This manual, supplemented by the accompanying documents on the Surgical Critical Care CD-ROM, provides you with everything you need to know to immediately function as a Surgical Critical Care fellow.

ACKNOWLEDGEMENT OF AUTHORS

This document has been continually revised and updated by each year's fellows beginning with its origins at the University of Miami, and continuing through its use at both Vanderbilt University and Orlando Regional Medical Center. It is anticipated that you will also find additions that you would like to see included. Feel free to mark this document liberally during the year. The Fellow's Manual is updated each Spring.

University of Miami
Vincente Cortes, M.D.
Marc Palter, M.D.
Martha Baker, R.N.
Debbie Weppler, R.N.
Joseph M. Civetta, M.D.

Vanderbilt University
Loren D. Nelson, M.D.
Rick Miller, M.D.
Karen Hunter, M.D.
Michael L. Cheatham, M.D.
Michael Chang, M.D.
Mark Fusco, M.D.
Will Miles, M.D.

Orlando Regional Medical Center
Loren D. Nelson, M.D.
Michael L. Cheatham, M.D.
Ernest F. J. Block, M.D.
SURGICAL CRITICAL CARE FELLOWS AT ORLANDO REGIONAL MEDICAL CENTER

1997 - 1998
Zubair Zoha, MD

1998 - 1999
Jeffery Johnson, MD
Scott Sagraves, MD

1999 - 2000
Wayne Mashas, MD
Michael Wagner, MD

2000 – 2001
Kristine Lombardozzi, MD
Charles Morrow, MD

2001 – 2002
Joelle Jakobsen, MD
Luis Llerena, MD
AN OVERVIEW OF THE SURGICAL CRITICAL CARE RESIDENCY PROGRAM

SUMMARY
The Surgical Critical Care residency program at Orlando Regional Medical Center is designed to prepare the surgeon for a career as an academic surgical intensivist. The program stresses attaining not only an in-depth understanding of surgical pathophysiology and its management, but also the skills necessary to administer an intensive care unit and perform scientific research.

WELCOME TO THE SURGICAL CRITICAL CARE PROGRAM AT ORLANDO REGIONAL MEDICAL CENTER

INTRODUCTION
The Surgical Critical Care (SCC) program at Orlando Regional Medical Center (ORMC) is a 12-month ACGME-accredited teaching program designed to prepare the board-eligible/board-certified surgeon for a career as an academic surgical intensivist. Following completion of the program, the surgeon will be eligible to sit for the American Board of Surgery examination certifying “Added Qualifications in Surgical Critical Care”. Although the term “SCC fellow” is commonly used, it must be remembered that for the purposes of the ACGME and the Residency Review Committee (RRC), the SCC program is actually a postgraduate "residency" and the term "SCC resident" may therefore be utilized.

The educational philosophy of the SCC residency program is to provide the matrix upon which to develop a scientifically sound approach to the management of critically ill patients. Additionally, the program is designed to allow individuals to become specialists in the clinical aspects of Surgical Critical Care and include significant elements of teaching, research and administration in critical care.

The "SCC Fellow’s Manual" is intended to provide you with a comprehensive discussion of the SCC program as well as a brief introduction to the patient care protocols and day-to-day workings of the intensive care units (ICU) at ORMC. This manual began with the fellow’s manual as originally used at the University of Miami fellowship under Dr. Joseph Civetta. The manual was subsequently updated and used for a number of years at Vanderbilt University under Dr. Loren D. Nelson prior to its institution at ORMC. This manual is revised and updated annually as protocols, therapies, and technologies change. As your SCC residency concludes, your suggestions and additions to the fellow’s manual will be incorporated. Please read this manual closely prior to beginning your time at ORMC and review it frequently as your fellowship progresses, taking the time to note changes that you believe are necessary to further improve the manual for future fellows. Beginning in 2001, the “Fellow’s Manual” has been expanded dramatically becoming a multimedia CD-ROM that is intended to place a variety of educational resources at the user’s “fingertips”.

DEFINITIONS
For the purpose of this manual, the following definitions and abbreviations apply:

- **Surgical Critical Care (SCC) Service** – the clinical patient care team providing 24 hour/day service in the intensive care units and operating within the Surgical Critical Care Program. This team generally consists of a SCC attending surgeon, two SCC residents, a general surgery resident from the Department of Surgical Education, a resident from the Department of Emergency Medicine, and a resident from the Department of Internal Medicine. During some months of the year, visiting students from various medical schools may also rotate on the service.
- **Surgical Critical Care (SCC) Program** – the educational program within the Department of Surgical Education. The program consists of the program director, three full-time surgical faculty, the research manager, and support staff.

- **Surgical Critical Care (SCC) Resident** – the resident engaged in advanced training for at least 12 months who intends to become eligible for examination for the Certificate of Added Qualifications in Surgical Critical Care from the American Board of Surgery.

- **Rotating residents** – all residents from the primary general surgery program or other programs who spend one to two months on the SCC Service.

- **Chief Resident** – the general surgery resident in his/her final year of training.

- **Admitting physician** – the medical staff physician who admits the patient to the hospital.

- **Primary surgical attending** – the primary surgeon responsible for admitting and/or operating upon a patient admitted to the ICU and consulting the SCC service for assistance with patient management.

- **Critical care attending** – the consulting surgeon with added qualifications in Surgical Critical Care who is responsible for the daily operation of the SCC service.

- **Consulting physician** – physician requested by the attending physician or ICU managing physician to recommend treatment or diagnostic alternatives while the patient is in the ICU.

- **Intensivist** – a critical care physician who is board certified within his/her specialty in the field of critical care.

- **ICU Managing physician** – the physician responsible for management decisions while the patient is in the intensive care unit. The managing physician is the attending physician unless there is a written order in the patient’s medical record designating a managing physician or an order consulting a critical care service for comprehensive patient management.

- **Intensive Care Unit (ICU)** – the critical care units in which the SCC service cares for patients. This includes the Surgical / Trauma ICU (STICU), the Neurosciences ICU (NSICU), the Burn / Trauma Unit (BTICU), and, at times, the Post-Anesthesia Recovery Unit (PACU), the Medical ICU (MICU), the Progressive Care (step-down) Unit (PCU), and the Emergency Department (ED).

- **Intermediate Care Service (ICS)** – a “step-down” service staffed by a surgical intensivist, a physician’s assistant, and an advanced registered nurse practitioner. The ICS team facilitates rehabilitation and skilled nursing placement for sub-acute patients.

- **Orlando Regional Healthcare (ORH)** – the not-for-profit corporation owning Orlando Regional Medical Center (ORMC), Arnold Palmer Hospital for Women and Children (APH), and other hospitals and care centers which are not part of the educational program.

- All references in this document are intended to be gender non-specific.
EDUCATIONAL GOALS
The specific educational goals of the SCC postgraduate residency program are to prepare the resident to apply, evaluate, and teach the fundamentals of surgical critical care and to:

A. Show an understanding of a comprehensive approach to patients with multi-system critical illness.

B. List the indications and complications of invasive hemodynamic monitoring.

C. Demonstrate an understanding of and proficiency in the techniques for arterial, central venous, and pulmonary artery catheterization.

