbox"/> Dopamine <input type="checkbox"/> Norepinephrine <input type="checkbox"/> Epinephrine <input type="checkbox"/> Dobutamine <input type="checkbox"/> Other <input type="checkbox"/> Nitroglycerin <input type="checkbox"/> Lispro/insulin
PAST HISTORY PMH: <input type="checkbox"/> CAD <input type="checkbox"/> MS <input type="checkbox"/> AS <input type="checkbox"/> COPD <input type="checkbox"/> ETOH <input type="checkbox"/> MI <input type="checkbox"/> AI <input type="checkbox"/> HTN <input type="checkbox"/> CRF <input type="checkbox"/> Tob <input type="checkbox"/> MMR <input type="checkbox"/> TR <input type="checkbox"/> DM I OR II <input type="checkbox"/> Arthritis <input type="checkbox"/> Other EF _____ CR _____ ECHO _____ CATH _____ EKG _____ OTHER _____ PSH _____ HOME MEDS _____ ALLERGIES _____ <input type="checkbox"/> NKDA		ICU PHYSICAL EXAMINATION VITALS: HR _____ NEURO: <input type="checkbox"/> No focal findings <input type="checkbox"/> Paralyzed <input type="checkbox"/> Sedated <input type="checkbox"/> Other _____ HEENT _____ CVS: RESP: RR _____ Rhythm _____ @ _____ paced. mode _____ O2 sat _____ on _____ Heart Sounds _____ Lungs: RBS+? <input type="checkbox"/> <input type="checkbox"/> L/min NC PA Cath <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %FM COCl _____ CVP _____ SVP _____ PAP _____ PCIV _____ PAP _____ Mode _____ Rate _____ CT out _____ hrs VT _____ PEEP _____ U/O _____ hrs PG _____ FIO2 _____ Other _____ EXTREMITIES: Pedal Pulses: _____ <input type="checkbox"/> warm <input type="checkbox"/> cool <input type="checkbox"/> +edema <input type="checkbox"/> Other _____ NG? <input type="checkbox"/> <input type="checkbox"/> N
REVIEW OF SYSTEMS <input type="checkbox"/> UNABLE TO RESPOND - Sedated and/or ventilated <input type="checkbox"/> All other systems negative P: N: (if positive, comment) P: N: <input type="checkbox"/> Constitutional <input type="checkbox"/> Cardio <input type="checkbox"/> HEENT _____ <input type="checkbox"/> Neuro <input type="checkbox"/> Gastro <input type="checkbox"/> Gastro _____ <input type="checkbox"/> Resp _____ <input type="checkbox"/> Genit/uro <input type="checkbox"/> Musculoskeletal _____ <input type="checkbox"/> Post-op Pain _____		GI Abdomen: <input type="checkbox"/> Soft, NT, ND <input type="checkbox"/> +BS Other _____ Nutrition/Diet: _____ Recent REE: _____ Other: _____ Assessment/Plan: _____
ASSESSMENT/PLAN NEURO: _____ CVS: _____ RESP: _____ Renal/IGU: _____ ID: _____ GI: _____ OTHER: _____		RENAL/IGU Pre-op Wt _____ Current Wt _____ 24h I/O _____ CV/H 24hr balance _____ Foley <input type="checkbox"/> Y _____ Assessment/Plan: _____ LABS ICa _____ Mg _____ PO _____ Other _____ ID/HEME PT/PTT _____ WBC Diff _____ Temp/Tmax _____ Antibiotics _____ day _____ IV Lines _____ day _____ Cultures: Sputum _____ Blood _____ Other _____ Assessment/Plan: _____
Patient seen, examined and discussed with Dr. _____ Signed Dr. _____ Dr. # _____		
H-2042289 Rev 01/05	THIS FORM MUST REMAIN IN THE MEDICAL RECORD	U of M Logo ANESTHESIA NOTES

