

THE JOHNS HOPKINS HOSPITAL
CARDIOVASCULAR SURGICAL ICU
PROVIDER HANDBOOK
2014-2015



JOHNS HOPKINS
M E D I C I N E

Division of Cardiac Surgery
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Welcome to the Cardiovascular Surgical ICU

We are pleased to welcome you to the CVSICU where you will receive a comprehensive look at the field of post-operative critical care specific to the cardiovascular surgical patient.

The CVSICU provides trainees with the opportunity to care for critically ill patients requiring post-operative care following cardiac surgical procedures, as well as patients with end-stage heart failure who need mechanical cardiac support as a bridge to transplant. The working environment is dynamic and fast-paced and the patient care is often complex.

The CVSICU follows an interdisciplinary approach routinely involving critical care, nursing, pulmonary medicine, pharmacy, nutrition, and quality of care/performance improvement initiatives.



Glenn J.R. Whitman, M. D.
Director, Cardiovascular Surgical ICU

Program Overview

Johns Hopkins Hospital, Cardiovascular Surgical ICU

Management of the open heart surgery and thoracic patient has become increasingly complex as patients have become sicker, with poorer cardiopulmonary reserve and increased numbers of comorbidities. Operations are much more complex and surgical management of patients with end stage heart and lung disease has improved tremendously with new therapeutic options over the last decade.

Trainees will be responsible for the initial assessment, plan and follow up of all patients under the direct supervision of the CVSICU Intensivist. Trainees will assist in the management of all aspects of the post-operative care until the patient is discharged to another unit.

Trainees will provide patient care that is compassionate, appropriate, effective, and timely. Patients will be managed according to evidence-based guidelines and protocols to the extent practical and/or possible.

PROGRAM OBJECTIVES

PROGRAM PHILOSOPHY:

The purpose of this program will be to provide an advanced fund of knowledge and specialized skills in the management of the cardiac surgery patient, emphasizing the critical care nature of the patient's recovery in the early postoperative course.

The particular objectives of this program will be to develop the knowledge and skills associated with the care of the cardiac surgery patient, focusing particularly on:

ADULT CARDIAC DISEASE

1. Indications for surgical intervention in acquired cardiac disease
2. Physiology and pathophysiology associated with cardiopulmonary bypass
3. Management of post op valvular heart disease patient

AORTIC DISEASE

1. Medical and surgical management of the dissecting aorta
2. Medical and surgical management of aortic aneurysmal disease
3. Postop care of thoracic aortic surgery patients

END STAGE HEART DISEASE

1. Therapeutic options for the care of end stage heart disease
2. Indications and management of ventricular assist devices
3. Cardiac transplantation

INTENSIVE CARE

1. Diagnosis and therapy of shock
 2. Cardiac Hemodynamics
 3. Pharmacologic support of the heart
 4. IABP support of the heart
 5. Acid Base physiology
-

6. Electrolyte and acid-base disturbances
7. Ventilator management
8. Nutritional support of the ICU patient
9. Medical/Surgical therapy of infections

CARDIAC PACING

1. Fundamentals of cardiac pacing and indications for permanent pacemaker
2. Indications for biventricular pacing and defibrillators

SKILLS

1. Placement of arterial lines
2. Placement of venous lines: jugular, subclavian, and femoral, with ultrasound guidance as needed
3. Placement of chest tubes
4. Percutaneous placement of intra-aortic balloon pumps

EDUCATIONAL CURRICULUM

Patient Care

Trainees will demonstrate appropriate general management of the critical care patient. In addition, will gain specific experience in the post-operative care of cardiac surgery patients and demonstrate a satisfactory approach to:

1. Evaluation and management of the patient following routine cardiopulmonary bypass, including diagnosis and management of hypoperfusion, cardiac failure, hypothermia, respiratory failure, acute renal failure, acid-base abnormality, coagulopathy/hemorrhage, and post-operative CVA
2. Evaluation and resuscitation of the patient presenting with cardiac arrest, hypotension, and/or shock
3. Diagnosis and management of the patient with ischemic heart disease, including the diagnosis of acute myocardial infarction, the interpretation of EKG and TTE findings, the appropriate use of vasoactive agents to avoid supply-demand mismatch, indications for IABP, and the use of interventional cardiology vs surgical management
4. Diagnosis and management of the patient with valvular heart disease, including assessment of severity and determination of physiologic goals
5. Evaluation and management of the patient with systolic or diastolic dysfunction, including the rational use of vasoactive and inotropic agents
6. Evaluation, acute and chronic management of the patient with arrhythmia, symptomatic and asymptomatic, including the choice of antiarrhythmic agent, the indications and use of electrical cardioversion, and the management of transvenous, external and internal pacing
7. Appropriate placement of transvenous pacing wires, pacing Swan-Ganz catheter, and pace-port catheters

8. Management of the patient with pulmonary hypertension and/or right ventricular failure
9. Management of the patient with a ventricular assist device or ECMO, including perioperative care
10. Management of the patient with heart, lung, or heart-lung transplant during the perioperative period, including management of immunosuppressant regimen.
11. Management of the patient with aortic or peripheral vascular disease, including aneurysm, dissection, and ischemia
12. Management of the adult patient with congenital heart disease, pre and post repair
13. Evaluation of the post-sternotomy patient with fever, including appropriate evaluation for sternal wound infection
14. Placement of venous access devices, arterial monitoring lines, PA catheters, and chest tubes as indicated

Medical Knowledge

Trainees will encounter the following principles of cardiovascular physiology, pathology, pathophysiology and therapy, and discuss their incorporation into clinical practice:

1. Shock, definition, classification, diagnosis, and resuscitation, including treatment of complications
2. The FICK principle
3. Volume resuscitation
4. Interpretation of basic diagnostic tests including EKG/TTE
5. Myocardial infarction and its complications
6. Treatment of anemia
7. Vent management
8. Acid-based disturbances
9. Typical OHS pathway
10. Routine ICU drugs
11. Treatment of coagulopathy
12. Attend at least one: cabg, avr, aortic root, VAD
13. Describe considerations re: separation from bypass
14. Cardiac rhythm and conduction disturbances

15. Indications for and types of pacemakers
16. Pulmonary embolism and acute right heart failure
17. Pulmonary edema of cardiogenic & non-cardiogenic cause
18. Cardiac tamponade and other acute pericardial process
19. Acute and chronic valvular disorders
20. Acute aortic and peripheral vascular disorders
21. Acute complications of cardiomyopathies and myocarditis
22. Vasoactive and inotropic therapy
23. Pulmonary hypertension and core pulmonale
24. Complications of angioplasty
25. Principles of oxygen transport and utilization
26. Hemodynamic support with ventricular assist devices, including knowledge of available types with pulsatile and non-pulsatile flow
27. Use of the intra-aortic balloon pump
28. Thrombolytic and anticoagulant therapy, including indications and complications
29. Perioperative management of the patient undergoing cardiovascular surgery, including the physiology of cardiopulmonary bypass and post-bypass syndromes
30. Evaluation and management of hypertensive emergencies
31. Congenital heart disease in the adult population including hemodynamic alterations with surgical repair
32. Invasive and non-invasive methods for cardiac output measurement

Interpersonal Communication

Trainees will:

1. Communicate effectively with all healthcare providers, including the primary cardiac surgical service
2. Provide appropriate sign-out and transfer of care for overnight patients
3. Abide by rules governing patient privacy
4. Demonstrate effective listening, writing and presentation skills

Professionalism

Trainees will:

1. Maintain appropriate and effective relationships with all members of the healthcare team
2. Maintain therapeutic relationships with patients and families regardless of age, gender, cultural or socioeconomic status
3. Consider patient and family values in the development of treatment recommendations
4. Perform appropriately and in a timely manner all patient care responsibilities and assigned tasks
5. Complete all appropriate documentation including faculty/rotation evaluations and tracking of ACGME duty hours.

Practice-Based Learning and Improvement

Trainees will:

1. Identify areas of personal knowledge deficit in the medical knowledge objectives above and utilize best references to correct these deficits
2. Analyze current and novel clinical practices in cardiac surgical critical care by identifying relevant scientific publications and evaluating them using evidence-based medicine techniques
3. Appreciate the function of quality indicators in the ICU, including facilitation of data collection.

Systems-Based Practice

At the conclusion of the fellowship, the fellow will:

1. Understand the role and function of the cardiac surgical ICU
2. Understand the function of nurse practitioners and physician assistants in an ICU setting
3. Understand the resources involved in the provision of acute and long term care of the patient with cardiac disease
4. Demonstrate adherence to the principles of cost-effective medical care.

EDUCATIONAL STRATEGIES

➤ **Direct Patient Care:**

The majority of the educational experience will be provided in the evaluation and treatment of patients in the CVSICU and participation in daily teaching and work rounds with faculty.

Diagnostic studies are reviewed and if needed direct consultation is obtained from cardiology or radiology faculty members. Cardiomyopathy, electrophysiology, ID, nephrology, and neurology consultants are easily available for appropriate patients.

➤ **Practice-based Learning:**

The trainee will be expected to identify specific learning needs associated with each patient encounter or activity which will be met with further reading or discussion. They will be expected to provide evidence for clinical decision-making based on current best practice.

➤ **Didactic Lectures:**

Formal and informal didactic discussions will be provided on important issues in diagnosis and management of the patient with cardiac disease. Attendance at related cardiac surgical conferences is encouraged.

EVALUATION STRATEGIES

➤ **Trainee Evaluation:**

Each trainee will receive end of rotation verbal and written feedback from supervising faculty as well as other CVSICU team members (fellows, residents, medical students)

Each trainee may be asked during the course of the elective to provide a short verbal or written presentation on an interesting current case or an aspect of cardiac surgical critical care (Medical knowledge, practice-based learning and improvement, interpersonal communication)

➤ **Faculty Evaluation:**

Each trainee will provide an anonymous evaluation via the E*value system for faculty members with whom sufficient contact has taken place.

➤ **Rotation Evaluation:**

Each trainee will provide an evaluation of the elective rotation via the E*value system.

EDUCATIONAL CONFERENCES

MONDAY

Time:	Meeting:	Location:	Occurrence:
7:00 a.m.	Cardiac Surgery Morning Huddle	Zayed 7106	<i>Weekly</i>
7:15 a.m.	Provider Education	Zayed 5089	<i>Weekly</i>
10:00 a.m.	<ul style="list-style-type: none"> • ICU Conference 	Zayed 9100	<i>Weekly</i>
11:00 a.m.	<ul style="list-style-type: none"> • M&M Conference (1st & 3rd Monday) • PI Meeting (2nd Monday) 		
12:00 p.m.	<ul style="list-style-type: none"> • Case Conference (1st Monday) • Journal Club (2nd & 4th Monday) 		

TUESDAY

Time:	Meeting:	Location:	Occurrence:
1:00 p.m.	CVSICU CUSP	CVSICU	<i>2nd Tuesday</i>
	QAPI Committee	Zayed 5089	<i>4th Tuesday</i>
3:30 p.m.	Transplant Conference	Zayed 9100	<i>Weekly</i>
6:00 p.m.	ICU Attendings Meeting	Zayed 5089	<i>2nd Tuesday</i>

THURSDAY

Time:	Meeting:	Location:	Occurrence:
7:30 a.m.	CT Resident Conference	Zayed 7106	<i>Weekly</i>
8:30 a.m.	Cardiac Surgery M&M	Zayed 7106	<i>Weekly</i>

WEDNESDAY

Time:	Meeting:	Location:	Occurrence:
12:00 p.m.	Echo Conference	Zayed 5339	<i>Weekly</i>

FRIDAY

Time:	Meeting:	Location:	Occurrence:
7:15 a.m.	CVSICU Journal Club	Zayed 5089	<i>2nd Friday</i>
	CVSICU M&M	Zayed 5089	<i>4th Friday</i>
12:30 p.m.	Pulmonary & CCM Lecture Series	TBA	<i>Weekly</i>
3:30 p.m.	Heart Failure Conference	Bloomberg 5399	<i>Weekly</i>

SUPERVISION

The trainee will receive oversight by a **CVSICU Intensivist**. All procedures that are outside the scope of the trainee's usual practice will be directly supervised by the Intensivist, CS attending or by the cardiac surgical fellow.