D. List and prioritize means for increasing cardiac output and oxygen transport.

E. Define in physiologic terms the adequacy of cardiac output.

F. Reproduce and utilize the formulae for:
   - mean arterial pressure (MAP)
   - systemic vascular resistance index (SVRI)
   - pulmonary vascular resistance index (PVRI)
   - left ventricular stroke work index (LVSWI)
   - right ventricular stroke work index (RVSWI)
   - cardiac index (CI)
   - stroke volume index (SVI)
   - coronary perfusion pressure (coronary PP)
   - cerebral perfusion pressure (cerebral PP)
   - abdominal perfusion pressure (abdominal PP)
   - right ventricular end-diastolic volume index (EDVI)

G. List major risk factors for acute respiratory failure.

H. Discriminate between oxygenation, ventilation, and airway support.

I. List the physiologic mechanisms responsible for arterial hypoxemia.

J. Discuss indications, contraindications and complications of:
   - controlled mechanical ventilation (CMV)
   - intermittent mandatory ventilation (IMV)
   - assist control ventilation (ACV)
   - pressure support ventilation (PSV)
   - continuous positive airway pressure (CPAP)
   - positive end-expiratory pressure (PEEP)
   - pressure controlled ventilation (PCV)
   - pressure controlled inverse ratio ventilation (PC-IRV)
   - independent lung ventilation (ILV)
   - high frequency ventilation (HFV)
   - airway pressure release ventilation (APRV)

K. Discuss methods of supporting oxygenation for patients with arterial hypoxemia.

L. Reproduce and utilize the formulae for:
   - arterial O₂ content (CaO₂)
   - venous O₂ content (CvO₂)
   - alveolar O₂ content (CAO₂)
   - alveolar O₂ tension (PAO₂)
   - intrapulmonary shunt (Qsp/Qt)
   - arteriovenous oxygen content difference (C(a-v)O₂)
   - oxygen utilization or extraction ratio (VO₂ / DO₂)

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M. Define and list the major categories of shock and recognize the hemodynamic patterns of each.
N. Interpret arterial blood gas measurements in terms of acid-base disorders, adequacy of oxygenation, and adequacy of ventilation.
O. List the differential diagnosis of oliguria.
P. Identify laboratory tests that discriminate between intrinsic renal and pre-renal causes of oliguria and apply this information in the prevention of acute renal failure.
Q. Discuss methods for prophylaxis against acute upper GI bleeding in acutely stressed patients.
R. Discuss non-pancreatic organ system dysfunction associated with acute pancreatitis.
S. Discuss the changes in biochemical markers associated with acute hepatobiliary dysfunction.
T. Identify and use screening tests available for the evaluation and treatment of coagulation disorders.
U. Present to your peers the complex problems of critically ill patients in a logical and comprehensive manner.
V. Discuss ethical considerations created by the use of modern technology.
W. Select and administer appropriate resuscitation fluids for critically ill patients.
X. Develop educational programs in critical care.
Y. Develop research and quality assurance programs that contribute to optimal patient care.
Z. Administer a multidisciplinary surgical intensive care unit.

EXPECTED TIME COURSE FOR EDUCATION GOAL ACHIEVEMENT
The following is the expected time course for achievement of the education goals outlined above:

- Orientation to patient care and communication protocols and guidelines July-September
- Application of patient care and communication protocols and guidelines July-January
- Development of teaching skills January-March
- Refinement of teaching skills / development of research and administrative skills April-June
DIDACTIC TEACHING PROGRAM
The structure of the training program in surgical critical care includes daily attending teaching rounds, daily radiology conferences, twice weekly didactic conferences, and supplemental educational materials. The supplemental materials include extensive reprints of relevant articles in the critical care literature, audio and videotapes of presentations of pertinent topics, and a critical care reference library. A wealth of critical care reference documents, Powerpoint slide presentations, and videos is available on the accompanying Surgical Critical Care CD-ROM. The specific components of the program are outlined below:

Outline Of Didactic Teaching Program By System:

I. CARDIOVASCULAR
   A. Hemodynamic monitoring
      1. Indications
         a. Assessment
         b. Therapy
      2. Available technology
         a. Data required
         b. Data measured directly
         c. Derived data
      3. Technical aspects
         a. Site selection
         b. Methodology
         c. Artifacts of measurement
      4. Complications
         a. Prevention
         b. Diagnosis
         c. Treatment
   B. Adequacy of cardiac output
      1. Evaluation of perfusion
         a. Clinical
            i. Heart rate
            ii. Blood pressure
            iii. Urine output
            iv. Mentation
         b. Physiologic
            i. $\text{C(a-v)O}_2$
            ii. $\text{SvO}_2$
            iii. $\text{PvO}_2$
            iv. pH, base deficit, lactate
      2. Categorization of low flow states and tissue hypoxia
         a. Hypovolemic
         b. Cardiogenic
         c. Obstructive
         d. Distributive
         e. Endocrine
         f. Septic
         g. Dissociative
      3. Oxygen supply / demand balance
      4. Myocardial oxygen supply / demand balance
   C. Treatment of low flow states
      1. Augmentation of preload
      2. Afterload reduction
      3. Optimization of contractility
      4. Control of heart rate
D. Miscellaneous cardio-vascular topics
1. Treatment of hypertension
   a. Indications for treatment
   b. Modes of treatment
2. Preoperative cardio-vascular assessment
   i. Basal function
   ii. Augmented function
3. Treatment of arrhythmia’s
   a. Digoxin
   b. Lidocaine
   c. Procainamide
   d. Calcium channel blockers
   e. Beta blockers
   f. Cardioversion
4. Cardiac energetics
5. Peri-operative myocardial infarction
   a. Diagnosis
   b. Therapy
6. Autonomic nervous system / receptors
   a. Adrenergic sympathetic system
   b. Cholinergic parasympathetic system
   c. Regulation of organ blood flow
7. Inotropes, vasopressors, and vasodilators
8. Intra-aortic balloon counterpulsation and mechanical assist devices

II. PULMONARY
A. Peri-operative respiratory physiology
   1. Assessment of pulmonary function
   2. Pulmonary function after major surgery
   3. Prevention of postoperative pulmonary complications
B. Interpretation of arterial blood gas measurements
   1. Oxygenation
   2. Ventilation
   3. Acid - base balance
   4. Derived variables
C. Airway management
   1. Indications for airway control
   2. Complications of artificial airways
   3. Surgical vs. nonsurgical approaches
   4. Long term airway control
D. Oxygenation insufficiency
   1. Etiology / pathophysiology
   2. Prevention
   3. Oxygen delivery systems
   4. Alteration of mean airway pressure - PEEP / CPAP
   5. Positioning techniques – kinetic therapy / prone
   6. Complications of oxygenation support
E. Ventilatory insufficiency
   1. Etiology / pathophysiology
   2. Basic mechanical ventilator therapy - CMV, ACV, IMV, PSV
   3. Complications of mechanical ventilation
   4. Advanced and specialized ventilatory support modes
      a. PCV, PC-IRV, ILV, APRV
      b. High frequency ventilation
      c. Extracorporeal techniques
F. Thoracic trauma
1. Myocardial contusion
2. Pneumothorax / hemothorax
3. Pulmonary contusion
4. Flail chest
5. Major vascular injury

II. RENAL
A. Evaluation of oliguria
   1. Prerenal causes
   2. Renal intrinsic causes
   3. Postrenal causes
B. Acute renal failure
   1. Etiology / pathophysiology
   2. Assessment of renal function
   3. Prevention
   4. Differential diagnosis
   5. Therapy
      a. Alteration of renal blood flow
      b. Nutritional therapy
      c. Fluid / electrolyte changes
      d. Medication changes
      e. Dialysis and ultrafiltration
      f. Non-oliguric renal failure
C. Miscellaneous renal topics
   1. Interpretation of urine electrolytes
   2. Chronic renal failure
   3. End-stage renal disease, dialysis, transplantation
   4. Use and abuse of diuretics
   5. Fluid / electrolyte management
   6. Acid – base disorders

III. GASTROINTESTINAL / HEPATOBILIARY / PANCREATIC
A. Acute gastrointestinal bleeding
   1. Differential diagnosis
   2. Assessment of risk in surgical patients
   3. Techniques for evaluation of gastrointestinal bleeding
   4. Prophylaxis in high risk patients
      a. Antacids
      b. H2 blocking agents
      c. Other
   5. Medical management
   6. Surgical treatment
B. Miscellaneous gastrointestinal surgical topics
   1. Portosystemic shunts
   2. Gastroesophageal resection
   3. Pancreatic resection
   4. Major abdominal trauma
   5. Inflammatory bowel disease
   6. Pseudo-membranous colitis
   7. Ischemic colitis after surgery
C. Hepatobiliary
   1. Interpretation of liver function tests
   2. Hepatic dysfunction of sepsis
   3. Obstructive biliary disease
   4. Hepatic dysfunction with parenteral nutrition
   5. Acalculous cholecystitis
   6. Hepato-renal syndrome
   7. Hepatic transplantation

D. Acute pancreatic disease
   1. Diagnosis and evaluation
   2. Acute pancreatitis
   3. Pancreatic abscess
   4. Postoperative pancreatic problems
   5. Multisystem failure with pancreatitis

IV. CENTRAL NERVOUS SYSTEM
A. Acute central nervous system injury
   1. Trauma
   2. Hypoxic brain injury
   3. Intracranial pressure monitoring / therapy
   4. Long term complications of injuries