Progress Note

UNIVERSITY OF MICHIGAN HOSPITAL & HEALTH CENTERS Thoracic Intensive Care Unit Anesthesia Critical Care Service DAILY PROGRESS NOTE Date _____ Time _____ am/pm		Birthdate Name Reg No
HISTORY OF PRESENT ILLNESS Post-op Day #: Admit Dx: Surgery:		PAST HISTORY PMH: _____ <input type="checkbox"/> no change from admit note date _____ PSH: _____ <input type="checkbox"/> no change from admit note date _____
REVIEW OF SYSTEMS <input type="checkbox"/> UNABLE TO RESPOND - Sedated and/or ventilated <input type="checkbox"/> All other systems negative P: N: (if positive, comment) P: N: <input type="checkbox"/> Constitutional <input type="checkbox"/> Neuro <input type="checkbox"/> HEENT _____ <input type="checkbox"/> Resp _____ <input type="checkbox"/> Cardio <input type="checkbox"/> Gastro _____ <input type="checkbox"/> Genit/uro _____ <input type="checkbox"/> Musculoskeletal _____		
NEURO/PSYCH A & O x _____ No focal findings Sedated with _____ Other _____ Assessment/Plan: <input type="checkbox"/> Stable		GI Abdomen: <input type="checkbox"/> Soft, NT, ND <input type="checkbox"/> +BS Other _____ Nutrition/Diet: _____ Recent REE: _____ Other: _____ Assessment/Plan: _____
CVS HR _____ BP _____ Rhythm _____ @ _____ paced. mode _____ Peripheral Pulses _____ COCl _____ SVR _____ + edema CVP _____ PAP _____ PCIV _____ Medis _____ Drips: Milrinone _____ Vasopressin _____ Norepinephrine _____ Dobutamine _____ Epinephrine _____ Isoproterenol _____ Nitroglycerin _____ Other _____		RENAL/IGU Pre-op Wt _____ Current Wt _____ 24h I/O _____ CV/H 24hr balance _____ Foley <input type="checkbox"/> Y _____ Assessment/Plan: _____ LABS ICa _____ Mg _____ PO _____ Other _____ ID/HEME PT/PTT _____ WBC Diff _____ Temp/Tmax _____ Antibiotics _____ day _____ IV Lines _____ day _____ Cultures: Sputum _____ Blood _____ Other _____ Assessment/Plan: _____
RESP RR _____ <input type="checkbox"/> CTA _____ <input type="checkbox"/> Wheezes _____ <input type="checkbox"/> Crackles _____ <input type="checkbox"/> BS _____ <input type="checkbox"/> Other _____ O ₂ sat _____ on _____ L/min NC _____ % FM _____ Vent Settings: Mode: <input type="checkbox"/> IMV <input type="checkbox"/> PS <input type="checkbox"/> AC <input type="checkbox"/> PC CXR _____ Rate _____ PS _____ FIO2 _____ TV _____ PEEP _____ ABG: _____ Other _____ Assessment/Plan: _____		
OTHER MEDICAL DECISION MAKING		
Patient seen, examined and discussed with Dr. _____ Signed Dr. _____ Dr. # _____		
I-2042289/260 Rev: 01/05	THIS FORM MUST REMAIN IN THE MEDICAL RECORD	U of M Logo IN PATIENT NOTES

UNIVERSITY OF MICHIGAN HEALTH-SYSTEM
Surgical Intensive Care Unit Electrolyte Dosing Guidelines

WARNINGS AND PRECAUTIONS

- Patients with renal insufficiency are exempt from these guidelines (e.g., serum creatinine \geq 2 mg/dL, or patients on any form of renal replacement therapy (intermittent or continuous)).
- These guidelines are meant to assist with empiric dosing of electrolytes for ICU patients; doses may need to be adjusted based on patient-specific factors and responses to initial doses.
- Goal serum concentrations may also need to be adjusted based on patient-specific factors.
- These guidelines are for routine supplementation of electrolytes; **they are not meant for treatment in urgent or emergent situations.**

