

Revised –2/4/05

Orientation to Cardiothoracic Surgery

This information is designed to provide the surgical residents with guidelines in patient care and management of the Cardiothoracic patient. The protocols provided are not meant as a substitute for evaluating patients, however, deviations need reasons. Communication between junior and senior residents and attendings is essential. If you have a question or problem, call the chief resident or attending.

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General Thoracic

ATTENDING CALL SCHEDULE

Daytime – call CP office at 46254

Nights and weekends – ask senior resident

CARDIAC

One attending rounds weekly with the team, Saturday to Friday (on call weekend). Daily weekly call schedule is as follows

Monday	Picone
Tuesday	Fink
Wednesday	Lutz
Thursday	Per call schedule
Friday:	Per call schedule

THORACIC

Attending on call weekly (usually week prior to weekend) per established schedule for consults and emergencies.

RESIDENT CALL SCHEDULE

There are 2 cardiothoracic residents, a Senior general surgery resident and three Junior residents on the CP service. There will be either a Fellow or Senior resident on call with a Junior resident covering both SUNY Upstate and Crouse. Your call schedule can be obtained from the Residency Coordinator (Donna Bruch). Call will be approximately every third night.

RESIDENT AND FELLOW RESPONSIBILITIES:

CP Residents/Senior General Surgery Residents:

1. Lead rounds
2. Be in the OR on all cases
3. Supervise ward procedures
4. Devise treatment plan for CP patients and consults
5. Direct Junior resident activities
6. Present at Grand Rounds/M&M

(M&M is the second Wednesday of each month)

Junior Residents

1. A.M. rounds – round on all floor patients, write brief notes in chart prior or after formal rounds, give patient presentations during formal rounds with all current, pertinent information.
2. Make sure all H&Ps are completed and preops ready for OR
3. Write preop/postop notes as indicated
4. Perform floor procedures with supervision

5. Do floor work
 - a) notes, orders
 - b) remove chest tubes
 - c) remove pacer wires
 - d) remove central venous pressure lines
 - e) P.M. rounds and sign out
6. Dictate discharge summaries/transfer summaries, death notes

NOTE: The surgical supplies stocked on the CP units is paid for by that unit. Notify bedside nurse or unit secretary when taking supplies. PLEASE do not remove them for use on another unit without notifying the charge nurse.

CARDIAC ROUNDS:

Resident rounds begin approximately 6:15 a.m. in the CPICU. During this time, the ICU patients then the floor patients are assessed and evaluated. Decisions are made regarding transfers and discharges. Notes for each patient should be written in the morning after actual rounds. Transfers and discharge orders should be written at this time and communicated to the charge nurse. Please inform the Cardiothoracic nursing staff or ward secretary of anticipated discharges the evening before, confirm with the charge nurse during early morning rounds. Following the completion of rounds, the team proceeds to the x-ray board to review films for the service. It is the junior resident's responsibility to collect all recent films prior to that time for review. When patients are discharged or die, please note in pencil on the clipboard provided in the x-ray department.

In general, cardiac patients spend the first one to two days in the ICU postoperatively. The chest tubes are usually removed on postop day #2 unless there is a persistent air leak or persistent drainage. The pacing wires are usually removed on postop day #3 after checking coagulation studies, platelet counts, and rhythm. Tubes and wires should be removed in the morning in the event of bleeding. Patient can be discharged on the 4th or 5th day after surgery if no problems are presents.

THORACIC ROUNDS

Board rounds being in the x-ray department as follows:

Monday and Tuesdays – 7:10 a.m.

Wednesdays – immediately following Thoracic Surgery Conference

Thursdays- 8:00 a.m.

Fridays – immediately following the Thoracic Lecture Series

At this time, the resident meet with the attendings. Patient x-rays are shown, information presented and patient management discussed. Be prepared to discuss ALL patients, consults, and new admissions. Again, it is the junior resident's responsibility to collect all recent films for review at that time **PRIOR TO BOARD ROUNDS**. All patients must be seen and notes written prior to board rounds. The x-ray board does not always include: postop films, new films from overnight or off-service patients and consultations.