B. Miscellaneous central nervous system topics
   1. Encephalopathies
   2. Acute spinal injuries
   3. Diabetes insipidus
   4. Physical exam of neurologic system
   5. Determination of brain death

V. INFECTIOUS DISEASE
A. Evaluation of the septic patient
   1. Radiographic / imaging
   2. Occult signs of sepsis
   3. Use of the laboratory in sepsis

B. Sites for infection in critically ill surgical patients
   1. Peritonitis
   2. Intra-abdominal abscess
   3. Pneumonia
   4. Empyema
   5. Line / catheter sepsis and colonization
   6. Sinusitis, phlebitis, and other sources

C. Therapy for the septic patient
   1. Surgical approach
   2. Antibiotic therapy
   3. Special concerns in immuno-suppressed patients
   4. Opportunistic infections

D. Mediators of inflammation
   1. Tumor necrosis factor
   2. Cytokines
   3. Prostanoids
VI. MISCELLANEOUS CRITICAL CARE SUBJECTS

A. Fluid and electrolyte management
   1. Assessment of intravascular volume
   2. Necessary data base
   3. Selection of volume expanders
      a. Crystalloid
      b. Colloid
      c. Blood
   4. Use of volume challenge - bolus therapy

B. Use of blood products
   1. Red blood cells
   2. Fresh frozen plasma
   3. Platelets
   4. Cryoprecipitate / other factors
   5. Adverse effects of transfusion therapy
   6. Blood substitutes

C. Coagulation disorders
   1. Laboratory evaluation
   2. Disseminated intravascular coagulation
   3. Fibrinolysis
   4. Platelet dysfunction
   5. Congenital disorders of thrombosis
   6. Hypercoagulable states
   7. Pharmacologic anticoagulation

D. Metabolic and endocrine response to stress
   1. Systemic Inflammatory Response Syndrome (SIRS)
   2. Multiple Organ Dysfunction Syndrome (MODS)
   3. Glucose metabolism
   4. Water metabolism
   5. Adrenal / catecholamine response
   6. Pituitary / thyroid response

E. Nutrition
   1. Assessment of nutritional status
   2. Parenteral nutritional support
   3. Enteral nutritional support
   4. Complications of nutritional support
   5. Nutritional substrate allocation
   6. Metabolic monitoring

F. Daily problems in the intensive care unit
   1. Costs and allocation of resources
   2. Laboratory utilization
   3. Stress - both patients and personnel
   4. Death and dying

G. Other
   1. Hypothermia
   2. Analgesics / sedatives / hypnotics / anxiolytics
   3. Miscellaneous pharmacology and pharmacokinetics
   4. Ischemia – reperfusion injury
   5. Abdominal and extremity compartment syndromes
VII. TECHNICAL PROCEDURAL SKILLS

A. Cardiovascular
1. Peripheral blood sampling
2. Peripheral IV access
3. Central venous access
   a) Subclavian
   b) Internal jugular
   c) External jugular
   d) Femoral
4. Arterial catheterization
5. Pulmonary arterial catheterization
6. Right ventricular function analysis
7. Jugular bulb oximetry
8. Temporary transvenous pacing
9. Temporary transcutaneous pacing
10. Pericardiocentesis

B. Pulmonary
1. Oral tracheal intubation
2. Nasal tracheal intubation
3. Cricothyroidotomy
4. Percutaneous dilatational tracheostomy
5. Fiberoptic bronchoscopy
6. Intra-pleural pressure measurement

C. Gastrointestinal
1. Nasogastric intubation
2. Nasoduodenal feeding tube placement
3. Upper gastro-intestinal endoscopy
4. Percutaneous endoscopic gastrostomy
5. Stentaken-Blakemore tube placement

D. Other
1. Assessment of intra-abdominal pressure
2. Decompressive laparotomy
3. Resuscitative thoracotomy
### TEACHING CONFERENCES

<table>
<thead>
<tr>
<th>Name of Conference</th>
<th>Frequency</th>
<th>Individual / Department Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical Critical Care Teaching Rounds</td>
<td>daily</td>
<td>Critical Care Faculty</td>
</tr>
<tr>
<td>Surgery Grand Rounds</td>
<td>weekly</td>
<td>Dr. Friedell</td>
</tr>
<tr>
<td>Morbidity &amp; Mortality Conference</td>
<td>weekly</td>
<td>Department Faculty</td>
</tr>
<tr>
<td>Surgical Critical Care Fellow’s Conference</td>
<td>weekly</td>
<td>Dr. Cheatham</td>
</tr>
<tr>
<td>Critical Care Teaching Conference</td>
<td>Weekly</td>
<td>Administrative Fellow</td>
</tr>
<tr>
<td>Surgery Basic Science Conference</td>
<td>weekly</td>
<td>Dr. Friedell</td>
</tr>
<tr>
<td>Surgical Journal Club</td>
<td>monthly</td>
<td>Department Faculty</td>
</tr>
<tr>
<td>Forensic Pathology Conference</td>
<td>monthly</td>
<td>Dr. Anderson</td>
</tr>
<tr>
<td>Emergency Medicine/Surgery Conference</td>
<td>monthly</td>
<td>Dr. Falk</td>
</tr>
</tbody>
</table>

Residents in Surgical Critical Care participate in all conferences held within the Department of Surgical Education. Specifically, they present complex cases at Morbidity and Mortality Conference and discuss cases that are presented by other individuals. In addition, following an orientation period, the SCC residents share a progressive role as lecturers in the daily and weekly didactic teaching conferences. They prepare and deliver the didactic conferences to the junior residents and medical students. The critical care residents under the supervision of the SCC attending surgeons orchestrate the topics, agenda, and delivery of the weekly Critical Care Fellow’s Conference. The ICU residents play a major role in the case selection and presentation of the monthly forensic pathology conference. To insure the highest level of quality of these presentations, SCC faculty members are present to provide immediate feedback to the individual participants.

The SCC residents are responsible for medical student and junior resident education through daily bedside rounds and direct supervision of care. They increasingly participate in the other surgery didactic teaching conferences as they progress through their year of training. The SCC residents present the weekly Fellow’s Conference to their peers and the Critical Care Teaching Conference to the general surgery and other residents rotating on the SCC service. Each SCC resident is responsible for at least one Surgical Grand Rounds presentation each year. The SCC residents are instructors in the regional ATLS courses taught at ORH.

### THE CLINICAL ROTATION SCHEDULE

The residency in Surgical Critical Care includes 10 to 12 months in the ICU’s at ORMC. The resident may elect to take up to 2 months of elective rotations, depending upon resident staffing, in the Pediatric ICU at the Arnold Palmer Hospital for Women and Children, the Intermediate Care Service, the Nutritional Support Service at ORMC, or time in clinical research in critical care. Plans to pursue such rotations must be discussed with the program director at the beginning of the year. The resident may also elect up to 1 month of elective time to supplement specific educational needs, subject to the approval of the program director. The resident will receive 3 weeks of vacation during his/her residency.
THE RESPONSIBILITIES OF THE RESIDENTS IN PROVIDING CLINICAL CARE TO PATIENTS

SCC residents have in-hospital call approximately every third or fourth night depending upon the number of general surgery and emergency medicine residents on service. During their times on call and during their normal daily activities, the SCC residents have the responsibility of carrying out the patient care plan that is mutually agreed upon by the primary surgical team and the SCC service. In general, the primary surgical team retains complete responsibility for development of the patient care plan. While administering the patient care plan, the SCC resident has an appropriate amount of latitude regarding clinical decision-making and modification and execution of the care plan. However, should unforeseen circumstances occur, it is the responsibility of the resident to immediately notify the patient care team in order to establish a new patient care plan. Delivery of the patient care plan is under the direct supervision of the SCC attending surgeon. An attending surgeon supervises all technical procedures.

General surgery residents and other residents assigned to the ICU make daily morning work rounds with the primary surgical teams in order to exchange information and develop a patient care plan for the current day. Following these early morning rounds, the SCC residents participate in detailed patient care/teaching rounds with the SCC attending, general surgery and emergency medicine residents, and medical students. During these detailed rounds, all aspects of patient management are reviewed with the SCC attending. The patient care plan, as jointly discussed with the primary surgical team and the SCC service, is also reviewed during these rounds. If modifications to the daily care plan are recommended, they are discussed between the two services.