POTASSIUM- Goal serum potassium concentration ~ 4 – 4.9 mEq/L

Intravenous Treatment of Hypokalemia

Serum potassium concentration	Intravenous potassium dose [†]	Recheck serum potassium concentration
3.8 – 3.9 mEq/L	20 mEq potassium intravenously	Within 2 hours of completing dose
3.5 – 3.7 mEq/L	40 mEq potassium intravenously	Within 2 hours of completing dose
3.2 – 3.4 mEq/L	50 mEq potassium intravenously	Within 2 hours of completing dose
2.9 – 3.1 mEq/L	60 mEq potassium intravenously	Immediately after completing dose
< 2.9 mEq/L	80 mEq potassium intravenously and notify MD	Immediately after completing dose
† Rate of Intravenous Potassium Infusion	10 mEq potassium/hour; can increase to 20 mEq/hour, but continuous cardiac monitoring and infusion via a central venous catheter are recommended for infusion rates > 10 mEq potassium/hour. Maximum of 40 mEq potassium/hour in emergency situations.	
Maximum Potassium Concentration	80 mEq/L via a peripheral vein; up to 120 mEq/L via a central vein (admixed in NS or ½ NS)	

References:

Kruse JA, Carlson RW. Rapid correction of hypokalemia using concentrated intravenous potassium chloride infusions. *Arch Intern Med.* 1990; 150:613-617.

Kruse JA, Clark VL, Carlson RW, et al. Concentrated potassium chloride infusions in critically ill patients with hypokalemia. *J Clin Pharmacol.* 1994; 34:1077-1082.

Hamill RJ, Robinson LM, Wexler HR, et al. Efficacy and safety of potassium infusion therapy in hypokalemic critically ill patients. *Crit Care Med.* 1991; 9:694-699.

CALCIUM-Goal serum ionized calcium concentration ~ 1.2 – 1.3 mmol/L
(or total/corrected calcium ~ 8.8 – 10.2 mg/dL)

Intravenous Treatment of Hypocalcemia

Serum calcium concentration	Preferred calcium salt*	Calcium dose	Recheck serum calcium concentration
Ionized calcium = 1.12 – 1.15 mmol/L (or corrected calcium ~ 8.5 – 8.7 mg/dL)	Gluconate	1 g calcium gluconate over 30 – 60 minutes	With next AM lab draw
Ionized calcium = 1.05 – 1.11 mmol/L (or corrected calcium ~ 8 – 8.4 mg/dL)	Gluconate	2 g calcium gluconate over 30 – 60 minutes	With next AM lab draw
Ionized calcium = 0.99 – 1.04 mmol/L (or corrected calcium ~ 7.5 – 7.9 mg/dL)	Gluconate	3 g calcium gluconate over 60 minutes	Within 4 – 6 hours of completing dose
Ionized calcium = 0.93 – 0.98 mmol/L (or corrected calcium ~ 7 – 7.4 mg/dL)	Gluconate	4 g calcium gluconate over 60 minutes	Within 4 – 6 hours of completing dose
Ionized calcium < 0.93 mmol/L (or corrected calcium < 7 mg/dL)	Gluconate	5 g calcium gluconate over 60 minutes and notify MD	Within 4 – 6 hours of completing dose

* 1 g calcium gluconate = 4.56 mEq calcium

† Maximum rate of intravenous infusion = 1.5 mEq calcium/minute

Corrected serum $[Ca^{++}]$ (mg/dL) = measured serum $[Ca^{++}]$ (mg/dL) + $[0.8 \times (4 - \text{serum albumin (g/dL)})]$

References:

Olinger ML. Disorders of calcium and magnesium metabolism. *Emerg Med Clin North Am.* 1989; 7:795-822.

MAGNESIUM

Goal serum magnesium concentration ~ 2.5 – 3.5 mg/dL

Intravenous Treatment of Hypomagnesemia

Serum magnesium concentration	Intravenous magnesium sulfate dose [†]	Recheck serum magnesium concentration
2.2 – 2.4 mg/dL	2 g magnesium sulfate	With next AM lab draw
1.9 – 2.1 mg/dL	4 g magnesium sulfate	With next AM lab draw
1.6 – 1.8 mg/dL	6 g magnesium sulfate	4 – 6 hours after completion of dose if symptomatic, otherwise with next AM lab draw
1.3 – 1.5 mg/dL	8 g magnesium sulfate	4 – 6 hours after completion of dose
1 – 1.2 mg/dL	10 g magnesium sulfate	4 – 6 hours after completion of dose
< 1 mg/dL	12 g magnesium sulfate and notify MD	4 – 6 hours after completion of dose
Rate of intravenous infusion of magnesium	Recommend infusing 1 g magnesium sulfate/hour (~8 mEq magnesium/hour), up to maximum of 2 g magnesium sulfate/hour (doses of up to 32 mEq magnesium can be given over 4 – 5 minutes in <u>severe symptomatic hypomagnesemia</u> (urgent or emergent situation))	

† 1 g magnesium sulfate = 8.1 mEq magnesium

References:

Oster JR, Epstein M. Management of magnesium depletion. *Am J Nephrol.* 1988; 8:349-354.