Monday morning promptness and completeness of all x-rays is especially important since the OR begins at 7:30 a.m., and there is only thirty minutes to go over everything that has happened on the weekend. Be concise; a systems oriented presentation is best.

DAILY PROGRESS NOTES:

These notes should be written in the morning prior to rounds. They should be brief and concise. They should include:

- a) VS and heart rhythm
- b) Problem – oriented exam
- c) Lab results
- d) Conditions requiring hospitalization (ie: O2, arrhythmias)
- e) Plan (if not sure, logical thoughts can be later supported confirmed action)

OPERATING ROOM RESPONSIBILITIES:

1. Be prepared. Read the anatomy, procedure and disease.
2. Be presented in the OR PROMPTLY. Take beeper off before scrubbing.
3. For all cases, make sure chest xrays and other Relevant x-rays such as cines are in the OR and on the view box. For elective cases, these are on the cart in the holding area. For add ons these must be obtained through x-ray.
4. Help prepare patient (position, prep, lines)
5. Assist in opening and closure of the chest, cannulation
6. CABG- help take vein, close leg, hold heart, etc.
7. Valve replacement – help sewing in valve, assist with cannulation
8. Thoracic cases/misc. cases – perform procedures, help attending with case
9. Write postop orders, help transfer to ICU or recovery room
10. Check postop x-rays and labs.

Pre-printed postop orders are found in the ICU for cardiac surgery patients. Thoracic surgery postop orders are in the recovery room.

GUIDELINES TO CARDIAC SURGERY

1. Left anterior descending artery
2. Diagonal artery
3. Septal artery
4. Circumflex artery
5. Circumflex artery
6. Right coronary artery
7. Acute marginal artery
8. Posterior descending artery

CARDIAC SURGERY PREOPERATIVE GUIDELINES:

Most cardiac adult patient are ODA (on day admission) but some are admitted on the afternoon prior to surgery. They come with their cath reports, chest x-rays, EKG and lab work. The floor should notify you when the patient arrives. Your responsibility is to admit the patient and evaluate them for any significant non-cardiac disease, infections, renal insufficiency, etc.

Make note of any:

- a) carotid bruits or history of TIA
- b) cardiac dysrhythmias
- c) ventricular function
- d) neurological deficits
- e) venous varicosities or peripheral vascular disease
- f) poor dentition of valve patient
- g) BP discrepancy in arms (poss. Subclavian stenosis)
- h) Fevers or infections
- i) COPD
- j) ETOH abuse

For CABG, note any history prior bypass surgery, saphenous vein stripping, or venous varicosities. Please note radial, femoral and distal pulses during your H&P as radial artery harvest or intra aortic balloon pump insertion may be required.

Note recent medications with special attention to anticoagulants and antiplatelet, agents, allergies, etc.

Know cath report and review cine if possible.

Notify chief resident or attending immediately if any significant newly discovered abnormalities, **EVEN IF IT IS THE MIDDLE OF THE NIGHT**. This allows rescheduling for OR if necessary. Preop orders are found on the CT unit. (^G)

For Crouse preops: Copy preop onto Crouse chart. H&P and consents for hearts are to be on UNIVERSITY HOSPITAL forms.

It is mandatory that the chest x-ray, EKG and labs all be checked and documented in the chart prior to surgery. The operative permit must also be obtained and in the chart. Any problems must be discussed with the fellow or attending.

CARDIAC SURGICAL PATIENT-POSTOP EVALUATIONS AND POTENTIAL PROBLEMS

The immediate postop care is handled by the senior residents, fellow, PAs in the CPICU. There may be times when all of these individuals may be in the OR and you may receive a call from the ICU. Several guidelines have been established for the routine patient but events can happen. Your primary responsibility is the floor patients. In the event that a situation arises needing your assistance in the ICU, attend to the problem and notify the senior/fellow. Here are some principles regarding the ICU:

1. The patients are usually hypothermic when they arrive from the OR to the ICU.
2. When they begin to warm and vasodilate, expect to replace volume. A decrease in BP and CO as they warm is not unexpected. However, if the patient does not respond to volume replacement, you may have to consider inotropic agents. Starting new drugs should be approved by the fellow or attending.
3. Carefully monitor temp, HR, BP, filling pressures, urine output, cardiac output, chest tube output, ABGs and K+.
4. Volume replaced with:
 - Ringer's Lactate (1st choice)
 - Hespan (2nd choice)
 - 5% albumin (consider cost. This is a blood product)
 - Transfusion should be ordered only after approval of attending
5. Notify chief resident /attending if:
 - a) Starting inotropes or marked change in drug requirements.
 - b) Any major change in patient's condition
 - c) Excessive bleeding
 - d) Hemodynamic instability
 - e) Evidence of complications (respiratory and renal failure, stroke, need for invasive procedures.

It is generally better to call seniors/fellows with problems or concerns before situations deteriorate since it takes little time for these patients to become seriously ill. If in doubt, ask questions of anyone. Nurses can also be quite helpful, especially in the ICU. Know how to use them as a resource.

POSTOP BLEEDING:

1. Redos – patients requiring long pump time or patients with underlying dyscrasias tend to bleed more.
2. Do not extubate if you have significant drainage or questions of tamponade.
3. Remove tubes when drainage is < 100 cc per 8 hours and there is no air leak, usually on POD #2.
4. Treatment of excessive bleeding:
 - a. Definition: > 100 q 1 hr.
 - b. Assessment: check coags, H&H-consider repeat chest x-ray, type & cross.
 - c. Treatment

Increase PEEP to 10 (if C.I. >2.2)

Replace intravenous volume

Correct coagulopathy or thrombocytopenia

Protamine 25-50 mgm IV slowly

For elevated PTT immediately postop: platelets, fresh frozen plasma, DDAVP (renal patients)

- d. If the chest tube drainage stops suddenly after considerable drainage, consider cardiac tamponade.

Check CT patency, repeat chest x-ray

Check JVD, decreased CVP or C.I.

Consider echocardiogram

- e. Consider re-exploration if:

Persistent bleeding > 4 hours with clots in the chest tube.

Bleeding > 400 cc/hr times one hour

Hemodynamic instability or tamponade.

ARRHYTHMIAS:

1. Ventricular arrhythmias: Serious ones are usually an uncommon problem except in patients with poor ventricular function; postoperative PVCs can be common. Ectopy can be >6 unifocal PVCs/min, multifocal PVCs, couplets, triplets, sustained/nonsustained VT or VF (Bigeminy and trigeminy do not increase the risk of VT/VF). If patient is unstable, follow ACLS protocol. If the patient is stable:

- a. Check electrolytes (K+, M++) replace as needed
- b. Check SA02 and EKG (r/o ischemia)
- c. Contact cardiology for evaluation
- d. Contact fellow/attending

True ventricular arrhythmias may need IV lidocaine or Amiodarone.
 VF is primarily treated with cardioversion, torsades de pointes should be treated with IV magnesium (2 gm IV over 2 min) and defibrillation if it degenerates into VF.

2. Atrial dysrhythmias (a fib, aflutter, SVT)

Serious only if associated with fast ventricular response and lost 20% of C.O.

Hypotension secondary to loss of atrial kick

Occurs in about 1/3 of patients postoperatively

If hypotension occurs, synchronous cardioversion may be needed (call fellow or attending)

Goal is to maintain a HR <120 to conversion to NSR

(Patients with poor EF or incomplete revascularization do not tolerate tachycardia > 120 as well as revascularized patients).

Treatment: Rate Control:

PO beta blocker (Lopressor 12.5-50 mg daily bid).

IV diltiazem boluses (5 mg IV bolus) followed by continuous drip (5-15 Mg/hr peripheral IV can be used) then switch to PO (30-90 mg q 8h).

Note: Bolus IV diltiazem can produce sudden hypotension and heart block. Before administration, make sure that there is a functioning IV with NS present, pacing wires with pacemaker or external pacemaker source are present and IV calcium chloride syringe is present. The fellow should be aware and present for administration.

Digoxin IV or PO (load with 0.5 mg IV then 0.25 mg IV q 6h x 2 doses then 0.125 – 0.25 mg IV/po daily.