FIRST AND FOREMOST, remember that the patient belongs to the attending physician and that the final decision and ultimate responsibility for the patient’s outcome always lies with this surgeon or his/her designee. In the ORMC ICU’s, a distinction is made between the patient’s “attending” physician and the patient’s “managing” physician. For some patients, the attending and managing physician will be the same. For others, in which the attending physician may not feel comfortable directing the critical care management of the patient, a “managing” physician (usually an intensivist) will be designated by the attending physician to direct the patient’s day-to-day ICU care. Both the attending and managing physician may also delegate another physician, the senior resident on the primary service, or a consulting physician to make specific patient care decisions.

For every patient on the “teaching” services (“Blue” and “Red” teams) of the Department of Surgical Education, the Surgical Critical Care service will be designated as the patient’s managing physician. The Surgical Critical Care service will then make all patient care decisions in conjunction with the patient’s chief surgical resident. The Surgical Critical Care service will frequently be designated as the managing physician for “private” general surgical and vascular service patients also. In these cases, the Surgical Critical Care service will manage the day-to-day ICU care, but ultimate decision making responsibility remains with the patient’s private surgical attending. The degree of patient care involvement assigned to the Surgical Critical Care service on these private patients varies from surgical attending to attending. You will come to know each surgeon’s preferences during your first month or two in the ICU.

All plans, procedures, non-routine physician’s orders and diagnostic tests, consultation requests, and therapeutic or management changes must be discussed with the primary surgical team PRIOR to initiation. All adverse occurrences, complications, condition changes, and unexpected test results must be immediately communicated to the primary surgical team as well. Evidence of the communication with the primary surgical team must be documented in the medical record. For orders that you write on “private” (i.e., non-Surgical Education) patients, documentation of your discussion with the physicians involved should be recorded as “per Dr. _________” after your written physician’s order. Documentation of the discussion and rationale for the actions and therapy instituted should also be documented, when appropriate, in the Progress Notes section of the patient’s medical record.

Communication between the Surgical Critical Care service and the primary surgical services should be at the senior resident, chief resident, or attending level. Unlike on the regular patient care floors, communication up and down the traditional chain of command beginning with junior level residents can cause confusion and delay therapy. Communicate with the SENIOR resident as much as possible.

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The Surgical Critical Care service cannot function without communication and the trust that it fosters.

Both the residents on the primary surgical services and the SCC residents make rounds and document their patient care activities, assessment, and plans in the patient's medical record as frequently as is indicated. Thus, two sets of daily patient care notes are generated each day. In addition, a comprehensive dictated and transcribed ICU Attending daily note is posted on the chart each day as well.

The residents rotating on the SCC service for one to two months are members of the general surgery, emergency medicine, and internal medicine residency programs. During their rotation, they receive an intense experience in critical care closely supervised by the SCC attendings and SCC residents. The SCC provide close supervision of junior residents and contribute to the teaching conferences attended by these residents. They work as peers to the senior and chief residents in the general surgical program and share in the management of the complex patients admitted to the critical care units.

This parallel approach to patient management is intended to improve patient care by making resident and attending physicians available immediately at all times in the critical care units. The program is intended to improve educational efforts in critical care by providing an intense experience for the sponsoring program junior and senior level residents during their rotations on the SCC service. It also provides continuing experience in critical care for senior level and chief residents as they round throughout their entire training program with the Surgical ICU attendings and residents.

TECHNICAL PROCEDURES
Residents on the SCC service have graded levels of increasing responsibility in the performance of invasive critical care procedures. All of the trainees are specifically instructed in the principles, indications, contraindications, complications, and evaluation of each of the commonly performed invasive procedures. There is direct faculty supervision of all invasive procedures performed. The degree of supervision varies with the individual's experience and performance. Residents on the SCC service also provide assistance and supervision for procedures performed by other residents caring for patients not specifically referred to the SCC service. Specific procedures performed by the SCC service are described below.

1. Respiratory
   The SCC service provides all ICU airway management for patients referred to the service. While many patients are initially intubated in the pre-hospital, Emergency Department, or operating room setting, any re-intubation or any elective / urgent airway manipulation is provided by the SCC resident under faculty supervision. The SCC resident with faculty supervision performs all bronchoscopies for diagnosis or therapy. The SCC service does all ventilator management.

2. Circulatory
   The SCC residents, under faculty supervision, perform all central venous and pulmonary arterial catheterizations in patients referred to the SCC service. Maintenance of these devices and calculation of all hemodynamic variables are provided by the service. Residents are instructed in the indications for echocardiography and the application of the information obtained, but technicians or consulting cardiologists perform the actual procedures. Although rarely used, transvenous pacemakers are placed and maintained by the SCC service when indicated. Cardiac assist devices are not used in the Surgical ICU's. Patients requiring such devices are transferred to the Cardiovascular Recovery Room (CVRR) as per ICU policy.

3. Neurological
Intracranial pressure monitors are frequently used in brain injured patients. These devices are placed by consulting neurosurgeons or by SCC residents under their direct supervision. Maintenance of the devices, indications, contraindications, complications, and application of information obtained from the devices is a part of daily teaching rounds and regular didactic conferences. Computer assisted continuous EEG monitoring is used in the Neurosciences ICU and the data are reviewed and discussed on a daily basis on ICU teaching rounds.

4. Renal
Avoidance of acute renal failure and application of renal protection protocols is a part of daily ICU teaching rounds. This highly successful program has almost completely eliminated oliguric renal failure and the need for hemodialysis. The various renal replacement techniques including hemodialysis are discussed in didactic conferences. Management of acute renal failure and indications, contraindications, and complications of renal replacement therapies are discussed in regular didactic conferences. The SCC residents work closely with the nephrology consultants to plan the method, timing, and objective of each renal replacement intervention. Goals of each treatment are jointly reviewed to include electrolyte imbalances, acid-base disturbances, and volume status.

5. Gastrointestinal
Gastrointestinal tubes, stomas, and fistulae are a common part of general surgery and are managed jointly by the primary surgical services and the SCC residents. The SCC residents routinely perform intubation of the gastrointestinal tract for feeding, diagnosis, or therapy. The SCC residents, under the direct supervision of the SCC attending surgeon, perform upper gastrointestinal endoscopy for diagnosis and for placement of percutaneous gastrostomies (PEGs). Indications, contraindications, complications and management are discussed in daily SCC teaching rounds and routinely in didactic conferences.

6. Hematologic
Auto transfusion, assessment and treatment of coagulation abnormalities and transfusion of homologous blood components is a part of daily SCC patient care. Indications, contraindications, complications, and management strategies are discussed on daily teaching rounds and routinely in didactic conferences.

7. Infectious disease
Infectious disease issues are a major part of critical care problems in surgical patients. Diagnosis, treatment, use of antimicrobials, and adjuvant therapies are discussed in daily teaching rounds and routinely in didactic conferences. A Doctor of Pharmacy level pharmacist with special interest in antimicrobials and infectious disease is a member of the SCC teaching service and contributes to daily teaching rounds and conferences. When consultation from the Infectious Disease department is requested, the SCC resident interacts directly with the consultant as part of their educational experience.

8. Nutritional
Virtually all patients referred to the SCC service receive specialized nutritional support while in the ICUs. Enteral nutrition is utilized preferentially with total parenteral nutrition limited to specific indications. The SCC resident under supervision of the SCC attending directs the selection and administration of the support. Protocols are in place for routine nutritional assessment including nitrogen balance and metabolic expenditure studies. Residents on the SCC service use this information to formulate a comprehensive nutritional support plan. Representatives from the institutional Nutritional Support Team contribute to teaching rounds on a daily basis. Indications, contraindications, complications, and management details are discussed on daily teaching rounds and routinely in didactic conferences.

9. Monitoring/bioengineering
Basic and specialized monitoring devices are used in all patients admitted to the ICUs. The SCC residents interpret and apply the information obtained from the devices on a minute-to-minute
basis. The principles of the devices, indications, contraindications, complications, and applications are discussed on daily teaching rounds and routinely in didactic conferences.

10. Miscellaneous
Specialized beds, immobilization and mobilization devices, mechanical and chemical techniques for prevention of venous thrombosis and embolization are discussed on daily teaching rounds and routinely in didactic teaching conferences.