Sacks GS, Brown RO, Dickerson RN, et al. Mononuclear blood cell magnesium content and serum magnesium concentration in critically ill hypomagnesemic patients after replacement therapy. *Nutrition.* 1997; 13:303-307.

Hebert P, Mehta N, Wang J, et al. Functional magnesium deficiency in critically ill patients identified using a magnesium-loading test. *Crit Care Med.* 1997; 25:749-755.

Guidelines for the Use of Recombinant Human Erythropoietin (Epoetin alfa; rHuEpo) in Surgical Intensive Care Unit Patients

Epoetin alfa (Procrit®) use may be appropriate in the following critically ill patients in the ICU:

- 1) Patients with evidence of anemia (e.g., hematocrit <30%, hemoglobin < 10 g/dL) early in their ICU admission, with an expected length of stay in the ICU > 7 days and a reasonable expectation of survival, without evidence of iron, vitamin B12 (cyanocobalamin), and/or folic acid deficiency.
- 2) Patients with multiple organ dysfunction syndrome with an expected length of stay in the ICU > 7 days and a reasonable expectation of survival, without evidence of iron, vitamin B12 (cyanocobalamin), and/or folic acid deficiency.
- 3) Patients with evidence of anemia prior to a surgery with a large anticipated blood loss.
- 4) Patients with a documented or anticipated significant blood loss requiring numerous blood transfusions.
- 5) Patients who cannot accept blood transfusions (e.g., Jehovah's Witness) meeting other criteria above may benefit from rHuEPO therapy, but benefit of therapy in this scenario is less clear based on a very limited amount of data.

Epoetin alfa (Procrit®) Dose: 40,000 Units, given subcutaneously, once per week

- **HOLD Procrit if Hemoglobin is > 12 g/dL (UMHS, P & T approved policy)**
- **Therapy should be discontinued when the patient is floor status or ready to be discharged from the ICU, or if the patient's hemoglobin is maintained above 12 g/dL without blood transfusions, *unless* the patient was receiving erythropoietin prior to ICU admission (e.g., renal failure, anemia associated with chemotherapy, etc.) or has a new condition that will require long-term erythropoietin therapy (e.g., chronic renal failure).**
- **Patients with chronic renal failure already receiving erythropoietin therapy should receive darbepoetin alfa (Aranesp®) and continue on their previous dose (or equivalent dose).**

Iron Supplement: Iron supplementation is recommended with erythropoietin therapy to maximize effectiveness and prevent iron deficiency. The suggested total daily oral dose of *elemental* iron is approximately 150 – 200 mg.

- **Ferrous Sulfate tablets 325 mg (65 mg elemental iron) PO three times a day; OR**
- **Ferrous Sulfate liquid 300 mg (5 mL; 60 mg elemental iron) PO three times a day.**
- Some data suggest that administration of iron to patients with active infection may promote bacterial growth. Iron may be withheld in patients with an active infection until after it has been treated.
- Intravenous iron should only be used if patients are strictly NPO and cannot receive any medications by mouth, or in patients who have malabsorption syndromes (e.g., short bowel syndrome).
- **The suggested dose of intravenous iron dextran is 100mg IV once/ week (maximum of 50 mg/minute). A test dose of 1 mg IV must be given before the first dose to assess for any potential hypersensitivity or anaphylactic reactions. The dose of iron dextran can then be administered after waiting at least 1 hour after the test dose.**

Vitamin C (ascorbic acid) supplement: Ascorbic acid may be a beneficial supplement for patients receiving epoetin alfa and iron therapy in several ways: 1) it may increase iron mobilization and incorporation into heme synthesis; 2) it may improve the response to epoetin alfa; and, 3) when taken orally with oral iron preparations, it may enhance oral absorption of iron.