A **Cardiac Surgical Fellow** is also available as needed to supervise any patient care activities or procedures. A fellow is available at all times via the 1109 pager. (*410-283-1109)

Cardiac surgical Attendings are also immediately available for the patient requiring emergency evaluation or intervention or decision support. All Attendings have text messaging on their phones and all are accessible thru PING. For non-urgent messages, please consider texting directly, or by using PING.

For urgent and emergent messages, please call directly. Please remember that text messages sent at night may not be heard....an urgent/emergent message deserves a phone call.

CARDIAC SURGERY ATTENDINGS:

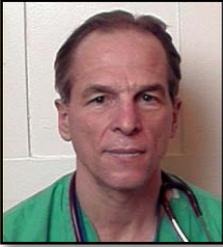
- Dr. Cameron 410-456-12522
- Dr. Mandal 443-299-2921
- Dr. Conte 410-294-11911
- Dr. Price 216-315-5503
- Dr. Vricella 410-790-15722
- Dr. Sciortino 410-693-3681
- Dr. Shah 410-218-88722
- Dr. Zehr 507-254-0908

CVSICU INTENSIVISTS:

- Dr. Whitman 215-300-3925
- Dr. Kim: 215-432-0301
- Dr. Dodd-o:410-283-4659
- Dr. Stephens: 410-916-2310
- Dr. Katz: 703-200-4836
- Dr. Sussman: 410-283-5154
- Dr. Price 216-315-5503
- Dr. Sciortino 410-693-3681

CVSICU FACULTY

Jeffrey Dodd O, M.D., PH.D.



Dr. Dodd-o is a faculty member of the Department of Anesthesiology. He works in the operating room as well as in the ICU. Dr. Dodd-o also serves as an Intensivist in the CVSICU. His lab interests focus on acute lung injury and lung transplantation.

Nevin Katz, M.D., F.A.C.S., F.A.C.C.



Dr. Katz is Associate Professor of Surgery and an Intensivist in the CVSICU at Johns Hopkins. He completed a residency in General Surgery at the Massachusetts General Hospital, and a fellowship and residency in CT Surgery at the University of Alabama. Dr. Katz was Professor of Surgery and Director of the Heart Transplant Program at Georgetown University. Dr. Katz founded and directs the

Foundation for the Advancement of Cardiothoracic Surgical Care (FACTS-Care) which provides multi-disciplinary educational activities to advance the specialty of CVT Critical Care. His research interests include cardiac surgery associated renal failure. He is Associate Editor for Perioperative Management of *The Journal of Thoracic and Cardiovascular Surgery*.

Bo Soo Kim, M.D.



Dr. Kim is also a member of the faculty of the Division of Pulmonary and Critical Care at Johns Hopkins and serves as an Intensivist in the CVSICU. Dr. Kim is a clinician scientist, whose research interest is in cigarette smoke induced emphysema and in the regulation of pulmonary endothelial cell apoptosis.

Joel Price M.D., M.P.H., F.R.C.S.C.



Dr. Price is an Assistant Professor of Surgery and an attending surgeon in the division of cardiac surgery. He also works as an Intensivist in the CVSICU. Dr. Price completed residency training at the University of Ottawa Heart Institute in Canada. He then pursued fellowship training in complex valve reconstruction at St. Luc University Hospital in Brussels, Belgium and a second fellowship in aortic and endovascular surgery at the Cleveland Clinic. Dr. Price's clinical interests are aortic valve and aortic root reconstruction, mitral valve repair, aortic surgery and endovascular and minimally invasive surgery.

Christopher Sciortino M.D., Ph.D.



Dr. Sciortino is an Assistant Professor of Surgery, an attending surgeon in the division of cardiac surgery and an Intensivist in the CVSICU. He earned both his M.D. and a biophysics/bioengineering Ph.D. degrees from the Case Western Reserve University and completed both his general surgery and cardiothoracic surgery residencies at the Johns Hopkins Hospital. Dr. Sciortino's clinical

interests include adult cardiac surgery with special emphasis on heart failure, transplant, and the surgical management of patients with diabetes and morbid obesity.

R. Scott Stephens, M.D.



Dr. Stephens is an Assistant Professor of Medicine in the Division of Pulmonary and Critical Care Medicine at Johns Hopkins. He serves as an attending physician in both the CVSICU and the MICU. Dr. Stephens is a physician scientist, whose research interest is in acute lung injury and the regulation of pulmonary endothelial antioxidants by tyrosine kinases. Clinically, his interests

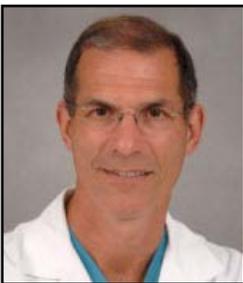
include the acute respiratory distress syndrome, refractory hypoxemia, and the use of extracorporeal membrane oxygenation (ECMO) for acute respiratory failure. He also serves as the Director of the required Advanced Clerkship in Critical Care Medicine for 4th year medical students, and teaches in the second-year pulmonary pathophysiology course at Johns Hopkins University School of Medicine.

Marc S. Sussman, M.D.



Dr. Sussman earned a medical degree at The Johns Hopkins University School of Medicine. He completed residencies in general and thoracic surgery at the New York University Medical Center. Dr. Sussman is Assistant Professor of Surgery. His general surgery and thoracic surgery training were done at NYU Medical Center. He recently completed a fellowship in Surgical Critical Care at Johns Hopkins.

Glenn J.R. Whitman, M.D.



Dr. Whitman is Associate Professor of Surgery and the Director of the CVSICU and Heart Transplant program at Johns Hopkins. He previously served as the Chief of Cardiac Surgery at the Medical College of Pennsylvania, as well as the University of Maryland. His current focus at Hopkins is on systems improvements and quality assurance in Cardiac Surgery Critical Care. Among all of his areas of interest, teaching is foremost. He has received the golden apple and golden scalpel awards on several occasions.

Clinical Guidelines

Johns Hopkins Hospital, Cardiovascular Surgical ICU

Johns Hopkins Cardiac faculty performs over 1200 surgical cases per year, including mechanical assist and transplant operations. The clinical exposure to these patients will emphasize an interdisciplinary approach involving multiple specialties, including pulmonary, critical care, pharmacy, nutrition, and quality of care/performance improvement initiatives. It is expected that this exposure to a variety of disciplines and philosophies of care will add immeasurably to the development of the resident's judgment and skills.

The CVSICU houses 16 critically ill patients requiring either routine post-operative care following cardiac surgical procedures or critical care for complications occurring during the post-operative period. The ICU team consists of an attending with experience in critical care, a CVSICU fellow, a surgical resident, and a core of experienced advanced care practitioners.

Fellows/Residents from Cardiac Anesthesia, Pulmonary, Surgical and Anesthesia and Critical Care Medicine periodically rotate in the CVSICU for 2-4 weeks at a time.



WHEN TO ALERT THE ATTENDING / 1109

** Overnight-Call the 1109 first!*

1. Significant change in pressors/shock
2. NSS >1000 cc after the patient warmed
3. New arrhythmia (new atrial fibrillation, flutter, ventricular ectopy)/EKG's
4. New BD of -5 or greater
5. Unanticipated need for blood
6. Bleeding > 200 per hour
7. VAD flow decrease > 1 liter
8. Significant increase in oxygen requirements
/intubation e.g. increase to over 60% FiO₂
9. Worsening mental status/Neurologic deficits/
Failure to wake from post-op sedation/
Deterioration in peripheral pulses.
10. Deviation from the plan
11. Pt. death or a change in resuscitation (DNR)
status

POST-OP OHS: USEFUL FORMULAS & GUIDELINES

FLUID SPACES

- Total Body Water (L) (TBW) = $2/3$ Body Weight (kg)
- Intracellular Fluid (ICF) = $2/3$ TBW
- Extracellular Fluid (ECF) = $1/3$ TBW
- Intravascular volume = $1/12$ TBW

Intravascular Fluid Resulting From I.V. Administration of:

D5W 1L	NSS 1L	5%Albumin	25% Albumin	Hespan 6%
85cc	250cc	250cc	50cc	250cc

BASE EXCESS

Every ABG requires analysis to determine the patient's base excess.

Determination of Base Excess (B.E.) From ABG:

1. Change in $pCO_2 = 10 \rightarrow$ change pH = 0.08
(In opposite direction, but skip the decimal. It will only cause you trouble!)
2. B.E. = $2/3$ difference between predicted pH (by pCO_2 alone) and actual Ph *(disregard decimal points)*

Example: Actual ABG, pH = 7.40 & $PCO_2 = 30$

* Based on pCO_2 alone, the pH should be 7.48. However, the measured pH is 7.40, which represents a difference of 8 *(neglect the decimal)*. The base excess is $2/3$ of this difference, which equals $16/3$ or approximately 5. Furthermore, the pH is lower or more acidic than expected so the base excess is -5 .

HCO₃

REPLACEMENT

HCO₃ Replacement (for postop Cardiac Surgery)

- The bicarbonate space (*in liters*) equals 1/3 of the patient's body weight (*in kg*).
- Bicarbonate deficit (*meq HCO₃*) equals 1/3 x body weight x base excess.
- N.B.
 1. Increase minute ventilation to compensate metabolic acidosis to maintain pH app 7.45
 2. In general, replace bicarbonate for any deficit > -4
 3. Do NOT bolus bicarbonate until potassium > 3.0 mEq/L
 4. A metabolic acidosis should always be considered abnormal. *Search for etiology!*

CRITERIA FOR

EXTUBATION

1. Negative Inspiratory Force(*NIF*) <-20cm H₂O
2. Tidal Volume (*TV*) > 5 cc/kg
3. Minute Ventilation < 10 LPM
4. Vital Capacity (*VC*) > 10 cc/kg
5. P/F Ratio > 200 (*pO₂/ FiO₂*)
6. Rapid Shallow < 80 (*This is the Tobin Index, defined as: respiratory rate / tidal volume, where the tidal volume is expressed in liters*)
7. Ability to appropriately interact and obey commands
8. On CPAP/PSV for ½ hour, ABG requirement:
 - < pH < 7.44
 - 36 < pCO₂ < 44
 - PO₂ > 80 on FIO₂ = 0.4
 - Base Excess = -4 or better

VENT PCO₂

MANAGEMENT

1. To adjust pCO₂, regard minute ventilation (*MV*) as equivalent to alveolar ventilation.
2. PCO₂ is proportional to $\frac{1}{MV}$
Minute ventilation
3. Formula required to change ventilation to generate a desired pCO₂:
 - a. $pCO_2 (old) \times MV (old) = pCO_2 (desired) \times MV (new)$
 - b. $MV (new) = \frac{pCO_2 (old) \times MV (old)}{PCO_2 (desired)}$

NUTRITION

1. Typically, a non-stressed person requires:
 - Protein: 0.6- 0.8 gm/kg/day
 - N2: 0.12 gm/kg/day
 - Non-protein calories: 125 - 150 Kcal/gm N2/day
2. An extremely sick patient may require:
 - Protein: 2 – 2.5 gm/kg/day
 - N2: 0.3- 0.35 gm/kg/day
 - Non-protein calories: 100 - 130 Kcal/gm N2/day
3. The sicker the patient:
 - The more calories one needs (*predictable given increased N2 requirement*).
 - The greater is the percentage of fat (*up to 40%*) that makes up those calories.

INOTROPIC SUPPORT IN POST CARDIAC SURGERY PATIENTS

The indication for inotropic support post coronary pulmonary bypass surgery is depressed cardiac output in the face of an adequate preload and acceptably low afterload (mean BP). In one large study of 1500 elective cardiac surgery patients, over 30% required inotropic support post bypass.

Catecholamines adversely affect myocardial oxygen supply demand, and consequently they should not be used indiscriminately. However, when cardiac index is less than 2 LPM and when preload is maximized (*usually 10-15% higher than the best PAD noted coming off bypass or at the close of the procedure*) and when afterload is minimized (*in general, mean BP < 75 mmHg is well tolerated, even by the elderly*), an inotrope is called for.