THE SURGICAL CRITICAL CARE RESEARCH PROGRAM
There is an active scientific research program on the Surgical Critical Care service. Three program themes are developed at this time. One theme involves the clinical aspects of high technology monitoring systems in the continuous assessment of hemodynamic function in critically ill patients. The second theme is advanced ventilatory support in severe acute respiratory distress syndrome. The third theme is shock resuscitation and prevention of organ failure. A variety of industry sponsored research studies are always in progress and the resident is encouraged to enroll patients in these trials as appropriate.

There is no requirement for research activities by residents in the surgical critical care program. The faculty strongly encourages participation in the clinical aspects of the investigation program however. The facilities available for clinical research include the Surgical Critical Care Units at ORH and animal facilities at the Health Research Institute on our campus. Four extensive computerized databases are available for clinical research. These include detailed clinical care transcription, a demographic, diagnosis, procedure, and complication database (SWIFTMD), the Society of Critical Care Medicine’s Project IMPACT critical care database, and the American College of Surgeons’ NTRACS trauma registry. Additionally, computer support, document processing, information retrieval, and biostatistical support is available within the Department of Surgical Education.

SURGICAL CRITICAL CARE RESIDENT EVALUATION
SCC and other residents rotating on the SCC service are evaluated regularly by the faculty. This includes mid-rotation counseling every two to three weeks as well as an end-of-rotation written evaluation of the residents. The residents are evaluated on the basis of their overall performance and their presentations during the daily teaching rounds and discussions of assessment and care plans for their patients. Resident performance is discussed by all attending faculty involved in the care of patients in the Surgical ICU. The SCC residents participate in the evaluation and counseling of junior residents and students on their service.

The residents’ technical skills are assessed by the direct observation by the supervising faculty member of all bedside procedures performed. The volume and breath of technical experiences of residents are assessed by monthly review of their procedures and complications list. These lists are housed in the Surgical Education Departmental database.

There is a multiple choice written examination for all residents and medical students rotating on the Surgical ICU Service. The written examination is administered as a brief pretest and longer post-test. This helps to improve the evaluation of the individuals rotating on the service as well as the performance of the service in meeting its educational goals.

Residents who elect the one year residency in surgical critical care are evaluated monthly by the program director and quarterly by all faculty members involved in the educational program. This evaluation includes a written evaluation by all SCC attending surgeons and formal discussion between the critical care resident and the program director. The trainee is evaluated on clinical and diagnostic skills, technical skills, didactic knowledge, problem-solving ability, consultation skills, judgment, and interpersonal skills necessary for appropriate management of an intensive care unit. The objective Multidisciplinary Critical Care Knowledge Assessment Program (MCCKAP) written examination is administered to the SCC residents each year allowing them to compare their knowledge base to their
peers around the world. The SCC residents are invited to participate in the mock oral board exams given to senior surgical residents each year.

All medical students and residents rotating through the SCC service are asked to complete an evaluation form assessing the educational program and individual faculty member's contribution to this program. These anonymous evaluation forms are reviewed following the meeting in which the individual residents rotating on this service are evaluated. Opportunities are provided for the one-year trainees in critical care to provide appropriate feedback to the program director and all faculty participants regarding their role in the educational program in surgical critical care. This feedback will be both oral during the quarterly performance evaluations of the trainees and written each quarter in a formal program evaluation provided by the trainee in surgical critical care. These evaluations will be given to the Department of Surgical Education Academic Chairman for review with the individual faculty members on a semi-annual basis.
"THE TEN COMMANDMENTS"

1. "Honesty first, last, and always."
   • "The smart man admits when he is wrong"
2. "Do it now."
   • *If the unit becomes busy, there may not be time later.*
   • *Sleep always comes last.*
3. "Do it right the first time."
   • *The patient will likely not give you a second chance.*
4. "If you don't know, ask."
   • *There is no such thing as a "stupid question".*
   • You are here to learn. The majority of your critical care education will be through one-on-one discussions with the ICU faculty.
5. "Communicate before, not after."
   • You can be faulted only if you *don't* call.
6. "Do it yourself."
   • Trust no one and assume nothing.
   • Always see test results or x-rays yourself.
   • Delegate with discretion.
7. "Round frequently."
   • Anticipate disasters by knowing your patients and identifying untoward physiologic events before they happen.
8. "Write it down."
   • Keep a list of tasks and constantly revise and update it throughout the day.
9. "Do some reading everyday."
   • Read about the diagnosis and management of each of your patients.
10. "Remember the patient and their family."
    • Keep in mind that it is a privilege to care for each patient AND their family.
    • Communication is essential.
A WORD ABOUT COMMUNICATION

Accurate and effective communication is essential to every aspect of our daily lives. If you think about it, the vast majority of the world’s problems are related in some way to poor communication. Communication is vital to practicing critical care as well. As a fellow or resident, you will communicate on a daily basis with other physicians, nurses, respiratory therapists, physical therapists, dieticians, social workers, medical students, unit secretaries, and hospital volunteers, not to mention the patient and their family. A good fellow is one who understands how to provide state-of-the-art care to a critically ill patient. An excellent fellow is one who communicates effectively with those around him/her while providing the same excellent level of patient care. As with the world, the vast majority of non-patient related problems that arise in the ICU are related to poor communication skills on the part of the critical care fellow or resident.

In every thing that the critical care fellow / resident does, he/she should have three goals:

1. Communicate.
2. Communicate again.
3. Confirm that the communication was effective.

COMMUNICATION at all levels is the most important skill to be learned in critical care.

COMMUNICATION will make or break your fellowship experience. The fellow / resident who communicates well and explains the rationale for his/her actions will rapidly gain the respect and support of the ICU faculty and nursing staff even if those actions are flawed. A truly brilliant fellow who communicates poorly, however, will have an unrewarding experience, will lose the ICU nurse’s respect and support, and will fail completely to develop into an excellent surgical intensivist.

Communication fosters trust -
Trust engenders responsibility -
Responsibility allows autonomy -
Autonomy mandates communication.
JOINING THE TEAM:
THE DAY-TO-DAY WORKINGS OF THE
SURGICAL CRITICAL CARE SERVICE

The first few months of the fellowship involve a difficult period of adaptation not only to the microenvironment of the Surgical Intensive Care Units (SICU), but also to the macro-environment of Orlando Regional Medical Center (ORMC). ORMC is a regional tertiary referral center. Its physical plant is fairly new resulting in a pleasant workplace for the newcomer. ORMC is the only Level I Trauma Center in central Florida. ORMC brings institutional pride to the community.

The new fellow will spend some time learning to get around in this maze and interacting with the personnel at different professional levels. Fortunately, he/she will soon find that in the middle of this complex network, there is a home base, a more familiar and friendly environment that, in terms of topography, can be rapidly mastered. In time, he/she will develop the necessary professional relations to support the ensuing 12-24 months of productive learning and working activity.

The process of adaptation to the new environment, the necessary adjustment to join the ICU team and some of the particulars of the physician interrelations are well described in the text CRITICAL CARE by Civetta, Taylor and Kirby. This section of the fellow's manual focuses on the parochial ways of "doing things" in the SICU at ORMC to make adaptation less painful to the new critical care resident.

THE SURGICAL ICU'S AT ORMC

The Surgical / Trauma ICU has a maximum capacity of 10 beds. There are also 8 beds in the Neurosciences ICU, 8 beds in the Medical ICU, and 4 beds in the Burn / Trauma ICU. These are the units that you will spend the most time in. The occupancy rate varies from 90 - 100% at most times. There may also be surgical step-down (Progressive Care Unit, PCU) patients who are routinely seen by the Surgical Critical Care service. This means that the fellow is expected to act as the coordinator of care for as many as 18 to 24 critically ill patients.

THE STICU NURSING STAFF

On an hourly basis, the people that you, as the ICU fellow, will spend the most time with throughout your fellowship will not be the faculty or housestaff, but rather the nursing staff. **It cannot be stressed strongly enough that it is vital to be able to work constructively and amicably with the nurses.** Good rapport with the staff will lead to better patient care. Most of the nursing staff are highly trained and experienced, and possess sound clinical judgment. You will depend on them for accurate information, early warning of potential problems, execution of complex orders, and set up and use of the multiple, complex monitoring devices commonly used in the unit today.