- **Vitamin C (ascorbic acid) 250 mg PO three times a day, with iron.**
- **Patients with renal insufficiency (even if receiving renal replacement therapy (RRT)) should receive 250 mg per day, or less.** There is evidence that patients on RRT receiving higher ascorbic acid doses day can develop increased oxalate levels, which can lead to deposition of oxalate in the kidneys, heart, and blood vessels (Tarnag DC, et al. *Kidney Int.* 1999;55:2477-86).
- Intravenous ascorbic acid should only be used if patients are strictly NPO and cannot receive any medications by mouth, or in patients who have malabsorption syndromes (e.g., short bowel syndrome). The suggested dose of intravenous ascorbic acid is 250mg IV three times a day. **Patients with renal insufficiency (even if receiving renal replacement therapy (RRT)) should receive 250 mg IV per day, or less.**

Selected References

Corwin HL, Gettinger A, Rodriguez RM, *et al.* Efficacy of recomb. human erythropoietin in the critically ill patient: A randomized, double-blind, placebo-controlled trial. *Crit Care Med* 1999;27:2346-2350.

Goodnough LT, Monk TG and Andriole GL. Erythropoietin therapy. *NEJM* 1997;336:933-938.

Maddougall IC. Meeting the challenges of a new millennium: Optimizing the use of recombinant human erythropoietin. *Nephrol Dial Transplant* 1998;13 (suppl 2):23-27.

Qvist N, Boesby S, Wolff B, *et al.* Recombinant human erythropoietin and hemoglobin concentration at operation and during the postoperative period: Reduced need for blood transfusions in patients undergoing colorectal surgery – prospective double-blind placebo-controlled study. *World J Surg* 1999;23:30-35.

Van Iperen CE, Gaillard CAJM, Kraaijenhagen RJ, *et al.* Response of erythropoiesis and iron metabolism to recombinant human erythropoietin in intensive care unit patients. *Crit Care Med* 2000;28:2773-2778.

Tarnag DC, Wei YH, Huan TP, *et al.* Intravenous ascorbic acid as an adjuvant therapy for recombinant erythropoietin in hemodialysis patients with hyperferritinemia. *Kidney Int.* 1999;55:2477-86.

UNIVERSITY OF MICHIGAN HEALTH-SYSTEM
Surgical Intensive Care Unit
Prevention of Radiocontrast-Induced Acute Renal Failure
(or Radiocontrast-Induced Nephropathy (RCIN))

Definition of RCIN: Increase in serum creatinine of $\geq 25\%$ or an absolute increase in serum creatinine of ≥ 0.5 mg/dL within 24 – 72 hrs of receiving IV radiocontrast.

Risk Factors

For RCIN: Underlying renal impairment (e.g., Scr > 1.5 mg/dL, or estimated GFR < 60 mL/min), diabetes, intravascular volume depletion, hypotension, advanced heart failure, advanced age (e.g., > 75 y/o), vascular disease, concurrent use of nephrotoxic medications (e.g., aminoglycosides, amphotericin, NSAIDs, COX-2 inhibitors) or other medications that may potentiate RCIN (e.g., loop diuretics), recent administration of IV radiocontrast agent (within previous 7 days), osmolarity of radiocontrast agent, dose of radiocontrast agent administered (increased risk when $> 100 - 150$ mL administered).

Prevention of RCIN in at-risk patients:

1. **Discontinue metformin, NSAIDs, COX-2 inhibitors, loop diuretics, and any other nephrotoxic medications if possible.**
2. **Administer N-acetylcysteine 600mg PO q 12 hrs x 48hrs, starting the day BEFORE administration of IV radiocontrast agent, continuing the day of IV radiocontrast.**
3. **IV hydration: Normal Saline 1 mL/kg/hr x 24 hours, starting up to 12 hours before IV radiocontrast,**

OR

Sodium Bicarbonate (150 mEq NaHCO₃ (3 amps) in 1 L of D5W) 3 mL/kg/hr for 1 hour before administration of IV radiocontrast, then 1 mL/kg/hr during during radiocontrast exposure and for 6 hours after IV radiocontrast.