For the last decade a new class of **inotropes, phosphodiesterase inhibitors** (*milrinone*), has been increasingly utilized. These drugs have the advantage of lowering afterload and PA pressures as well as having significant inotropic effects on myocardium. Although the associated thrombocytopenia, long half life (60 - 90 min), and cost of milrinone mitigate against its use as a first line inotropic agent, its inotropic effects without increasing afterload make it extremely attractive.

Vasodilators: Nitroglycerin should be used routinely for the first several hours post-operatively. In general, one should try to maximize the dose of nitroglycerin as tolerated by the patient's blood pressure; it should be used for its vasodilatory effects on the native coronary artery circulation as well on all classes of bypass grafts, including saphenous vein, internal mammary and radial artery.

Calcium channel blockers like diltiazem and nicardipine can be used for BP control, but in some cases have been shown to be inferior as conduit vasodilators. Diltiazem has negative inotropic effects, and nicardipine has limited cardiac effects but is much more expensive than nitroglycerin.

MEDICATIONS	CONCENTRATION	DOSAGE
Diltiazem IV (for a-fib rate control)	125 mg in 125cc (1 mg/cc)	5 mg q 5 mins X3 as an IV bolus 5-15 mg/hr
Nicardipine (Cardene)	40 mg/200 cc (0.2 mg/cc)	5-15 mg/hr
Dopamine (Intropin)	400 mg in 250 cc (1600 mcg/cc) 800 mg in 250 cc (3200 mcg/cc)	3 -20 mcg/kg/min
Dobutamine (Dobutrex)	500 mg in 250 cc (2000 mcg/cc)	3 - 20 mcg/kg/min
Epinephrine (Adrenalin)	2 mg in 100 cc (20 mcg/cc) 10 mg in 250 cc (40 mcg/cc)	0.01 – 0.25 mcg/kg/min
Norepinephrine (Levophed)	8 mg in 250 cc (32 mcg/cc)	0.01 – 0.4 mcg/kg/min
Isoproterenol (Isuprel)	2 mg in 100 cc (20 mcg/cc)	0.01 – 0.2 mcg/kg/min
Milrinone (Primacor)	20 mg in 100 cc (200 mcg/cc)	0.125-0.75 mcg/kg/min
Esmolol (Brevibloc)	2500 mg in 250 cc (10mg/cc)	Loading dose 500 mcg/kg over 1 min Maintenance dose 50-300 mcg/kg/min
Nitroprusside (Nipride)	50 mg in 100 cc (500 mcg/cc)	0.05 - 10 mcg/kg/min
Nitroglycerin	100 mg in 250 cc (400 mcg/cc)	0.05-4 mcg/kg/min
Phenylephrine (Neo-synephrine)	20 mg in 100 cc (200 mcg/cc)	0.1 – 4 mcg/kg/min
Vasopressin (Pitressin)	50 units in 100 cc (0.5 units/cc)	0.01- 0.04 units/min

EARLY POST-OP MANAGEMENT OF THE OHS PATIENT

VENTILATOR MANAGEMENT

Upon arrival to the ICU following surgery, the best blood gas management is that of a slight respiratory alkalosis. As the patients rewarm, CO₂ production increases. Managing the patients when they are cold, aiming for a slight respiratory alkalosis prevents hypercapnia and acidosis as the patients warm. It is important to reduce the FIO₂ to non-toxic levels as soon as possible after surgery. This can be done by monitoring the arterial oxygen saturation and does not require obtaining a blood gas if the only change in the ventilator setting is the concentration of inspired oxygen. Other ventilator settings should be followed 30 minutes later by a blood gas to insure that the desired change in ventilation has been achieved. A good rule of thumb is to use the following formula to estimate the effects of changes in ventilator settings on pCO₂.

$$\text{Present pCO}_2 \times \text{minute ventilation} = \text{desired pCO}_2 \times \text{new minute ventilation.}$$

Every blood gas obtained should be analyzed for evidence of respiratory and/or metabolic acidosis. Every 10 mm Hg change in pCO₂ should be accompanied by a reciprocal change in arterial pH of .08. Using this rule of thumb, it is possible to calculate the degree of base excess or deficit for each blood gas. Disregarding decimals, two-thirds (2/3) of the difference between the expected pH based on the pCO₂ and the actual pH is the base excess or deficit. For example, if the patient's pCO₂ is 30, a pH of 7.48 is expected. If the pH is 7.45, there is a base deficit of 2.

EXTUBATION

WITHIN 6 HOURS

Extubation within 6 hours out of O.R. for CABG patients-

- If no bleeding and hemodynamically stable, the goal is to have patients extubated within 6 hrs post-op.
- Reverse paralytics when core temp is 35.5°c
- We have a IV fluid warmer for volume resuscitation

**Remember to fill out the pink reminder sign with time out of O.R. and expected extubation time!*

VOLUME

REPLACEMENT

As patients rewarm, the venous capacitance channels dilate, and there may be an ongoing need for volume replacement. This is best treated in anticipatory fashion. However, despite all of our best efforts, at times a volume deficit may result. Volume therapy recommendations are as individualized to the patient; however, even for a prompt response NSS therapy (*except for blood, if the Hb is less than 7 and the patient has coronary disease*) is all that is needed, no albumin. Placing the patient in trendelenburg can acutely “transfuse” 0.8 to 1.0 liter into the central circulation.

**If fluid therapy is needed acutely, in the face of what would appear to be adequate filling pressure, always keep in mind: Tension ptx, tamponade, heart failure, or a rhythm disturbance.*

ELECTROLYTE

MANAGEMENT

These guidelines are helpful in repleting electrolytes. In general, be more conservative in patients with compromised renal function. The goal for repletion is generally determined by patient condition and attending preference, but basic guidelines are provided on page 31.

- **Potassium:** Careful monitoring of serum potassium level and replacement is critical as disorders of potassium metabolism can have important cardiac consequences, especially arrhythmias.

**Serum potassium is checked every 6 hrs in the first 24 hrs post-op and is replaced according to a potassium replacement protocol for patients with SCr <2.*

 - 10 mEq of KCl raises the serum level by approximately 0.1. **For example, replete with 40 mEq if the K⁺ value is 3.6 and the goal is 4.0. PO or IV are equally efficacious.*
 - For IV administration be sure to pick the appropriate rate/concentration for central vs. peripheral access.

 - **Magnesium:** Magnesium depletion is common after cardiopulm bypass. Hypomagnesemia is also associated with ventricular arrhythmias.
 - Serum magnesium is repleted in the ICU with 2 to 6 gm of magnesium sulfate over 30-60 min. **Magnesium cannot be given rapidly because of the risk of hypotension.*
 - One gram magnesium will increase the serum level by ~0.1 mg/dL)

 - **Sodium:** Disorders of sodium metabolism are common in patients with more complicated post-op courses, hypo- or hypernatremia may result due to use of diuretics or enteral feeding preparations. When managing sodium metabolism disorders, it is important to determine whether the patient has an excess or deficit in total body sodium. Once this is made, the issue of an excess or a deficit of free water can be addressed

 - **Bicarbonate:** Replacement of HCO₃ may be indicated in case of severe metabolic acidosis (*Base excess more negative than -5*). The HCO₃ deficit should be calculated. HCO₃ replacement of ½ the calculated deficit should be given (*see appendix*). Treat ≤ -5. Do NOT bolus bicarbonate until serum potassium > 3.0 mEq/L

 - **Glucose:** All patients are on insulin IV post-op. Blood glucose levels should always be kept below 200. Even patients with no history of diabetes may require glucose monitoring. See insulin section on page 48.
-

CHEST TUBE
MANAGEMENT

- **Hard Mediastinal Tubes** are usually removed the morning after surgery and Soft Tubes on POD2.
- **Pleural Tubes**, if present, may be left in place longer. Pleural tubes are removed when there is less than 100 cc of drainage for an eight 8 hr period and the patient has no air leak, usually on the first postoperative day, if there is <15-20cc/hour for three consecutive hours, the tube can be pulled. Pleural tubes may stay in longer per the CT surgical resident or surgical Attending. Routinely, no CXR needs to be ordered after removing chest tubes in post op cardiac patients.

***THIS DOES NOT HOLD TRUE FOR:**

1. **Lung Transplantation Patients-** Chest tubes may stay in for days until the surgery attending gives the order to pull them
2. **Redo Sternotomy Patients-** Typically the chest tubes are NOT removed on POD 1
3. **Dr. Shah's Patients-** Their chest tubes will be pulled at the direction of the CT surgery Fellow. Typically Dr. Shah does not pull any chest tubes until POD 2

**Any questions, please consult with the CT Surgery Resident*

BLEEDING

- General criteria for return to the OR, assuming normal coagulation functions include the following:
 1. Greater than 300 cc for first hour
 2. Greater than 200 cc for the second hour
 3. Greater than 100 cc/hr thereafter.

- When one is faced with excessive chest tube drainage, the following is a helpful approach:
 1. Control hypertension
 2. Check for hypothermia
 3. Check hemoglobin, hematocrit, PT, PTT, platelet count, thrombin time, fibrinogen, and D-dimer
 4. Make sure the Blood Bank has available blood (*in general, attempt to keep 4 units ahead when the patient has potential bleeding problems*)
 5. If the patient is hemodynamically stable, increase his PEEP from 5 to 10 cm water (*this may provide some mediastinal tamponade*)
 6. Check portable chest x-ray for increase in size of mediastinal silhouette especially if drainage studiedly stops
 7. Assure that FFP, platelets, and possibly cryoprecipitate are available

- Therapy while awaiting laboratory evaluation usually follows the following format:
 1. DDAVP (*0.3 mcg/kg IV*). *Can repeat once in 6 hours then daily as necessary; excessive doses may worsen coagulopathy.*
 2. Protamine: The basis for this is the theory that heparin rebound may be occurring as the patient rewarms and heparin is liberated from the patient's fat stores. (*Dosage – 25-50 mg.*) *Excessive protamine doses may worsen coagulopathy.*

- In general, by the time this empiric therapy has been initiated, the coagulation profile obtained will be returned, and administration of FFP, platelets or cryoprecipitate may be initiated.

- All patients following bypass surgery have platelet dysfunction. Platelets come with plasma and platelet transfusions are appropriate initial therapy. Fresh frozen plasma contains clotting factors but no fibrinogen. If the prothrombin time is abnormal,

but the thrombin time is normal (*a measure of adequate fibrinogen and successful reversal of heparin*), fresh frozen plasma should be given. If the thrombin time is prolonged and the fibrinogen is low, cryoprecipitate (*which contains fibrinogen*) is appropriate therapy.

- It is important to be particularly suspicious if the chest tube drainage suddenly stops. It may be that the chest tubes have clotted and that blood is continuing to drain into either the mediastinal or pleural spaces.