There is a period of mutual readjustment at the beginning of each academic year for both the new fellows and the nurses. Try to make this a smooth transition for all involved, as a little extra time up front will both save later headaches and provide a good working relationship down the line. Remember that the SICU cannot run smoothly (or at all) without experienced, dedicated nurses, which means that you cannot do your job effectively without the nurses. Also remember that many of the nurses you encounter in the ICU were practicing critical care before you even considered medical school and will continue to be at ORMC long after you leave! Approaching your fellowship with a mind open to learning from the ICU nursing staff will provide you with immeasurable and long lasting benefits.

THE SURGICAL EDUCATION DATABASE

21 Revised 5/30/01
To know everything about every patient is the challenge of the fellowship. The method used to keep the information organized without mixing up patients is a matter of personal taste. Although a good memory is very useful, it is worthwhile to have some sort of summary or recorded information to assist a tired memory when discussing problems with the ICU attending, surgical team attending, consultants, ICU residents, surgical team residents, radiologist, clinical pathologist and nursing staff. This could be implemented in the form of a ring notebook with replaceable pages, index cards, or an electronic database. Occasionally a patient is re-admitted and the old information is valuable and shortens the review of the chart to the occurrences since discharge from the unit. Important information includes name, hospital number, age, date of hospital admission, date of SICU admission, diagnosis, significant data from the past history, allergies, surgical procedures, reasons for admission to SICU, active problems, antibiotics and other medications, the organisms being treated, current long term plans and plans for the day.

The Surgical Critical Care service utilizes a computerized database to facilitate daily patient care. This database, specifically written for the department, is housed on the corporate Intranet or “SWIFTMD”. This database contains most of the important information that will help you organize your daily patient care activities including patient demographics, laboratory results, radiologic studies, medication records, patient transcription, as well as procedure documentation. The database will help you to log your procedures during your fellowship facilitating subsequent application for American Board of Surgery certification in Surgical Critical Care as well as granting of hospital privileges. You will receive a detailed orientation to the database once you arrive at ORMC. An instructional manual is included on the Surgical Critical Care CD-ROM.

A DAY ON CALL

STICU MORNING ATTENDING ROUNDS
The main event of a day in the SICU is morning attending rounds. The ICU fellow will gather with the team that is finishing the shift and the team that is starting the new shift and will discuss the patients in detail. Rounds start at 0800 and last for 2 - 4 hours. The attending of the day and the fellow must be physically present at all times during rounds in order for this session to achieve its objectives. The ideal situation includes presentation of the patients by the junior residents and students on call during the previous 24 hours complemented by significant additions by the fellow with relevant information as necessary. Special emphasis is placed on the events of the previous 24 hours. The fellow's contribution is especially important when attendings switch, especially if the new attending has not been on for some time. Since the presentations stress the most recent events, the fellow must be sure to mention all significant events that have occurred since the attending last saw the patient. Representatives from nursing, pharmacy, respiratory care, nutritional support, and the primary service should each add their pertinent comments. Each patient presentation is followed by a discussion of the case by the ICU attending including the pertinent teaching points. After discussion of alternatives and questions, the plan for the next 24 hours is laid out. It is extremely important that communication is clear at this point and that the on call resident or fellow has a complete understanding of the interventions to be made. The resident/fellow should not try to keep this in his/her memory, but notes should be taken so that specific plans are not forgotten, resulting in significant omissions coming to light during family or evening rounds.

The off duty resident/fellow may need to handle acute problems during the course of rounds; he/she is encouraged to do so since he/she is abreast of the most recent events. If the continued presence of a physician is required at the bedside, one of the residents/fellows not assigned to patient care that day (i.e., the "in-between team") should leave rounds and manage the problem. Nothing disturbs morning rounds more than waiting for the post-call fellow to return from a bedside with vital information.

The last subject of morning rounds is discharges, admissions, elective and emergency consults. The fellow should scrutinize the daily operating room schedule prior to rounds and discuss planned or potential admissions with the ICU Shift Manager. A plan is delineated at this time concerning admissions
for the next 12 hours. The charge nurse is a pivotal participant of this discussion since he/she is aware of any staffing problems that might affect bed allocation or the potential acuity of the possible admissions, as well as about the availability of step down beds for transferring patients ready for discharge. It also pays to get to know the nursing coordinators (known as the "PCC") who will know the hospital's bed situation (extension 5460).

**The SICU nurses and therapists are a vital source of information about the patient.** They are in close contact with the patient for 12 hours a day while you, as the fellow, must divide your time between 12-24 patients. The nurse can frequently tell you about the primary team's last visit, the opinions and recommendations of consulting services, and the family's understanding of and questions about the patient's condition.

**X-RAY ROUNDS**
Attending rounds are followed by a visit to the X-ray reading room in order to see the radiographs obtained on each patient during the previous 24 hours. The entire SICU physician team including the personnel not on call that day is expected to participate in X-ray rounds. All the films should have been previously seen by the resident/fellow except the ones taken during the course of rounds. Notations should be added to the list of things to do regarding observations made during the course of X-ray rounds as to repositioning of endotracheal tubes, nasogastric tubes, feeding tubes and intravascular catheters. Complex cases will be discussed with the radiologists to ensure accurate interpretations.

**DAY WORK ROUNDS**
The two time intervals when the activity of the SICU fellow is most intense are morning pre-rounds from 0600 until 0800 and work rounds in the afternoon. Because attending and X-ray rounds are usually finished between 1100 and 1200, there are only limited hours left to contact consultants, surgical teams, radiologists, the nutritional support team, and pharmacists to obtain answers to specific questions, request consultations and have procedures scheduled. This available time is markedly reduced on Friday afternoons when, for obvious reasons, consultants are hard to locate and reluctant to do anything additional unless it is presented as an absolute crisis. Therefore, it is necessary on certain occasions to reach consultants and schedule important procedures before starting work rounds. It is mandatory that crucial procedures be scheduled personally and that consultants be spoken to personally rather than delegating this to junior residents or students who might not understand what is really happening or might not be as persuasive on the telephone.

Patients should be assigned to junior residents and students before morning rounds. Otherwise, 3 hours of rounds could go by and, at the end when patients are assigned, residents may only vaguely remember the specific plans laid out. At no time should more than 4 patients be assigned to medical students. This enables each member of the junior staff to concentrate on the remaining patients.

Although the junior residents and medical students will generally follow those patients admitted on their nights on call, it may be better (at times) to rotate patients among residents to increase their exposure and, thus, their learning experience. In general, students should not be assigned chronic, long-term patients. Continuity of care, however, is necessary at the fellow level.
Work rounds include a methodical review of the flow sheet including close scrutiny of each system, emphasizing the patient's main problems:

**Cardiovascular**
- Check vital signs
- Check hemodynamic parameters and monitoring devices (obtain new values if indicated)
- Review cardiovascular drips and adjust as necessary
- **All patients with a pulmonary artery catheter should have a printout of both the latest hemodynamic and oxygen transport variables available for rounds.**

**Respiratory**
- Check ventilator settings and blood gas results
- Check pulse oximeters and mixed venous oximeters
- Calculate Qsp/Qt and Vd/Vt (when necessary)
- Check adequacy and frequency of respiratory orders (chest physical therapy, aerosol treatments and oxygen therapy); evaluate the need for new orders or need to continue the current ones
- **Only fellows or experienced senior residents should make non-emergent ventilator changes. Students are NOT allowed to make ventilator changes without the fellow or respiratory therapist in attendance.**
- All ventilator changes must be IMMEDIATELY documented on the patient's flowsheet and in the Physician Orders. Both the nurse and the respiratory therapist should be notified of any ventilator changes.

**Renal**
- Check urine output and renal function parameters with special attention to trends.
- Check volume status and the continued need for potentially nephrotoxic medications.
- A 24 hour creatinine clearance can be performed when urine is collected for UUN.

**Metabolic**
- Evaluate fluid balance and adequacy of fluid orders in volume and composition.
- Check results of follow up serum and urinary chemistries, arterial blood gases, blood glucose levels and insulin drips.
- Lactic acid levels should be measured in patients with unexplained metabolic acidosis or until lactate levels return to normal (less than 2.0 mmol/L).