QUESTIONS:

- What radiocontrast agent do we use? What dose/volume of IV contrast do we typically use?
- Actually, the data evaluating the use of NAC for prevention of RCIN are conflicting. Overall, suggests there may be some benefit in at-risk patients, and it's PO, it's cheap, and safe (PO formulation). A new study in NEJM evaluated higher dose of NAC (1200mg q12 hrs), but this was in patients undergoing urgent angiography (+/- PCI). Is there a situation where the higher dose might be of any benefit in our patients? Maybe in patients who receive larger doses of IV contrast ($> 150-200$ mL of IV contrast)? Really no data here.
- Any indication for IV NAC? I can't really see one in our patients. Only 2-3 studies that have evaluated IV NAC, and no real benefit to IV formulation (only shown in that new trial in NEJM). Also, significantly more expensive (costs at UM: 600mg PO = \$0.34, 600mg IV = \$10.05), and potential adverse effects w/ IV NAC (angioedema, dyspnea, chest-tightness, dermatitis/rash/pruritis, hypotension, tachycardia).
- NS vs. NaHCO₃ for IV hydration?? Only one study has evaluated NaHCO₃, small number of patients, more data evaluating NS.

SICU Daily Goal Sheet

D I E C U T A R E A

BIRTHDATE
NAME
REG NO
DATE:

SIRS (2 or more present)

<input type="checkbox"/> Temp ≥ 38 C (>100.4 F) or Temp ≤ 36 C (< 96.8);	Temp: _____
<input type="checkbox"/> Heart rate ≥ 90 /min;	HR: _____
<input type="checkbox"/> Respiratory rate ≥ 20 /min;	RR: _____
<input type="checkbox"/> WBC count $\geq 12,000$, $\leq 4,000$ or $> 10\%$ neutrophil bands;	WBC: _____
<input type="checkbox"/> Document or suspected infection	

SICU Daily Goals

<input type="checkbox"/> Family updated within last 24 hours	<input type="checkbox"/> N/A
<input type="checkbox"/> Patient on DVT prophylaxis	<input type="checkbox"/> N/A
<input type="checkbox"/> Patient on GI prophylaxis	<input type="checkbox"/> N/A
<input type="checkbox"/> Patient CS < 140	
<input type="checkbox"/> Electrolyte protocol	
<input type="checkbox"/> Sepsis criteria met	
Intubation:	
<input type="checkbox"/> Drug holiday last 24 hours	<input type="checkbox"/> N/A
<input type="checkbox"/> Weaning attempted today	<input type="checkbox"/> N/A
<input type="checkbox"/> Parameters obtained	<input type="checkbox"/> N/A
<input type="checkbox"/> Chlorhexidine ordered	<input type="checkbox"/> N/A
<input type="checkbox"/> HOB $> 30^\circ$	<input type="checkbox"/> N/A

Lines: Lines can be removed **Insertion dates:**

Plans for the Day

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

H
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(Not for use in diabetic ketoacidosis or obstetrics)

Goal Blood Glucose □ 100-140 mg/dL □ 100-120mg/dL.

Type 1 diabetics should always have basal insulin.

Always use clinical judgment when situation does not fit the protocol.

Table #1 Insulin Infusion Initiation

BG (mg/dL)	Bolus Insulin units IV push	Initial insulin Drip Rate -Units per ml
100 – 140	0	1
141 – 180	2	2
181 – 220	3	2.5
221 – 260	4	3
261 – 300	6	3.5
> 300	8	4.5

Re-check BG every 1 hour when drip started and when changing vasopressors, steroids, TPN, PPN, tube feeds or if patient becomes NPO
Monitor K+ levels, as appropriate per unit-based standards of care.
WHEN PATIENT BEGINS TO EAT, ADD SUBCUTANEOUS INSULIN FOR MEAL COVERAGE AS PER TABLE # 4