****Do not try to handle this problem alone. Confer with the Surgeon ASAP as a timely return to the OR saves the patient an unnecessary risk of potential tamponade as well as from hours of blood loss and excess volume replacement therapy.***

MANAGEMENT OF
ARRHYTHMIAS

ATRIAL FIBRILLATION	
<i>*A very common arrhythmia following CABG or valve replacement, especially in the elderly.</i>	
<u>Etiology:</u>	<u>Check:</u>
• Electrolyte Imbalance	• K+, MG++
• Ischemia	• ECG
• Fluid overload (uncommon)	• PCW, CT P, CXR, weight
• Hypoxia	• Pulse oximetry, ABG, CXR, WBC
• Pulmonary embolization	• ABG, CXR, start heparin, spiral CT, consider V/Q scan
• Exogenous/endogenous catecholamines	• (e.g.Epi,Dopa)
• B-blocker withdrawal	•
• Hyperthyroidism	• Consider TFT's
• Mechanical irritation	○
• Atrial distension secondary to valvular heart disease	○
• Rejection in transplanted hearts	○

<u>Prophylaxis (for CABG or valve surgery)</u>	
1. Amiodarone, as per CVSICU protocol, or metoprolol 12.5-50 mg PO Q12H, as tolerated	
2. Maintain a potassium greater than 4.0 and Magnesium greater than 2.0	
<u>Treatment</u>	
1. DC cardioversion if patient is hemodynamically unstable (SBP <90, CHF, ischemic); synchronous cardioversion 100-200 joules)	
2. If patient is hemodynamically stable control ventricular rate with Amiodarone, as per CVSICU protocol	
- IV Digoxin	
- IV Diltiazem	
- IV beta blocker (if no contraindications such as CHF, asthma, COPD)	
<i>*If AF persists, or is intermittent for more than 48 hours, consult attending surgeon regarding anticoagulation.</i>	
ATRIAL FLUTTER	
<u>Treatment:</u>	
1. Control rate as for atrial fibrillation with amiodarone as first line, beta blocker and diltiazem as second line	
2. Try rapid atrial pacing (through existing wires or new transvenous bipolar atrial lead) to convert to NSR or Afib.	
- 20mA	
- 30-60 secs.	
- 110-150% of atrial rate (use rapid atrial pacemaker)	
- Bipolar (2 atrial wires or 1 atrial wire on negative terminal and ground on positive terminal)	
SINUS TACHYCARDIA	
<i>*Must be taken seriously as it can be the result of a significant underlying problem.</i>	
<u>May result from:</u>	
Hypovolemia	Beta blocker withdrawal
Fever	Hypoxia
Pain, anxiety	Pulmonary embolism
Anemia	Pneumonia
Ischemia	Hyperthyroidism
CHF/fluid overload	
<u>Treatment:</u> Correct underlying cause. Be alert for evidence of residual ischemia. Do not simply beta block without addressing above differential diagnosis.	

PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA

Etiology: Electrolyte imbalance, history of PSVT, heightened sympathetic tone.

Treatment:

1. DC cardioversion if hemodynamically unstable
2. If hemodynamically stable, treat in the following sequence:
 - Carotid sinus massage x 20 seconds
 - Adenosine
 - Rapid atrial pacing
 - Cardioversion
 - Consider starting oral diltiazem or a beta blocker to prevent recurrence.

ATRIAL PREMATURE BEATS

Etiology: See differential diagnosis for atrial fibrillation.

Treatment: Correct underlying cause. Do not start antiarrhythmic therapy!

**Note:* If the nature of a supraventricular tachyarrhythmia is unclear, an atrial electrogram may be obtained by attaching the atrial wires to the standard arm leads of an ECG machine or the cardiac monitor and looking at Lead I, II, or III. The presence of organized atrial activity or its lack may help in the diagnosis of the nature of the arrhythmia. It is important to remember that even when looking at an atrial electrogram, the larger depolarization is usually due to the ventricle

BRADYCARDIA

Etiology:

- Drugs: Beta-blockers, digoxin, verapamil, diltiazem (not nifedipine)
- Post-op heart block from valve surgery
- Acute inferior MI
- Intrinsic conduction system disease

Treatment:

1. Atrial, A-V or ventricular pacing (*this is the Rx of choice!*) If pacing wires do not work, try reversing leads and use maximum output.
2. Atropine 0.5 mg IVP if hemodynamically unstable (1 mg if PEA), max total dose ~3 mg
3. Isoproterenol drip to accelerate HR (may cause hypotension)
4. Discontinue potentially offending agents

VENTRICULAR PREMATURE DEPolarIZATIONS / NON-SUSTAINED VENTRICULAR TACHYCARDIA

Etiology:

- Electrolyte imbalance (especially K⁺ and Mg⁺⁺)
- Ischemia
- Acute congestive heart failure
- Hypoxia
- Hypothermia
- Catecholamine (exogenous or endogenous)
- Swan-Ganz catheter (rarely) i.e., mechanical
- Hyperthyroidism
- Ischemic reperfusion
- Chronic/idiopathic

Treatment:

For arrhythmia occurring in the first (48) hours:

1. Correct underlying abnormalities- especially electrolytes
2. Restart antiarrhythmic therapy if treatment was required preoperatively.
3. Start IV lidocaine or procainamide for multifocal PVC's, unifocal PVC's (> 10/min), couplets, triplets, or NSVT.

For arrhythmia occurring post-op day 3-7: Rule out treatable causes & Consider EP evaluation

SUSTAINED VENTRICULARTACHYCARDIA/ FIBRILLATION

Institute ACLS protocol:

- If the patient is not hypotensive, a 12-lead ECG should be obtained for future reference and confirmation of the diagnosis.

PACEMAKER
MANAGEMENT

- Atrial, A-V sequential and ventricular pacing are the modes of pacing in diminishing preferential order. (*All efforts are made to utilize atrial kick, due to its 15-20% boost to cardiac output.*) In emergencies, if the patient's temporary pacing wires from the O. R. are dysfunctional and/or if a transvenous wire is not possible, the external transcutaneous pacemaker (*Zoll pads*) can be used.
- Threshold testing is performed on all wires daily at the time of the patient's arrival to the CVSICU. The MA should be set at 200% of threshold on patients who continue to require pacing.
- If twice threshold exceeds 20 mA, is escalating, or if the wire no longer works and the patient requires pacing, the Cardiac Attending or CT surgical Resident should be contacted for possible pacemaker implantation.
- If the patient is to be anticoagulated with Coumadin, the pacing wires are removed on the AM after the first Coumadin does unless the patient is pacemaker dependent. *In general wires can be pulled on the morning of POD 4.*

**All patients should have pacers in an "inhibited" mode, (e.g. VVI), during transport and in the CVSICU.*

HYPERTENSION MANAGEMENT

Hypertension is a frequent problem, particularly after CABG. In general, for a previously normotensive patient after CABG, the desired mean arterial pressure is 70-75. If the patient had pre-existing hypertension, then allowing the mean arterial pressure to approach 75-80 is more reasonable. These are the kinds of patients that may not make urine unless they have a higher pressure head. On the other hand, patients with particularly diseased aortas (*and this usually includes AVR*s) do better with a blood pressure that is more tightly controlled.

Therapy:

- **Nitroglycerin (NTG)** -*Much less potent*
 - Primary a venodilator
 - Dosage 0.05-4 mcg/kg/min
- **Nicardipine (Cardene)** – *dihydropyridine Ca²⁺ channel blocker similar to nifedipine*
 - May be as effective as nitroprusside with less toxicity
 - Dosage start at 5 mg/hr. and increase by 2.5 mg/hr. every 5 to 15 min.; normal range 1-15 mg/hr.
- **Sodium nitroprusside (Nipride)**
 - Potent arteriolar vasodilator
 - Can rapidly be reversed by merely turning off
 - Dosage 0.1-10 mcg/kg/min
 - May cause cyanide (> 40 mmol) and thiocyanate (> 60 ug/ml) toxicities as well as pulm arteriolar shunting
- **Labetalol:** *Alpha, beta-1 & beta-2 antagonist*
 - Immediate onset, decreases HR, BP, myocardial contractility and MV_O₂
 - Dosage 0.25-6 mg/min IV; max PO dose 2400 mg/day
- **Esmolol (Brevibloc)**
 - Beta 1 selective
 - Doses: Loading dose of 250 to 500 mcg/kg followed by maintenance infusion of 50-300 mcg/kg/min **titrate infusion by 25-50 mcg/kg/min q 5-10 min until response.*
- **Hydralazine**
 - Primarily arterial vasodilator
 - Used as an intermittent PRN agent to help wean from infusions; may cause reflex tachycardia
 - Dose 10-20 mg q1-4 hours PRN
- **Morphine sulfate** - *2 to 10 mg IV and midazolam (1-2mg IV)*
 - Frequently are helpful adjuncts; consider alternative agents (*fentanyl, lorazepam*) in patients with renal dysfunction if repeated dosing is necessary

LOW CARDIAC
OUTPUT SYNDROME

Low Cardiac Output Syndrome/Cardiogenic Shock:

- In general, this is defined as cardiac index of less than 2.0 L/min/m².
- Patients may be peripherally cool, have low urine output, a metabolic acidosis, and hypotension.
- Basic approach involves a review of hemodynamic parameters which can be manipulated in order to improve low cardiac output, including optimizing heart rate, assuring a sinus or A-V sequential rhythm, optimizing preload, decreasing afterload, and finally increasing contractility.
- Often, manipulation of afterload (*MAP between 65 and 75 mm Hg*) is an important treatment, an intervention usually possible when hypertension is present.

Optimize Heart Rate

1. Pace A-V sequentially if necessary, HR 100
2. Treat Tachyarrhythmia

Optimize Pre-load

1. In general, this means giving volume to achieve the pulmonary artery diastolic or pulmonary capillary wedge pressure which seemed to be optimal at the conclusion of the operation.
2. Place the patient in Trendelenburg while this is being done.
3. As mentioned elsewhere, crystalloid not colloid should be used

Optimize Afterload

**MAP approximately 65-75 mm Hg*

1. NTG 0.051-4 mcg/kg/min., if still with elevated MAP add
2. Sodium nitroprusside – 0.1-10 mcg/kg/min.
3. Nicardipine 3-15 mg/hr (use rarely as cost is significant)
4. If MAP <65-70, it cannot be lowered further and one must then increase contractility.

Augment Contractility:

This is the final step, as any agent given strictly to augment contractility does so at the expense of increased myocardial oxygen utilization:

1. Epinephrine dose: 0.01 – 0.25mcg/kg/min
2. Dopamine dose: 5-20 mcg/kg/min
3. Dobutamine dose: 5-20 mcg/kg/min
4. Milrinone (*Primacor*) dose: 0.125 to 0.75 mcg/kg/min IV infusion

****The above maneuvers should be pursued rapidly in an effort to optimize output, as aggressive management is important in dealing with this problem. If the above therapies provide only marginal results, placement of an intra-aortic balloon should be considered immediately.***

FEMORAL ARTERIAL/VENOUS SHEATH REMOVAL

Under usual circumstances, the femoral artery and femoral venous sheaths that are placed in the cath lab will be removed prior to transfer to the OR. Occasionally, the surgical team may request that the femoral arterial sheath be left in place. These sheaths are removed early postoperatively, usually on the first morning after the patient's post-bypass coagulopathy has resolved. Only on rare occasions should these sheaths be left in longer.

****Arterial sheath punctures require at least 45 min direct pressure to the site after removal and careful observation for the next 6 hrs.***

In elderly patients or those with diffuse peripheral vascular disease in whom hemostasis in the percutaneously punctured artery is questionable, it may be advisable to remove the sheaths under direct vision by cut-down. Similarly in-patients with intra-aortic balloons (IABP) and compromise of distal circulation, it may be advisable to remove the sheaths under direct vision with thrombectomy of the artery prior to direct closure. These decisions will be made by the attending surgeon.

****The guidelines for the technique of removal of sheaths placed in the cath lab apply to removal of intra-aortic balloons. Timing of IABP removal should be determined in consultation with the attending.***

LINES AND FOLEYS

- Intravascular lines are removed as soon as they no longer serve a purpose.
- Swan-Ganz catheters, femoral catheters, (*according to CVSICU protocol*), are to remain only as long as necessary.
- The CVL stays in if the patient is on amiodarone IV, on low dose vasopressors.
- For patients going upstairs on POD 1, single lumen CVL to stay in.
- For patients going upstairs on POD 2 or greater, pulling the CVL is up to the team, as has been the case to date.
- Foley catheters should be removed on the morning of POD 2. Foleys should not be left in for convenience while diuresing the patient. Careful consideration must be given before reinserting foleys especially in valve patients. If the patient has not voided in 8 hours and has no symptoms of retention (*pain or distension*) consider bladder scan.

When inserting either of the pacing catheters:

**The bipolar pacing wire kit are the pacing swan with pacing wire*

- The bipolar pacing wire is on a separate shelf with the items you need to insert it with our current introducer kit.
- The Catheter Sheath that is next to the bipolar pacing wire is designed to adapt the catheter to the cordis that we currently stock.