**Nutrition**
- Assess nutritional status and need for supplementary nutritional support
- Check recent metabolic cart and UUN studies
- Check the most recent recommendations by the nutritional support team
- Reconsider route of current nutritional support and possibility of new routes
- Check TPN solution type and additives.

**Hematologic**
- Check hemoglobin and WBC; trend values and evaluate for changes
- Assess clotting variables, platelets,
- Evaluate for potential sources of bleeding
- Check for medications that could be suspected of causing hematologic abnormalities.

**Gastrointestinal**
- Examine every abdomen and evaluate status of wounds
- Consider need for continuation of drains and tubes
- Communicate important findings which seem to have been missed by surgical team (not mentioned in notes or discussions).

**Infectious Disease**
Investigate fever spikes, WBC elevations
Consider need for new or repeat cultures, need for line changes, need for special cultures
Consider continued need for antibiotics, status of antibiotic regimen and need for changes
Culture results and antibiotic changes should be recorded
Discuss antibiotic levels with the clinical pharmacist.
New antibiotic orders and antibiotic level orders should be written.

**Neurological**
- Recheck the Glasgow Coma Scale reported in morning rounds, address any acute changes
- Adjust narcotics, sedatives and psychoactive drug
- Evaluate the need for delirium tremens prophylaxis
- Check serum sodium (goal = 150-155 mEq/L) and osmolarity (goal = 305-320 mOsm/L) on patients receiving mannitol or hypertonic fluids; adjust as necessary
- Adjust anticonvulsants according to serum levels
- Adjust ventilation (if indicated) to maintain a PaCO$_2$ of 30-35 torr
- Check pupils for reactivity.

The nursing medication administration record (MAR) should also be reviewed paying special attention to each medication the patient is receiving. A close watch should be maintained for adverse reactions and dosages should be adjusted according to changes in renal or hepatic function. Reordering medications should be part of morning rounds. IV fluids and rate of administration should be checked. The microbiology data must be updated during work rounds.

The junior residents should be encouraged to do the order writing during this part of rounds so that they become familiar with the doses and with order writing in general. All medical student orders must be co-signed by a physician. Junior house staff and students frequently complain about what they call secretarial assignments, but the fact is that they are not clinically mature enough to make independent therapeutic decisions. It is only through an understanding of the decision making process and participation in the actual practice of patient care that they will acquire the skills to be intensive care clinicians.

**It is important that the reasoning for all the decisions be explained to all involved parties: junior staff, students, nursing staff, respiratory therapists, surgical teams. This constitutes the most important teaching goal of bedside rounds.**

After the flowsheet and medications have been reviewed and appropriate interventions have been made, specific activities are delegated by the fellow to the junior staff and students. The connotation of the term delegation is very important: **ultimately the ICU attending considers the fellow the responsible party**; therefore, he/she should assess the capabilities of the junior staff and constantly follow the progression of the task that has been delegated.

As previously stated, contacting consultants, scheduling special tests, and obtaining official results of radiological or other clinical tests is an important early priority. Only after those things have been done should the fellow concentrate on other time consuming activities.

The next priority is intravascular line changes. Elective line placement and changes should be completed before the change of the nursing shift, preferably before 1800 so the ICU attending can be present and before the nurses are busy completing the flowsheets for their evening report.
AFTERNOON ROUNDS
Speaking with families is part of the 4 PM afternoon rounds agenda and usually is an ultimately rewarding activity. The importance of good communication between the physicians and patient families cannot be stressed strongly enough. This cannot be delegated to junior staff. It is best to maintain communication with the family at the attending and fellow level in order to provide consistent information from the coordinator of patient care to the concerned family member. Students and junior residents should direct family's questions to the fellow. Ideally, two people are present when talking to the family including a fellow, attending (especially if there is a problem), nurse, and/or surgical team member. The second person can act to verify information and to assess the family's reaction.

Being in the operating room most of the day, the primary services are frequently not available to talk with families. It is not unusual to hear family members say they have not talked with a doctor "in several days". The fellow becomes an important source of information and assurance to many families. Try to be present during visiting hours and accessible to family members. The nurses will frequently ask you to update the family if they have not seen the primary service recently. It takes but a few minutes, fulfills the family's need to talk with a physician, allows you to get to know the family, and can be very rewarding. Obviously any sensitive issues should be discussed between the family and attending surgeon. If you sense any discomfort with the family's relationship with the primary service or any perceived problems in patient care, these items should be immediately brought to the attention of the patient's primary surgeon.

LATE AFTERNOON AND EARLY EVENING
Ask the ICU Shift Manager to inform you of all potential admissions and of all admissions as they actually arrive in the SICU. Make a point of "checking in" with the ICU Shift Manager every 2-3 hours (and more often if the unit is busy) to find out the latest information on admissions, patients in the Emergency Department (who may become admissions), transfers, and the hospital bed status. More often than not, the SICU is nearly full with only 1 or 2 potential beds or "admissions slots". Triage of stable patients out of the SICU to accommodate critically ill patients should always be in the back of your mind (See the ICU Bed Allocation protocols). The hospital in general also stays at a high occupancy rate and floor beds may not always be readily available. Always keep in mind which bed will be used as the admission slot for a CODE-90 (cardiac arrest) from the floor, an unexpected operating room patient, or the trauma patient that needs emergent resuscitation prior to the operating room. Close communication with the ICU Shift Manager is essential and will prevent surprise admissions as well as allow you to budget your time and plan procedures. Reviewing the operating room schedule first thing in the morning and discussing these potential admissions with the ICU Shift Manager will allow you to anticipate and plan their care in advance.

New admissions introduce variety to the afternoon. Usually, elective admissions of the day arrive from the operating room and require the devoted attention of the fellow and junior resident in charge of the patient at least for the first 30 minutes. Obtain a direct report from the anesthesiologist, CRNA, or surgeon to assess the condition of the patient and to evaluate for potential instability. Remember to inform the ICU attending about the new admissions and to have a plan of action for discussion.

The student/resident must write an admission note with details of the history, reason for admission to the SICU, intraoperative course, intraoperative complications, admission physical examination and results of admission blood work and CXR, assessment and plan. Such a note is of use not only for presentation of the patient to the attending, but as a summary for the incoming team. The note should be concise and limited to no more than one page.

After the change of the nursing shift, it is useful to make bedside rounds with the junior staff to gather the results of the tasks delegated and in order to assess the progression of the patients.

As long as the plans made during morning rounds and adjusted in afternoon rounds are being followed and no new or significant developments have occurred, there is no need to call the attending. If things are not "going well", problems have developed, or you are not sure how to handle a particular problem, it is best to call the ICU attending and talk it over. It cannot be stressed enough that the ONLY ERROR IS NOT CALLING. As time goes on and you learn and develop competence and confidence, trust between
attending and fellow also grows and you will have plenty of time for independent action. This is not true in July! Before calling the attending, all the information pertinent to the problem should be collected and tentative and alternative strategies thought out.

EVENING PRE-ROUNDS
The fellow will update the status of the patients, occurrences of the day and changes made to the plans discussed during morning rounds. New patients will be presented as well as new consults and any potential admissions. It is not necessary for the junior residents to take active part of this session if there are no acute crises in progress. Be sure to discuss the census situation with the ICU Shift Manager before the evening phone call. A plan for triage and acceptance of patients must be formulated to optimize bed utilization and expedite admissions. The flowsheets of particularly complex patients should be collected in preparation for the attending phone call and the quietest area of the unit selected to sit down and call the attending.

EVENING "CHECKOUT" ROUNDS
Evening checkout rounds are at 9 PM each evening. This session is a phone conversation between the SICU attending and fellow/resident. The junior staff and students are not invited. This is an opportunity for the fellow/resident to have a one-on-one discussion with the attending. Using the flow sheet as a source of information, the fellow describes the events of the day, the results of the interventions, and conveys the useful information that he/she has collected. He/she is expected to summarize and abstract the crucial facts, avoiding irrelevant trivia. The news story approach is strongly suggested: who, what, where, when, and how in the first paragraph. The events of the evening are discussed including intervention and patient care plans. Clarification of plans, potential triage patients, new admissions, and preoperative evaluations are all discussed. Again, no question should remain at the end of the conversation as to the plan of action for the night. The fellow/resident should ask for any necessary clarification and write down the plans laid out in order to avoid errors and omissions. Rounds are finished with the presentation of the remaining preoperative consults (unable to be seen by the consult fellow during the day) as well as any outstanding emergency consults. Advance plans should be made for potential discharges the next morning as well as discussing bed availability for the next day's elective cases.