Treatment: Chemical Cardioversion for Afib recurrent or persistent >24 hrs

Amiodarone

IV bolus 150 mg over 10 min

IV load 150 mg bolus followed by infusion of 900 mg in 500 cc at 1.0 mg/min for 6h then 0.5 mg/min for 18 hours

PO load 400 mg tid x 5-7 days

Maint 200 mg po daily
Procainamide 1000 mg IV/PO
RARELY USED
Then Procan SR 750-1000 mg po q 6h

Note: Procainamide and Amiodarone can cause torsade de pointes. Also, Amiodarone has betablocking properties and should be used cautiously with other rate controlling agents.

Anticoagulation for Afib >24-48 hrs due to risk of thromboembolism

No heparin boluses in early postoperative patients, see anticoagulation
Patients may be started on IV heparin then converted to Coumadin

AV CONDUCTION ABNORMALITIES:

Treat the underlying cause; usually due to low CO or hypovolemia

- a. Must check ABGs
- b. Shivering can cause acidosis – RX with Demoral or muscle relaxants
- c. Consider NaHCO₃ if pH <7.30 & serum HCO₃ <20.

Note: Inotropes do not function properly during an acidotic state.

EXTUBATION:

Patient is ready for extubation if:

- a. PO₂ good >65
- b. PCO₂ <50
- c. PH > 7.30
- d. NIF > 25 mm H₂O
- e. TV > 600 cc

Patient also must be fully awake with no neuro deficits; have no evidence of tachypnea, bleeding, be hemodynamically stable; and have no gross abnormalities on CXR.

LOW CARDIAC OUTPUT:

1. First maximize filling pressures by use of LA, PA, CVP with volume infusion
2. Inotropes – Dobutamine, Dopamine, Epinephrine, Levophed, Primacor (useful with pulmonary hypertension and RV failure)
3. Pacing (faster HR can increase C.O.... (C.O.= S.V. x heart rate and rhythm
AV sequential preferable rate 80-90.
AV interval 150-200 Ventricular output 20
4. Vasodilators- Nipride or NTG if SVR >1000

5. Discuss needs for IABP
6. Always repeat C.O. measurements after new RX
7. Follow mixed venous oxygen saturation (60% worrisome)
8. If severely low C.O. or LV dysfunction, keep HCT>30%.

SEVERE HYPOTENSION (shock of sudden onset)

Sudden, catastrophic fall in B.P. < 80; progressive with poor perfusion.

Requires emergency evaluation and treatment, since leads to myocardial ischemia, graft closure, renal failure, stroke and cardiac arrest.

1. Causes:
 - a. Usually due to severe vasodilation, hypovolemia (low filling pressures).
 - b. Other causes: infarction, tamponade, low output syndrome, hypoxia (due to mucous plug or pneumothorax).
 - c. Less common causes: sepsis, CHF, pulmonary emboli, prosthesis dysfunction.

2. Management:
 - a. CALL SENIOR RESIDENT/ATTENDING FOR HELP
 - b. Volume infusion: raise legs (optimize filling pressures)
 - c. Calcium chloride 0.5 to 1 mg IV to increase vascular tone BP temporarily
 - d. Start inotropes
 - e. Check cardiac rhythm: use pacing and bradycardia; cardioversion for atrial tachycardia >150 and ventricular tachycardia; start Lidocaine for ventricular arrhythmias (see arrhythmias)
 - f. Check airway – Look for pneumothorax or hypoxia (bag, suction, auscultation, check O2 stats).
 - g. If persistent BP <50, start full CPR procedure
 - h. ICU thoracotomy, if suspicious of tamponade (FELLOWS/SENIOR ONLY)
 - i. If BP improves and no CPR is needed, check stat:
 - j. EKG, CXR, CBC, BMP, ABG
Consider echocardiogram
Try to establish etiology, diagnosis and treatment accordingly

OLIGURIA {Def: <1cc/kg/hr), or <30 cc/hr}

1. Check
 - a. Cardiac output/cardiac index
 - b. Filling pressures (CVP, PA with Swan-Ganz catheter)
 - c. Renal function (BUN, creatinine, UA, Urine NA, osmolarity)

2. Treatment

- a. Optimize CO (Rx as above)
 - b. Fluid challenge (250-500 cc Ringers lactate)
 - c. Furosemide 40 mgm IV
 - d. Renal dose Dopamine (central access required)
 - e. Renal consult (consider CAVH)
3. Routine diuretics are given in a.m., first day post-op. Continue until weight is close to preop weight, especially valve cases and patients with poor LV function.