Supplies needed:

1. Bipolar Pacing Wire kit
2. The sheath (*condom*) directly next to the pacing wire
3. Remington Adapters directly next to the condoms

**To drop sterile into field so provider can connect and RN can take ends and connect to pacer while provider advances catheter in sterile manner*

4. A Cordis from the shelf
5. Drapes, Chloraprep, gloves, caps, masks etc.

****If you need to place a cordis, place the one we stock. If we are out of the specialized condoms for any reason, then it is advised that you place a pacer-port swan (located with the other central lines) to properly take up the space in the cordis.***

DIALYSIS PATIENT

For Chronic dialysis patients, their care must be individualized. Dialysis should be arranged for the day before/ the day after surgery. Since prolonged bleeding time secondary to platelet dysfunction is found in uremic patients, platelets should be ordered pre-op so available post-op. General points of care for renal failure patients include careful use of potassium, magnesium, and calcium supplementation to obtain normal levels.

The following is a listing of the pertinent medications:

- **Aminoglycosides/Vancomycin**
 1. Renally excreted
 2. Dose on basis of drug levels
 3. Discuss with pharmacy or renal consult regarding supplemental dosing of these agents with each dialysis run.
- **Digoxin**
 1. Renally excreted
 2. Dose on basis on drug levels
 3. Discuss with pharmacy or renal consult regarding supplemental dosing of this agents with each dialysis run.
- **Nitroprusside**
 1. Renally excreted
 2. Monitor thiocyanate toxicity
- **Heparin**
 1. Not renally excreted
 2. Dose as for normal patient.
- **Warfarin**
 1. Not renally excreted
 2. Dose as for normal patient.
- **Avoid Meperidine (Demerol)**

**In the immediate post-dialysis period, the patient may be relatively hypovolemic. For the first few hrs after dialysis, the patient may be relatively heparinized*

**Chest tubes, intravascular lines and pacemaker wires are not to be removed for 4 hrs after return from dialysis.*

PULMONARY ARTERY
CATHETERIZATION

<u>Parameter</u>	<u>Equation</u>	<u>Normal Value</u>
- Cardiac Output	$CO = SV \times HR / 1000$	4-6 L/min
- Cardiac Index	$CI = CO / BSA$	2.8-4.2
- Stroke Volume	$SV = CO / HR$	60-90mL
- SVR	$SVR = [(MAP - CVP) / CO] \times 80$	900-1400 dynes-cm-sec ³
- PVR	$PVR = [(MPAP - PAOP)/CO] \times 80$	100-250 dynes-cm-sec ³
- Right Atrial Pressure (RAP) or Central Venous Pressure (CVP)		2-6 mmHg
- Right Ventricular Pressure (RVP)		15-30 / 2-8
- Pulmonary Artery Pressure (PAP)		15-30 / 8-15
- Pulmonary Artery Occlusion Pressure (PAOP)		6-12 mmHg
- Left Atrial Pressure (LAP)		4-12 mmHg
- Right Ventricular End-Diastolic Volume (RVEDV)	SV/EF	100-160 mL
- Right Ventricular End-Systolic Volume (RVESV)	EDV-SV	50-100 mL
- Right Ventricular Ejection Fraction (RVEF)	$100 \times SV/EDV$	40-60%

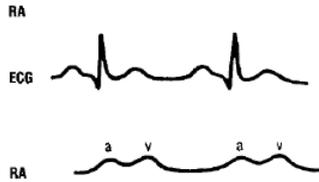
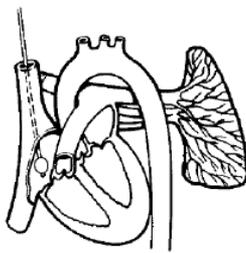
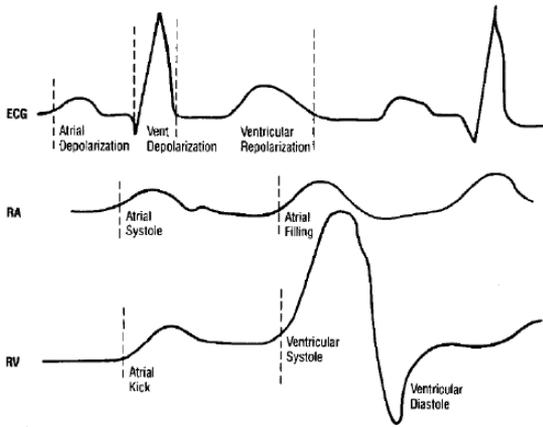


Figure 16
Right Atrial Waveform

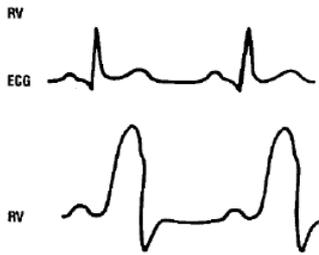
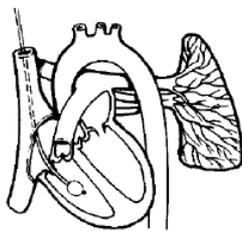


Figure 17
Right Ventricular Waveform

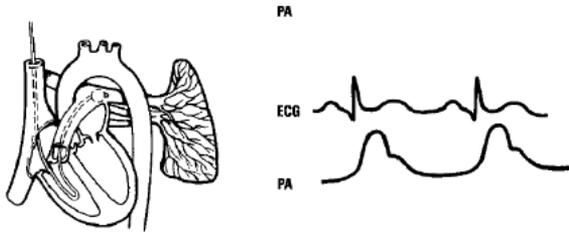


Figure 18
Pulmonary Artery Waveform

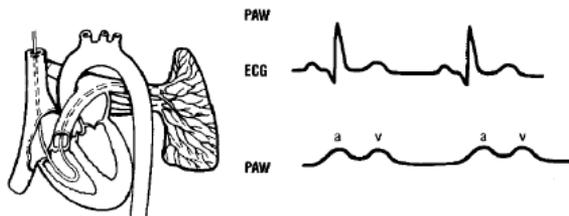


Figure 19
Pulmonary Artery Wedge Waveform



Figure 20
Normal Insertion Tracings

PAW is greater than LVEDP:

- Mitral stenosis
- Left atrial myxoma
- Pulmonary embolus
- Mitral valve regurgitation

PAD less than LVEDP:

- Decreased LV compliance
- High (>25 mm Hg) LVEDP
- Aortic valve regurgitation

PRESCRIBER MEDICATION OVERVIEW

HOW TO CONTACT

PHARMACY

Clinical Pharmacy Specialist:

JESSICA CROW, PHARM D

Available for clinical questions and ID approvals during weekdays; can be contacted via pager/cell as needed for questions in evenings/weekends.

Pager: 3-5862 ▪ Cell: (806) 433-3558

Point of Care Pharmacist:

STEPHANIE DAVIS, PHARM D

Available for general/clinical questions and responsible for verifying orders and dispensing medications for CVSICU

Ascom phone 4-7414 ▪ Cell: 850-582-9329

Critical Care/Surgery Pharmacy

Contact pharmacy directly via phone 47414 *at all times.*

When the PCP is not available, the phone will automatically forward to the pharmacy.

MEDICATION

PRIORITIES

STAT = Administer within 30 minutes

Routine = Administer at next scheduled administration time. *i.e. Q12H = 10 a.m. & 10 p.m.*

Now and routine = Administer first dose within 2 hrs of order being written (the next dose may be given as scheduled or skipped based on time to next scheduled dosing interval)

Time critical = give at a specific time (*Can only use with once, q24h, q12h, q8h, q6h, etc...* NOT BID, TID, QID)

****Do not use this frequency to time a new medication within 2 hours of writing the order unless you notify pharmacy that this needs to be given immediately so dose can be dispensed****

MEDICATION

FREQUENCIES

Daily: = **10 a.m.**

If you order a daily drug after 10 a.m., the first dose will not be given until the next day unless you use “*Now and routine*” priority

BID or Q12H: = **10 a.m. and 10 p.m.**

If you order a Q12H drug after 10 a.m., the first dose will not be given until 10 p.m. unless you use “*Now and routine*” priority

BIDD: (*BID diuretic*) = **10 a.m. and 4 p.m.**

Q8H or TID: = **6 a.m., 4 p.m., 10 p.m.**

Special Frequencies for Medications:

Warfarin 18:00

Tacrolimus 08:00 and 20:00

Ganciclovir 06:00 and 18:00

Mycophenolate and prednisone follow standard Q12H

INSULIN

MANAGEMENT

******See SCIP Measure description on page 59******

- All patients receiving insulin infusions in CVSICU will be managed via nurse-managed protocol with goal blood glucose 100-139 mg/dL
- All patients in the CVSICU should ideally remain on an insulin infusion until POD 1 23:59.
- Diabetic patients should not be transitioned until POD 1 23:59 unless absolutely necessary for bed management

For patients on insulin infusion:

- If blood glucose >160 mg/dL upon arrival from OR, treat with insulin bolus for target \leq 160 mg/dL

- Do NOT bolus until potassium > 3.0 mEq/L
 - Bolus 1 unit insulin for every 10 mg/dL >160 mg/dL. If BG 161-169 mg/dL, bolus 1 unit.
- For any BG >160 mg/dL on POD 0 and POD 1
 - RN asks prescriber to order bolus dose of insulin targeting BG <160 mg/dL
 - Prescriber: bolus 1 unit insulin for every 10 mg/dL >160 mg/dL. If BG 161-169 mg/dL, bolus 1 unit
 - Do NOT bolus until potassium > 3.0 mEq/L
 - RN changes infusion rate per nurse-managed protocol even if bolus administered. If concerned for hypoglycemia, discuss immediately with provider.

For patients transitioned to insulin aspart SQ prior to POD 1 23:59

- All patients must remain on insulin aspart SQ Q4H high correctional scale until POD 1 23:59 ± glargine
- Prescriber will add comment below to the order for insulin aspart SQ Q4H high correctional scale
 - On POD 1 if BG >160 mg/dL, administer 2 units in addition to prescribed dose from high correctional scale and recheck BG 2 hours later
 - Note: On recheck 2 hours after receiving extra insulin, if BG remains >160 mg/dL, RN will notify prescriber. Prescriber will determine if patient is within critical window (18-24 hours post-operatively).
- If so, they will determine if it is appropriate to order a single once SQ dose of aspart or if the patient should be initiated on IV insulin infusion with bolus.
- If not, the prescriber will determine if it is appropriate to initiate on IV insulin infusion with bolus, or to wait until next scheduled q4h BG check to give additional SQ insulin. Do not give SQ insulin more frequently than q4h if not within critical window.

Diet

- On POD1, patients should only be ordered for the following:
 - “Clear liquid no concentrated sweets” diet, which can be found in the diet order set under “Diet, Other”
 - “Carbohydrate controlled diet, 30 g”. Change carbohydrate amount with each meal to 30g instead of standard 60g

After POD 1 23:59

- Patients should generally remain on an insulin infusion if on epinephrine, clinically unstable, or requiring >2 units/hr of insulin
- Use Q4H correctional dose insulin (+ Q4H nutritional insulin) in patients who are NPO, receiving tube feedings, clear liquid diet, or parenteral nutrition
- Use PC/HS correctional dose insulin (+ PC nutritional insulin) in patients who are eating meals
- If patients were on “clear liquid no concentrated sweets” or “carbohydrate controlled 30 gram” diet to manage blood glucose, advance to carbohydrate controlled diet as tolerated

PPI'S

Proton pump inhibitors (PPIs) increase the risk of pneumonia and *Clostridium difficile* infection and use should be limited to the following indications:

- History of GERD or UGIB within 3 months
- Mechanical ventilation
- Hydrocortisone >250 mg/day or equivalent
- Shock requiring vasopressors
- Severe thrombocytopenia (*plts* <50,000)
- Coagulopathy (*INR* >1.5 *NOT due to warfarin*)
- Significant burns
- Intracranial hemorrhage/trauma
- Spinal cord injury

Pantoprazole 40 mg is the preferred PPI for IV and tablet formulations (must be swallowed whole). For enteral administration, order lansoprazole suspension 30 mg daily.

MUPIROCIN

Mupirocin for MSSA/MRSA positive patients:

- Elective cases will receive outpatient nasal screening as a PCR (*not culture*) for *S. aureus* prior to surgery.
- If MSSA or MRSA positive, they should receive a total of ten doses of mupirocin nasal ointment q12h ***First dose MUST be given prior to surgery; if not initiated prior to**

surgery there is no known benefit to starting treatment postoperatively

- Transplant cases should receive inpatient preoperative screening. If test result not available prior to surgery, they should receive at least a single dose of mupirocin preoperatively and then continue or discontinue based on results.