Occasionally there is a patient who is markedly unstable while night rounds are in progress: the fellow should have a resident stay at the bedside with instructions to keep him/her abreast of any significant changes.

NIGHT WORK ROUNDS
The team on-call again gets together for general bedside rounds. The session follows the same schedule of day work rounds with some minor changes. The flowsheet is reviewed again. Appropriate laboratory studies for the next day should be discussed and ordered: there are no "routine" morning labs. Every test should be ordered for a specific reason. CXR's are ordered as well during night rounds. As a guideline, one CXR should be obtained every 24 hours for intubated patients, but only for specific indications on non-intubated patients. Routine chest X-rays are not needed after guidewire line changes or in patients who have been chronically ventilated and are stable.

On Sunday night, special laboratory studies are ordered for the patients receiving either parenteral or enteral nutritional support. They include: CBC and platelets, Basic Metabolic Profile (BMP - electrolytes), Complete Metabolic Profile (CMP - total protein, albumin, calcium, phosphorus, total bilirubin, AST, ALT, alkaline phosphatase), magnesium, transferrin, triglycerides, prealbumin, and 24 hour urine collection for urine urea nitrogen (UUN). Zinc and copper are only ordered once a month and only if the patient has been on total parenteral nutrition for more than 8 weeks or if deficiency is suspected on clinical grounds.

If the medicine administration record review has been properly done during day rounds, only a quick check is necessary at this time, especially looking for medications that require therapeutic levels checked (i.e., digoxin, lidocaine, procainamide, aminophylline, dilantin, phenobarbital, carbamazepine, aminoglycosides, vancomycin).
The overall plan of care should be discussed with the night nursing and respiratory staff and all questions answered so that the teaching objectives of rounds are accomplished for the night crew. It is even harder to keep the team together at night, and it takes a concerted effort on the fellow's part to stop the juniors and students from drifting away.

All orders should be written; verbal orders are for true emergencies and when used should be signed as soon as possible. A physician must co-sign the student's orders at the time the order is written. The nurse taking care of the patient or the nurse covering the patient should be notified and the chart should be flagged as a safety mechanism.

Many emergency admissions arrive in the SICU after midnight. They also usually constitute the more complex cases (either trauma cases with multiple injuries, cardiovascular and respiratory instability or elective surgical patients with acute cardiorespiratory decompensation and/or sepsis). These cases require immediate attention by the fellow and resident assigned since the entire database must be created from scratch. Information should be collected rapidly from all sources while, at the same time, therapeutic measures are instituted and monitoring devices are inserted. When the “busy work” is completed, an admission note must be written, containing the list of problems, diagnosis or injuries, work up, an admission physical examination, the results of admission lab results and CXR, and finally, an overall assessment and therapeutic plan. Be sure to check to see that the patient and any procedures are entered into the SWIFTMD database. To be physically present at all of the places that you are needed when there are 2 or 3 critically ill patients at the same time, enlist a junior resident to carry out specific actions and report results back to you at frequent intervals. Also, the ICU Shift Manager can keep you abreast of problems in other patients.

The fellow should be prepared to stay up all night and to be busier than in the day since there is no second person to assist him/her. The junior staff is already tired, the sickest patients are admitted at night, the least experienced nurses may work on the night shift, and even the more stable patients seem to decompensate at the worst possible moment.

One of the busiest periods in the SICU occurs from 0600 until 0800. During this time, the fellow is expected to review daily progress notes, exchange information with the residents of all the various surgical teams, review all the morning X-rays, review all the new lab data (and institute corrective measures for any abnormal values), find results of important gram stains sent over the previous 24 hours, obtain preliminary readings on radiological studies done overnight, discuss the projected discharges and admissions with the incoming charge nurse, answer questions from the operating room staff, recovery room staff and surgical teams regarding bed availability for elective cases and receive new emergency consults from the trauma and other surgical teams. All these activities are spiced by a multitude of patients’ developments brought to the fellow’s attention by the incoming nursing shift. It is at this time when the fellow’s ability to handle multiple problems at the same time is taxed the most!

Also during this time a fellow or resident designate should round with the busiest surgical teams (or those with the most acute patients).

Daily progress notes should consist of a brief summary of the events of the previous 24 hours. These serve as the most knowledgeable and concise listing of events and decisions. This note briefly reflects the events of the day and plans for the night. The author of the daily note is evaluated by the ICU attending in his/her ability to articulate concisely the day’s activities and plans. Include consultant input, antibiotics and the source and organism being treated, other medications, hemodynamic, cardiorespiratory and nutritional support plans in the daily note.

Close communication should be maintained with the ICU attending throughout the night: when a patient is not responding in the expected fashion, when the fellow has any doubts or even when the attending might want to know about a successful outcome of a therapeutic intervention in a complex case.
ADMISSIONS
There is a general order for prioritizing admissions when a bed becomes available. This is detailed in the ICU Bed Allocation Protocols. In brief, unstable patients in the operating room who will require invasive critical care monitoring or pulmonary support always have first priority for admission. Unstable patients from the Emergency Department are the second priority. Unstable patients from the floor or step down units are considered next. Pre-operative cardiopulmonary evaluation patients represent a special group of patients who are given a high priority for admission by virtue of their potential for becoming critically ill postoperatively. Only after the above patients are admitted are the more routine admissions assigned beds. It is often useful to make a trip to the PACU, ER, OR, or floor to evaluate patients before assigning them an ICU bed. Frequently, what constitutes an "ICU admission" in someone else’s mind will just as appropriately be cared for in a step-down unit bed.

Standardized, pre-printed orders for admission to the SICU are available in the SICU, PACU, Emergency Department, and Surgical Step-Down Unit (PCU). Patients admitted to the SICU are strongly encouraged to have these orders filled out.

All admitted patients should have admission orders written or co-signed by a senior resident of the surgical team. These orders include essential clinical information; team beeper information; routine nursing orders for skin care, tubes, monitoring equipment and dressings; intravenous fluids; IV infusions; antibiotics; all other medications and patient care equipment. Mechanical ventilation orders are usually given by the ICU fellow. The fellow must review the orders written by the team to make any necessary changes and additions (all changes should be discussed with the senior/chief resident or attending surgeon on the admitting surgical team).

On occasion when the hospital census is very high, non-surgical services may wish to admit critically ill persons to the SICU. This is generally discouraged, although in certain cases there may be no other good alternative. Work closely with other attendings so that all patients get optimal care in the most appropriate ICU.

DISCHARGES AND TRANSFERS
A patient is ready to be discharged from the ICU when intensive care is no longer needed or the reason for intensive monitoring either by medical or nursing staff is over. Both the ICU and the surgical team have to reach this conclusion before the actual discharge occurs and the new location for the patient should be ready. Specific transfer criteria and PCU admission criteria are available in the ORMC policy and procedure manual.

Sometimes disagreements may arise regarding the fitness of the patient for discharge, or the need for a step-down or intermediate care unit. These disagreements are usually ironed out when the teams have an open discussion of the case either at the fellow/resident level or, if necessary, at the attending level.

If short term intermediate care (PCU) is needed but not available, it is important to define when the patient starts his/her step down unit day or days. Plans for direct transfer to the floor can be made if a step down unit bed never becomes available and the patient has continued to improve.

Patients and families should be prepared for the transfer to the floor or step down unit ("ligation of the umbilical cord") particularly after prolonged SICU stays. If the patient is transferred in the middle of the night, the family should be prepared and notified in advance. Usually the SICU team is more conservative with respect to placing the patient in an intermediate care unit but, ultimately, the surgical team is responsible for the disposition of the patient after discharge from the unit. All discharges and transfers should be reviewed by the SICU attending (NO EXCEPTIONS).

Transfer orders must be in the chart before the patient leaves the SICU. It is important to have the senior resident of the surgical team write orders as soon as discharge is agreed upon so there are no delays when the step-down unit or regular ward bed becomes available. Patients with continued critical care problems may be followed by the ICU team until they are transferred from the step down unit (PCU).