Table #2 Insulin Infusion Titration

BG mg/dL	Insulin Infusion (units per hour) - Regular insulin at concentration of 1 unit per mL.	
<70	Hold infusion, give 25 ml of 50% dextrose IV bolus (1/2 ampule). Re-check BG in 15 minutes until BG >70, then hourly. When BG > 140, restart infusion at 50% of last rate.	
70 - 80	<u>Infusion rate < 0.5 units/hour</u> (or last rate <0.5 units/hour if held) Hold infusion.	<u>Infusion rate > 0.5 units/hour</u> (or last rate ≥0.5 units/hour if held) Hold infusion. Recheck BG in 1 hour. If BG > 80, restart infusion at 50% of last rate.
81 - 99	Re-check BG 1 hour x 2, 2 hours x 2 and then every 4 hours. If within goal, start correction scale (Table #3) every 4 hours. If BG is >140, restart at the last infusion rate.	<u>Infusion rate > 0.5 units/hour</u> (or last rate ≥0.5 units/hour if held) Decrease infusion by 50% of last rate. Re-check BG hourly.
100 – 140	<u>NO CHANGE</u> unless BG decreased by >25mg/dL since last hour. If yes decrease infusion by 1 unit /hr. Re-check BG every 1 hour. If between 100-140 x 4 <u>consecutive</u> hrs and changing <40 mg/dL per hr, then check BG every 2 hours.	AREAS/UNITS with BG goal of 100-120
		100-120 <u>NO CHANGE</u> unless BG decreased by > 25mg/dL since last hour. If yes decrease infusion by 0.5 units /hour
		121-140 <u>Increase</u> infusion by 0.5 units/ hour unless BG decreased by > 25mg/dL since last hour. If yes decrease infusion by 0.5 units /hour.
141 – 180	<u>Increase</u> by 1.0 unit/hr unless BG decreased by > 50 mg/dl since last hour. If yes decrease infusion by 1unit/hour. Re-check BG every 1 hour.	
181- 220	<u>Increase</u> by 1.5 units/hour unless BG decreased by > 50 mg/dl since last hour. If yes, decrease infusion by 1unit/hour. Re-check BG every 1 hour.	
221 – 240	<u>Increase</u> by 2 units/hr unless BG decreased by > 50 mg/dl since last hour. If yes, decrease infusion by 1unit/hour. Re-check BG every 1 hour.	
241 – 300	<u>Bolus 4</u> units regular insulin IV; <u>increase</u> infusion by 2.5 units/hour unless BG decreasing by > 50 mg/dl since last hour. If yes, decrease infusion by 1 unit/hour and do not give the bolus of 4 units regular insulin. Re-check BG every 1 hour.	
301 - 340	<u>Bolus 5</u> units regular insulin IV; <u>increase</u> infusion by 3 units per hour. Re-check BG every one hour.	
> 340	<u>Bolus 6</u> units regular insulin IV; <u>increase</u> infusion by 4 units per hour. Re-check BG every one hour.	

Table #3 Infusion Transition Subcutaneous Correction Scale

(Novolog/Humalog Insulin every 4 hours)

BGmg/dL	Insulin Units	
<120	0	After 24 hours reassess requirement for intermediate or long-acting insulin.
121-140	1	Type 1 diabetes patients need basal insulin and should not be on correction scale insulin alone.
141 – 180	2	<u>Re-check BG 1 hour x 2, 2 hours x 2 and then every 4 hours.</u>
181 – 220	3	NOTE: If BG >140, restart insulin drip at rate of initiation (Table #1).
221 – 260	4	
>261	5	

(Please Turn Over)

Table #4 Meal Coverage Insulin*Type 1 diabetics should always have basal insulin.*

Administer Novolog/Humalog insulin for meal coverage if patient is on insulin drip and begins eating.

Adjust insulin dosage according to percentage of meal eaten.

Novolog /Humalog can be given with a meal (less than 15 minutes before or just after patient finishes eating)

Order ADA diet in addition to other requirements.

Drip Rate meal (units/hr)	Ate >50% meal (units)	Ate <50% (units)
0-0.5	2	0
0.6-2	4	2
2.1-4	6	3
4.1-6	8	4
6.1-8	10	5
8.1-10	12	6
>10.1	14	7
Custom Order		