VTE PROPHYLAXIS

- Standard dose for CVSICU patients is heparin 5000 units Q12H
 - Dose 5000 units Q8H if > 100 kg
 - Consider 7500 units Q8H if >150 kg
 - Consider dose 2500 units Q12H if < 40 kg
 - Give first dose no sooner than 24hrs Post Op.
 - Consider holding Heparin for aPTT_r ≥ 1.3 times control, PT INR ≥ 1.3, platelets < 100,000.
- Lung transplant patients are at higher risk of VTE, so enoxaparin is utilized in these patients
 - CrCl ≥ 30 mL/min: enoxaparin 40 mg SQ Q24H
 - CrCl < 30 mL/min: enoxaparin 30 mg SQ Q24H
 - For weight <50 kg or significant renal dysfunction, consult with pharmacist regarding dosing
- Enoxaparin hold parameters
 - First dose no sooner than 24 hours postop; hold for platelets <100,000
 - First dose must be held until at least 2 hours after epidural insertion
 - Wait minimum 12 hours after last dose before removing epidural; consider up to 24 hours in significant renal dysfunction

STATIN

Most patients will receive high-intensity statin therapy perioperatively for potential anti-inflammatory benefits.

- Atorvastatin 80 mg daily for at least five days perioperatively, then can return to home dose statin or continue 80 mg.
- The max dose of rosuvastatin is 40 mg (10 mg if CrCl <30 mL/min)
- Simvastatin has multiple drug interactions (maximum 20 mg in combination with amiodaron)
- Consider holding statin if AST/ALT >3 x ULN.

ANTICOAGULATION

- Mechanical valves: warfarin when mediastinal drains are removed
 - *INR 2-3 for AVR, 2.5-3.5 for MVR*
- Tissue valves : ASA only
- VADs generally started on heparin/warfarin within ~7 days postoperatively depending on risk of thrombosis versus risk of bleeding. Typical initial INR goal if 1.8-2.2 for Heartmate II VADs and 2-3 for Heartware. See below for aspirin recommendations.
- Anticoagulation should be considered on patients who remain in atrial fibrillation > 48 hours who have a CHADS₂ score of ≥ 2. Heparin stopped when patient is in sinus >24 hrs. However, if pt is in afib for more than 3 days, even if they are then converted, they are anticoagulated for 6 weeks.
- Generally reduce initial warfarin dose by 50% in patients receiving amiodarone
- **Anticoagulation** may lead to cardiac tamponade, either immediate or late. The classic patient may have been over-anticoagulated for 2-3 days.

- **Tamponade** may present as a cardiac arrest with electrical/mechanical dissociation, or as hypotension, or “*not doing well*” with particular note made of low urine output or rise in creatinine.
- When in **extremis**, a timely reopening of the pericardial space by opening the inferior portion of the wound may save the patient’s life.
- In the patient whose course is more **gradual**, an echocardiogram is the diagnostic procedure of choice.

ASPIRIN

- Start 325 mg on postoperative day 0 within 6 hours after surgery unless chest tube output >150 mL/hr; recommend holding if platelets < 50; consider decreasing to 81 mg if platelets consistently 50-80K.
- Decrease dose to 81 mg in all patients receiving therapeutic anticoagulation or clopidogrel/prasugrel (except HM VAD)
- For Heartmate II VAD ASA 81 mg and for Heartware ASA 325 mg.
- Do not recommend enteric coated aspirin since it may not be as well absorbed and has limited benefit in reducing GI bleeding.

AMIODARONE PROPHYLAXIS
FOR POST OP AFIB

- All patients should be initiated on an amiodarone infusion **immediately** post-op unless they meet one of the exclusion criteria below:
 1. Age < 40 years
 2. Pregnancy
 3. Resting heart rate < 65 bpm
 4. Second or third degree heart block
 5. Bifascicular block (i.e. RBBB and left posterior fascicular block or RBB and left anterior fascicular block)
 6. First degree AV block or LBBB in patients undergoing valve surgery
 7. Patient of Dr. Shah
- Aspartate aminotransferase (AST) or Alanine aminotransferase (ALT) >4 times normal (>120 IU/L)
- To transition from IV to oral amiodarone, calculate the total mg given via infusion and boluses, then multiply it x 2. Subtract this number from the total oral loading dose (*6 g for prophylaxis or 10 g for treatment*). Divide this by 600 to calculate the # of PO doses needed for the remainder of the load.

AMIODARONE

PROTOCOL

Amiodarone Protocol		IV	PO
Prophylaxis	Total loading dose	3 g	6 g
	Administration of loading dose	Optional 150 mg bolus over 10 minutes then titrate infusion based on HR: -HR \geq 80: 1 mg/min -HR 65-79: 0.5-1 mg/min -HR <65: stop infusion	600 mg PO Q12H
	Loading dose duration	1 mg/min: ~2 days 0.5 mg/min: ~4 days	5 days
	Maintenance dose	150 mg IV daily over 60 minutes until POD28	200 mg PO daily until POD28
Treatment	Total loading dose	5 g	10 g
	Administration of loading dose	Optional 150 mg bolus over 10 minutes then titrate infusion based on HR: - HR \geq 80: 1 mg/min - HR 65-79: 0.5-1 mg/min - HR <65: stop infusion	600 mg PO Q12H
	Loading dose duration	1 mg/min: ~3.5 days 0.5 mg/min: ~7 days	8 days
	Maintenance dose	150 mg IV Q12H over 60 minutes	400 mg PO daily

PERIOPERATIVE
ANTIBIOTICS

Population	Antibiotic	PCN-allergy Antibiotic
Median sternotomy <i>(Including heart transplant)</i>	Cefazolin	Vancomycin
Median sternotomy and MRSA+ or prior VAD	Cefazolin + vancomycin <i>(Vanc ONLY single dose in OR, do not continue post-op)</i>	Vancomycin
Median sternotomy OPEN chest <i>(including heart transplant, prior VAD, or MRSA+)</i>	Cefazolin while chest is open	Vancomycin
VAD OPEN chest	Cefazolin + Vancomycin	Vancomycin
Lung transplant	Cefepime <i>(transplant ID will tailor pre- and post-op regimen if culture history known)</i>	Cefepime <i>[if severe allergy (hives, anaphylaxis) consult transplant ID]</i>

**All antibiotics continue until 24 hours after chest closure except lung transplant, which continue until donor cultures are finalized and therapy is tailored to culture results.*

BETA
BLOCKERS

Preoperative doses do not predict postoperative doses in the CVISCU. **When initiating, dose low and go slow!*

Choice of agent:

- **Metoprolol** is generally agent of choice for IV or PO and best choice for patients with restrictive lung disease
 - IV total daily dose * 2.5 *PO total daily dose (divided Q6h or Q12H)*
 - 2.5mg IV Q6H = 12.5 mg PO Q12H
 - 5 mg IV Q6H = 25 mg PO Q12H
 - 10 mg IV Q6H = 50 mg PO Q12H
- **Carvedilol** beneficial in HF, DM and has antihypertensive (alpha blocking) effects
- **Labetalol** has more alpha blocking properties than carvedilol and offers additional benefit in hypertension

ACEI

- **Avoid ACEI early post-cardiac surgery** due to altered renal function post-bypass and hemodynamic instability
- If starting in CVSICU, recommend **captopril titration**
 - Initial 6.25 mg Q8H, can double the dose every 8 hours until BP goal reached to max 75 mg Q8H (*roughly equivalent to lisinopril 40 mg daily*)

ELECTROENCEPHALOGRAPHY (EEG)

- **Routine EEG's** get done on the same day if POE ordered by **3pm**, if ordered after 3pm they will be done the following business day.
- **Emergency EEG:** When you order an Emergency EEG, they can be ordered at any time through POE but the POE order has to be accompanied by a direct call to the Neurology Attending on the EEG request pager in PING.
- **Weekend EEG's** that are not routine – In this case the order should go into POE, but the EEG Tech should be paged starting at 11 but before 3. (*Not the Neurology Attending but the "EEG Technician On Call" in PING*)
- **Continuous EEG's:** This is where the EEG is kept on for a prolonged period of time, not just a single study. Place the order in POE then also page the EEG request pager who is the Attending for Neurology EEG.

If you get into the situation where you are cooling a patient who you think may have suffered **an anoxic brain injury** by getting a continuous EEG and following EEG brain activity, we may be able to decrease brain activity sufficiently at a higher temperature and therefore not have to cool the patient as deeply. **In this situation a continuous EEG might be helpful to us.*

- **Paging:** When you page the EEG Attending on the EEG request pager it states that if you don't get a call back within 15 minutes you should call another pager.

SCIP MEASURES

GLUCOSE CONTROL

BG 18 to 24 hours after anesthesia end time must be ≤ 180 mg/dL. ONE value may be > 180 mg/dL, but other values in time frame must be ≤ 180 mg/dL. If ONE value is above goal, there must be a subsequent value during time frame that is within goal.

Excluded patients- Transplant, study patients, LOS >120 days, readmissions, prescriber documented infection prior to surgery, or if within 24 hours after surgery: required CPR or reoperation, died, or discharged.

See section on insulin management for guidance to ensure SCIP measure is met.

FOLEY CATHETER REMOVAL

Foley Catheter Removal- Surgical patients whose urinary catheter is removed on POD or POD 2 with day of surgery being day zero.

- The Foley must be removed by midnight POD2 unless documented acceptable reason for maintaining the Foley. **This does not include statements like; patient on diuretic, patient is a fall risk.*

Acceptable reasons could be:

1. Foley in place to assess response to diuretic need for strict I&Os
2. Volume overload, need to assess effectiveness of diuretics,
3. Patient delirious and would be incontinent
4. Patient on strict bed rest unable to use bed pan.

CVSICU TRANSFERS AND DEATHS

*In the CVSICU, when a patient **dies or is transferred to another facility**, 2 things are mandatory:*

1. Hospital Course Note in Sunrise

This is a narrative summary in a note type called Hospital Course Note that will automatically send information to the Hospital Discharge Summary in EPR that is faxed out to referring physicians. We can write the most efficient, cogent note of any. To do it you need to add Hospital Course note to your favorites in your document list and complete it and finalize it in a way that summarizes the hospital course and death.

2. General Surgery Generic Discharge Worksheet

There are 4 areas that need to be completed...

I. The Discharge Status

Discharge Status

Please select patient status if this is not a routine/standard discharge:

AMA Elopement Expired

II. Check off all the Problems

Problem List

Show All Available Show Selected Only

Problem	Onset Date	Category/Type	Status	Scope	History

III. Check off the Significant Events

Significant Events

Show All Available Show Selected Only

Type	Status	Scope	Event	Description	Onset Date

IV. Complete Smoking Status

Social History

Smoking Status: Never smoked Current smoker... Former smoker...

Finalize Documents

Complete At Discharge

This document has been completed and is ready for printing.

POE DOCUMENTATION

1. **Operative/Invasive High-Risk Procedure Notes**

- **Immediate brief operative progress note** – document and sign immediately after procedure and before patient moves to another level of care (e.g. PACU, home, ICU).

Required elements:

- Surgeon and assistant names
- Procedure performed
- Description of each procedure finding
- Post-op diagnosis
- As applicable to procedure, estimated blood loss and specimens removed

- **Detailed dictated operative note** – dictate immediately after procedure and sign within 7 days. *Required*

elements:

- Same as above, plus detailed description of procedure
- Clinical stage of tumor as appropriate

NOTE: It's OK to write just one detailed post-op/post procedure note immediately upon completion.

2. **Discharge Summary** – Dictate and sign within 30 days of discharge.

Required elements:

- Reason for hospitalization
- Procedures performed
- Care, treatment and services provided
- Significant findings
- Patient's condition and disposition at discharge
- Information provided to the patient and authorized person(s)
- Provisions for follow-up care
- Presence of any reportable diseases

3. **Clinic Notes** (structured and unstructured, but excluding procedure notes held to #1 above) - Enter into EPR and sign within 30 days of visit.

4. **H&P** - Complete no more than 30 days before or 24 hours after patient admission, with update note within 24 hours after admit. H&P must be in chart within 24 hours after admit and before surgery or a procedure requiring anesthesia services.

5. **Pre- and post-anesthesia documentation:** Document pre sedation/ pre-anesthesia assessment within 48 hours prior to surgery or a procedure requiring anesthesia services:
- Review of medical history, including anesthesia, drug and allergy history
 - Heart
 - Lungs
 - Airway
 - ASA classification
 - Plan for anesthesia care
 - Document immediate re-evaluation (vital signs) immediately before administering moderate or deep sedation or anesthesia
 - Document post-anesthesia evaluation for anesthesia recovery no later than 48 hours after surgery or a procedure requiring anesthesia services:
 - Respiratory function
 - Cardiovascular function
 - Mental status
 - Temperature
 - Pain
 - Nausea and vomiting
 - Postoperative hydration

6. **Informed consent**

- Obtain prior to all invasive procedures, anesthesia administration, and before blood/blood products are administered
- Must outline benefits and risks of procedure AND benefits and risks of alternatives to treatment
- Must be signed, **dated & timed** by patient or legal guardian, witness, and provider

7. Sign, **date & time** all entries.
8. Providers must **document ID#** after signature (*Write legibly.*)
10. **Do not use prohibited abbreviations** in the medical record.
11. **Verbal orders** must be used rarely & signed by end of next day.
12. **Summary list (PAM) for continuing ambulatory care services** *Initiated by the 3rd visit, readily available to practitioners caring for the patient, and updated whenever there is a change in any of the required elements:*
 - Any significant medical diagnoses and conditions
 - Any significant operative and invasive procedures
 - Any adverse or allergic drug reactions
 - Any current medications(*including over-the-counter /herbal*)
13. **Restraint orders and in-person evaluation/re-evaluation of patient:**
 - A. **Violent/Self-Destructive Patient Orders**
 - 4 hours for adults \geq 18 yrs
 - 2 hours children 9-17 yrs
 - 1 hour children < 9 yrs
 - B. **Violent/Self-Destructive Patient Evaluation:** In-person face-to-face evaluation within 1 hour of initiation of restraints/seclusion.
 - Evaluation of patient's immediate situation
 - Patient's reaction to the intervention
 - Patient's medical and behavioral condition
 - Need to continue or terminate restraint/seclusion
 - In-person face-to-face evaluation every 24 hours
 - C. **Non-Violent Patient Orders**
 - New order every 24 hours
 - D. **Non-Violent Patient Evaluation**
 - In-person evaluation within 24 hrs of initiation of restraints as well as in-person evaluation every 24 hrs

**Coders will not assign a code for conditions that are integral or inherent to the disease process or postoperative state, unless the condition further affects management of the patient's care in one of the above ways.*

HOW TO ACCESS POE ORDER SETS

Albion Gateway | My Applications | Sunrise Clinical Manager

My Applications > Sunrise Clinical Manager

File Registration View Go To Actions Preferences Tools

No patient visit selected. **1. Select patient**

Patient List > Orders > Results > Patient Info > Documents > Flowcharts > Clinical Summary > ID Charts > Images > Blood Products > EDMS

Current List: CVSICU **Select All Patients** 11 Visit(s) Save Selected Patients...

Name Alert	Assigned Location	Patient Name	Service	Provider	Unack Alerts	Assigned Nurse	Assigned Provider	Assigned Respiratory Therapist
	CVSICU-017-B		Cardiac Surgery	CONTE, JOHN Vic		Maisha 4-7349	Liz 4-7408	
	CVSICU-018-B		Cardiac Surgery	Simeone, Alan Arthur		Shelly/ Anna 4-7350	Liz 4-7408	
	CVSICU-019-B		Cardiac Surgery	CONTE, JOHN Vic		Shelly/ Anna 4-7351	Liz 4-7408	
	CVSICU-020-B		Cardiac Surgery	CONTE, JOHN Vic		Lauren/ Dietra 4-7352	Liz 4-7408	
	CVSICU-021-B		Cardiac Surgery	CONTE, JOHN Vic		Emmanuel/ Heather 4-7...	Betsy 4-7401	
	CVSICU-024-B		Cardiac Surgery	CONTE, JOHN Vic		Stefannie 4-7356	Liz 4-7408	
	CVSICU-025-B		Cardiac Surgery	Cameron, Duke Edward		Heather 4-7356	Betsy 4-7401	
	CVSICU-026-B		Cardiac Surgery	SHAH, ASHESH S		Joanna 4-7358	Betsy 4-7401	
	CVSICU-028-B		Cardiac Surgery	CONTE, JOHN Vic		Chris W/Joanna 4-7360	Betsy 4-7401	
	CVSICU-029-B		Cardiac Surgery	Cameron, Duke Edward		Charlette/ Joanna 4-73...	Betsy 4-7401	
	CVSICU-031-B		Cardiac Surgery	Simeone, Alan Arthur		Kelly 4-7363	Liz 4-7408	

Albion Gateway | My Applications | Sunrise Clinical Manager

My Applications > Sunrise Clinical Manager > Patient List

File Registration View Go To Actions Preferences Tools

1. Highlight a patient

2. Select Clipboard

Patient List > Orders > Results > Patient Info > Documents > Flowcharts > Clinical Summary > ID Charts > Images > Blood Products > EDMS

Current List: CVSICU **Select All Patients** 11 Visit(s) Save Selected Patients...

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	CVSICU-031-B		Cardiac Surgery	Simeone, Alan Arthur		Kelly 4-7363	Liz 4-7408	

Order Entry Worksheet -

19y (02/19/199)

Requested By: Me Other Source: (Allergy Details)

Date: Time:

Session:

Type: Standard Reason:

Manual Entry Searching for...

Order

- CVSICU (CVSICU) Admission Orders (RNH POST OP)
- CVSICU (CVSICU) Admission POST OP
- CVSICU (CVSICU) Admission POST OP PART A
- CVSICU (CVSICU) Admission POST OP PART B
- CVSICU (CVSICU) Anticoagulation Post Op Prophylaxis
- CVSICU (CVSICU) Continuous Cardiac Output Swan

ACCESSING SERVICE LISTS



3½ Floppy (A:)
CD Drive (D:)

3½-Inch Floppy D
CD Drive

Network Drives

Common on 'jhdfs\data\cardiacsurgery' (F:) Network Drive
 Home on 'jhdfs\Users\$' (H:) Network Drive
 Icu lists and forms on 'jhdfs\data\cardiacsurgery\commo...' Network Drive
 hdaniel9 on 'jhdfs\data\cardiacsurgery\users' (M:) Network Drive

Name	size	Type	Date Modified
Old PA NP patient lists		File Folder	6/23/2013 6:19 PM
Old Resident patient lists		File Folder	6/24/2013 1:31 PM
Resources		File Folder	6/27/2013 9:16 AM
Schedules		File Folder	6/24/2013 6:39 AM
~\$ _PA,5,31,13.docx	1 KB	Microsoft Office Wo...	5/31/2013 6:42 PM
~\$ _PA,6,5,13.docx	1 KB	Microsoft Office Wo...	6/5/2013 7:57 AM
~\$ ICU_RESIDENT_6,2,13.d...	1 KB	Microsoft Office Wo...	6/2/2013 8:51 AM
~\$ ICU_RESIDENT_6,9,13.d...	1 KB	Microsoft Office Wo...	6/9/2013 6:03 AM
ICU Admit Sheet NEW.doc	83 KB	Microsoft Office Wo...	5/23/2012 6:00 PM
CVSICU_RESIDENT_6,22,13...	92 KB	Microsoft Office Wo...	6/23/2013 3:00 AM
CVSICU_RESIDENT_6,23,13...	91 KB	Microsoft Office Wo...	6/23/2013 6:14 PM
CVSICU_RESIDENT_6,24,13...	92 KB	Microsoft Office Wo...	6/25/2013 6:19 AM
CVSICU_RESIDENT_6,25,13...	96 KB	Microsoft Office Wo...	6/26/2013 6:01 AM
CVSICU_RESIDENT_6,26,13...	93 KB	Microsoft Office Wo...	6/27/2013 4:56 PM
NP_PA,6,22,13.docx	116 KB	Microsoft Office Wo...	6/23/2013 3:00 AM
NP_PA,6,23,13.docx	114 KB	Microsoft Office Wo...	6/24/2013 2:36 PM
NP_PA,6,24,13.docx	115 KB	Microsoft Office Wo...	6/25/2013 6:37 AM
NP_PA,6,25,13.docx	115 KB	Microsoft Office Wo...	6/25/2013 6:59 PM
NP_PA,6,26,13.docx	117 KB	Microsoft Office Wo...	6/27/2013 11:34 AM

CPG POD 0 SHEET

Date: _____
Procedure: _____
Cardiac Surgery Attending: _____
CVSICU Team Members: _____

Patient Name, MRN, DOB

(ICU Attending, Fellow, Resident, AP & Nurse)

Cardiac Surgery Clinical Practice Guidelines: POD 0

Phase 1: Upon Admission to the CVSICU	Comments		
*Check when addressed			
<input type="checkbox"/> Rapid Extubation Protocol Ordered, <i>if appropriate</i>			
<input type="checkbox"/> Review EKG and CXR Immediately			
<input type="checkbox"/> External & internal pacemakers addressed			
<input type="checkbox"/> Change to single chamber pacer, <i>if appropriate. (AICD to be re-programmed on POD 1, if stable)</i>			
<input type="checkbox"/> If Swan in place, check height, weight and computation <input type="checkbox"/> Send SvO2			
<input type="checkbox"/> OGT to LIS and check placement			
<input type="checkbox"/> Validate current Type and Cross			
<input type="checkbox"/> Insulin drip <input type="checkbox"/> Notify provider for IV insulin bolus if any BG >160mg/dl			
<input type="checkbox"/> Chest Tubes to 20 cm suction			
<input type="checkbox"/> MAP goal discussed (<i>Reflected in orders</i>)			
<input type="checkbox"/> Date/Team Information Completed (<i>Top left</i>)			
<input type="checkbox"/> Clip PINK "Vent Alert Sign", <input type="checkbox"/> BG Clock, and <input type="checkbox"/> POD 0 Checklist to door			
Provider Signature: _____	Nurse Signature: _____		
Phase 2a: Assessment / Management: Nursing (within 2 Hours post-admission)	Comments		
*Check when addressed			
<input type="checkbox"/> Correlate manual BP to A-line			
<input type="checkbox"/> VAP bundle (<i>HOB 30°, Mouth Care q4hr., CHG q12hr.</i>)			
<input type="checkbox"/> Stockings and SCD's in place			
<input type="checkbox"/> Notify Attending if Chest tube output > 150cc/hr. x 2hr. <input type="checkbox"/> Send Heme 8 / coags			
<input type="checkbox"/> Family contacted <input type="checkbox"/> Phone #'s in chart			
<input type="checkbox"/> ASA 325mg via NG tube NOW if no signs of bleeding			
<input type="checkbox"/> Carrier D5W (<i>Goal rate 20 cc per hr.</i>)			
Phase 2: Assessment / Management: Provider (within 2 Hours post-admission)	Comments		
*Check when addressed			
<input type="checkbox"/> Vent changes, review initial ABG, aim for alkalemia until weaning			
<input type="checkbox"/> Appropriate POD 1 labs ordered			
<input type="checkbox"/> Verify MRSA/MSSA PCR status <input type="checkbox"/> Verify Isolation status			
<input type="checkbox"/> Continue mupirocin dosing, <i>if applicable</i>			
Provider Signature: _____	Nurse Signature: _____		
Nursing: Daily Goals/Plan of Care			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Pain Control: Fentanyl: (<i>Intermittent/Continuous</i>) Propofol: Other: MAP Goal: CV/PIPAD Goal: Pressors/Wean Plan: (Aflib) Amio Treatment Plan: </td> <td style="width: 50%; padding: 5px;"> Infectious Disease Antibiotics: Antibiotic stop dates: GI/Nutrition/Volume GI/Nutrition: Diuresis Goal: Heme Anticoag: Study Patient: Yes* No *If yes, what study: _____ </td> </tr> </table>	Pain Control: Fentanyl: (<i>Intermittent/Continuous</i>) Propofol: Other: MAP Goal: CV/PIPAD Goal: Pressors/Wean Plan: (Aflib) Amio Treatment Plan:	Infectious Disease Antibiotics: Antibiotic stop dates: GI/Nutrition/Volume GI/Nutrition: Diuresis Goal: Heme Anticoag: Study Patient: Yes* No *If yes, what study: _____	
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; padding: 5px;"> Neuro / Pain CV Resp </td> <td style="padding: 5px;"> Early Extubation: <input type="checkbox"/> Y <input type="checkbox"/> N </td> </tr> </table>	Neuro / Pain CV Resp	Early Extubation: <input type="checkbox"/> Y <input type="checkbox"/> N	
Neuro / Pain CV Resp	Early Extubation: <input type="checkbox"/> Y <input type="checkbox"/> N		

*Updated 4.30.14-H.Daniels

OR TO ICU HANDOFF

OR to ICU Handoff - Checklist	
• Out of OR Time:	_____
• Patient arm band intact	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Pacemaker connected	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Is dual chamber pacer needed?	<input type="checkbox"/> Y <input type="checkbox"/> N *If not, change to Single Chamber Pacer _____
• Central line dressings occlusive	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Are Medication Infusions Standard Concentrations	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Are lines in order?	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• IV pump for GTTS - Verify patient weight and "infusion mode"	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Was IV insulin protocol (OR goal: 130-160) utilized in the OR?	<input type="checkbox"/> Y <input type="checkbox"/> N *Last Intraop BS: _____
• Patient's Admitting Temperature:	_____
• Was Beta Blocker Given?	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Swan Ganz Catheter	<input type="checkbox"/> Y <input type="checkbox"/> N, SvO2 Swan Ganz Catheter <input type="checkbox"/> Y <input type="checkbox"/> N _____
• Check LP drain set-up (if applicable)	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• If patient on INO, discussed weaning plan	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Pink Donut in place?	<input type="checkbox"/> Y <input type="checkbox"/> N _____
• Foley cath secured?	<input type="checkbox"/> Y <input type="checkbox"/> N* *If no, please secure using the Grip-lok device _____
• Is patient in a study?	<input type="checkbox"/> Y* <input type="checkbox"/> N *If yes, what study? _____
• <u>If Vascular Surgery Patient:</u>	
• Obtain Vascular MD on Call:	_____, Pager/cell number _____
• Obtained neuro checks at time of handoff	<input type="checkbox"/> Y <input type="checkbox"/> N

CPG > POD 1 SHEET

Date: _____
POD #: _____
Cardiac Surgery Attending: _____
CVSICU Attending/Provider: _____
Nurse: _____

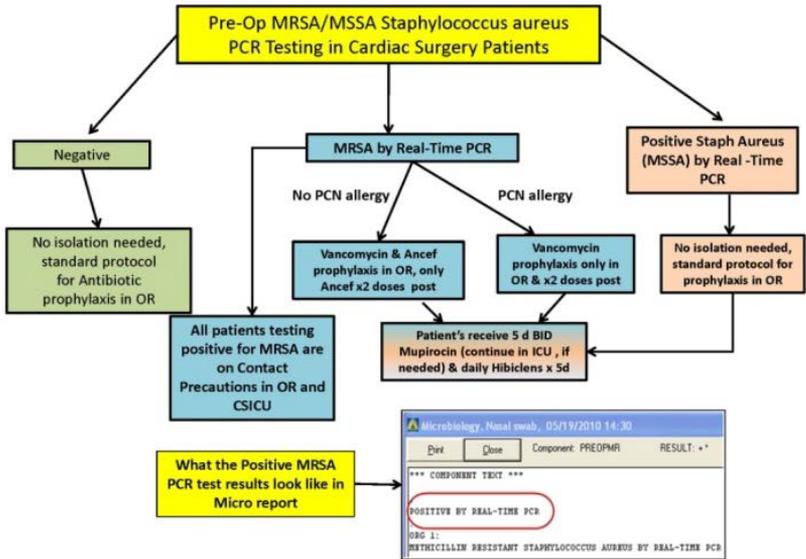
Patient Name, MRN, DOB

Cardiac Surgery Clinical Practice Guidelines: POD>0

<small>* Check if addressed</small> Assessments:	Nursing Daily Goals - Plan of Care:
<input type="checkbox"/> VAP bundle (HOB 30°, Mouth Care q4hr., CHG q12hr., Wean Screen) <input type="checkbox"/> Sedation vacation at least q24hours <input type="checkbox"/> External & Internal pacemakers addressed (<i>Threshold & Sensitivity</i>) <input type="checkbox"/> Change to single chamber pacer, <i>if appropriate (AICD to be re-programmed)</i> <input type="checkbox"/> Central lines/Arterial lines: Necessary? <input type="checkbox"/> If Central Line > 14 days old, team should consider new site <input type="checkbox"/> Central line dressing occlusive <input type="checkbox"/> Verify MRSA/MSSA pre-op PCR / Need for mupirocin <input type="checkbox"/> If patient has foley cath secure with grip-lok device <input type="checkbox"/> Document need for Foley cath. <i>If no need, D/C Foley cath by MN POD #2</i> <input type="checkbox"/> Sequential compression devices, sub q heparin <input type="checkbox"/> PT/OT needs assessed <input type="checkbox"/> Consult Issued, <i>if applicable</i> <input type="checkbox"/> If intubated, pink donut-shaped ring to back of head <input type="checkbox"/> Nutrition needs assessed <input type="checkbox"/> <i>If POD 1 - Address Glucose SCIP measure</i>	Tolerance for Sedation Vacation: Pain Control: Activity Plan: PT/OT/SLP Needs: Vent/BiPAP changes: Pulm Toilet Plan: MAP Goal: (Afib) Amio Treatment Plan: Diuresis/Lasix Plan: I&O Goals: Diet: Tube feed: _____ @ _____ ml/hr, Goal rate: _____ Insulin gtt. / SS Aspart
Diagnosics: <input type="checkbox"/> Appropriate testing ordered <input type="checkbox"/> If POD ≥2, CXR Needed?	BG Target window for: _____ (Time) from _____ to _____ (Time) *Call Provider if BG >160 Diets: All POD1 diets should be CL, no conc sweets, or 30 gram carb control until at least hour 24 post op. Abx Levels/Pan Culture/Cx Results:
Medications Addressed: <input type="checkbox"/> Med Reconciliation with Pre-op Meds <input type="checkbox"/> PPI <input type="checkbox"/> Statin <input type="checkbox"/> Beta Blocker <input type="checkbox"/> ASA <input type="checkbox"/> Diuretic <input type="checkbox"/> Stool softeners <input type="checkbox"/> Sleeping pill as needed	Endocrine (POD 1) ID Heme Study Patient Transfer
Miscellaneous: <input type="checkbox"/> Pt Fall Risk (Low / Moderate / High) <small>circle</small> <input type="checkbox"/> Fall risk alert card matches <input type="checkbox"/> Family contacted <input type="checkbox"/> Contact info verified <input type="checkbox"/> Document pressure ulcer prophylaxis, need for specialty bed <input type="checkbox"/> SSI, CLABS, Fall prev, d/c plng, pt/family ed. provided and documented <input type="checkbox"/> Restraint order in POE, <i>if applicable</i> <input type="checkbox"/> Social work/Pastoral needs addressed <input type="checkbox"/> Consult Issued, <i>if applicable</i> <input type="checkbox"/> Supportive care needs addressed <input type="checkbox"/> Consult Issued, <i>if applicable</i>	Antibiotic Stop Dates: Anticoag Goal: Study Patient: Yes* No *If yes, what study: Patient ready for transfer? Yes No *Issues delaying transfer:
Provider Signature: _____ Nurse Signature: _____	

*Updated 4.30.14-H.Daniels

PROTOCOL PER PCR TESTING AND SUBSEQUENT THERAPY



Prophylactic Antibiotics in OR For Cardiac Surgery Patients

MRSA PCR Positive

- PCN Allergic → Vancomycin in OR & x 2 doses post
- No PCN Allergy → Vanc & Ancef in OR, then only Ancef x 2 doses post

MSSA PCR Positive or NO Staph (routine case)

- PCN Allergic → Vancomycin in OR & 2 doses post
- No PCN Allergy → Ancef in OR & 2 doses post

**CVSICU MEDICAL STAFF
CONTACT INFORMATION:**

<u>Cardiac Surgeons</u>	<u>Pager</u>	<u>Provider #</u>
Cameron, Duke	410-456-1252	H6220
Conte, John	410-294-1191	P4472
Mandal, Kaushik	443-299-2921	T9028
Price, Joel	410-283-1061	V0586
Sciortino, Chris	410-693-3681	T4229
Shah, Ashish	410-218-8872	T4981
Vricella, Luca	410-790-1572	T3778
Zehr, Kenton	507-254-0908	
<u>Cardiac Residents</u>	<u>Pager</u>	<u>Provider #</u>
Parsee, Ana	410-283-6551	T9544
Schwartz, Gary	410-283-6554	T8300
Do, Nhue	410-283-6168	V0692
Kemp, Clinton	410-434-2420	T1610
Lehenbauer, David	410-283-3200	
Patel, Nishant	410-283-6288	T3154
<u>CVSICU Intensivists</u>	<u>Pager/Cell</u>	<u>Provider #</u>
Dodd-O, Jeff	410-283-4659	J2391
Katz, Nevin	703-200-4836	T6559
Kim, Bo	410-434-3213	T2416
Price, Joel	410-283-1061	V0586
Sciortino, Chris	410-693-3681	T4229
Stephens, Scott	410-283-5056	T3729
Sussman, Marc	410-283-5154	C5746
Whitman, Glenn	215-300-3925	T5598

<u>Important Numbers:</u>		
<u>CVSICU Fellows</u>	<u>Pager</u>	<u>Provider #</u>
Orija, Abiodun	410-283-4917	V2076
Paufler, Pamela	410-283-4910	V2077
<u>CVSICU NP/PAs</u>	<u>Pager/Cell</u>	<u>Provider #</u>
Calef, Andrea	410-283-2686	T6198
Crawley, Kristin	410-283-2391	T6280
Chittenden, Edith	410-283-4527	V0542
Dawson, Laura	410-283-5228	T8321
DeCarlo, Stephen	410-283-2939	T7742
Gordon, Matt	410-283-9369	T2145
Han, Kathryn	410-283-0632	V1648
Johnson, Jairus	410-283-5054	V0479
Paras, Jen	410-283-2733	V0663
Poltrack, Angela	410-283-5255	T8316
Riner, Lauren	410-283-2855	V1438
Stewart, Emily	410-283-3861	T5772
Tucker, Liz	410-283-5113	T2949
Wisniewski, Steven	410-283-8143	T5104
<u>Moonlighters</u>	<u>Pager/Cell</u>	<u>Provider #</u>
Azoury, Said	410-283-5384	T6534
Beaulieu, Bobby	410-283-5879	T6340
Grimm, Joshua	410-283-6503	T6515
Howley, Isaac	410-283-0462	T6037
King, Betsy	410-283-4536	T6232
Kodadek, Lisa	410-283-1631	T7373
Magruder, Trent	410-283-6154	T7027
Poruk, Katherine	410-283-6174	T8272
Valero, Vicente	410-283-5534	T5670

PAGING

ANESTHESIA

ICUs have occasionally been calling 5-4444 asking for "anesthesia only" for what turns out to be an elective intubation for a procedure such as an EGD.

Just a reminder that while you are allowed to call for "*Anesthesia only*" for urgent/emergent intubations

Elective intubations for procedures should be paged directly to the GOR coordinator that day or the Anesthesiology attending on call at night and on the weekends and holidays; not through the emergency paging system.

PHONE NUMBER PREFIXES:

410-550-xxxx

410-955-xxxx

Pager 410-283-xxxx

410-502-xxxx

410-516-xxxx

Pager 410-434-xxxx

410-614-xxxx

410-287-xxxx