POST OP ELECTROLYTE REPLACEMENT

1. K⁺ monitored immediately postop and frequently there after. There is a protocol for K⁺ replacement on the postop orders in the CP ICU. It should be administered via central line in the ICU. On the floor, oral replacement is preferred unless the level is below 3.0 or active arrhythmias are present. We try to keep K⁺ at >4.0, to reduce arrhythmias.
2. Magnesium repletion should be given intravenously only within the first 48 hour Postoperative period particularly in the ICU. Oral replacement should be standard on the floor, except in patients with ventricular arrhythmias and those undergoing excessive diuresis. We try to keep the Mg⁺⁺ at >2.0.

General guidelines for electrolyte replacement

ICU (standard protocol central line)

K ⁺ <3.0	(Call HO), 3 runs of 20 meq in 50 cc NS
K ⁺ 3.0-3.5	2 runs of 20 meq in 50 cc NS
K ⁺ 3.5-4.0	1 run of 20 mgq in 50 cc NS
Mg 1.2-1.6	(Call HO) 2 runs of 1 gm in 50 cc NS
Mg 1.7-2.1	(Call HO) 1 run of 1 gm in 50cc NS

FLOOR (po preferred)

K ⁺ 3.0-3.5	Kdur 40 meq po x 2 doses
K ⁺ 3.5-4.0	Kdur 40 meq po x 1 dose
Mg+1.3-1.6	Mg gluconate 500 mg po tid x 48 hours
Mg+1.7-2.0	Mg glucontate 500 mg po x 2 doses
K ⁺ <3.0m or Mg <1.2	Give 2 runs IV then 2 doses po try to avoid IV KCl in peripheral IVS.
	{K:10 meq in 100 cc NS; Mg: 1 gm 100 cc NS}

ANTICOAGULATION

Many cardiac patients are on some form of anticoagulation. All patients are placed on sq heparin postoperative. Patients with chronic or persistent atrial fibrillation or prosthetic or biological heart valves will be placed on Coumadin and followed by the INR value. Here are some principles to follow:

- 1) SQ heparin should be discontinued when INR is therapeutic.
- 2) Daily INR and Coumadin orders should be written until steady dose is achieved.
- 3) If bleeding arises, hold Coumadin and check PT/PTT and CBC with T&S.
- 4) If INR elevated >4, hold Coumadin and notify fellow/attending. Vitamin K and FFP should be administered at discretion of the follow or attending.
- 5) IV heparin general not used unless patient has DVT/PE or persistent atrial fibrillation (PTT 2 x control).
- 6) Wires and CT should be removed prior to therapeutic INR.
- 7) Target INR:

Prosthetic aortic valve	2.0-3.0
Mechanical Prosthetic mitral valve	2.5-3.5
Atrial fibrillation	2.0- 2.5

- 8) IV heparin is administered at rate of 10-16 units/kg/hr (800-1200 units/hr) to achieve at PTT value of 1.5 to 2.5 times control (50-80). Boluses can be given in 1000, 2,500 and 5,000 units as need with increases in the rate of infusion by 200 units/hr. Early postoperative patients should not receive boluses; adjustments should be by incremental increases. PTT should be check q 4h to 6h after heparin adjustment.

SEE HEPARIN PROTOCOL ORDER SHEET

Transfer to floor when patient is ready, usually postop day #1-2.

- a) All central lines removed-peripheral IV in place (or TLC)
- b) All patients must have functioning IV access, peripheral or central
- c) Transfer orders written

Catheters and drains are removed when they no longer serve a useful purpose. Prior to removal of tubes or wires, make sure that you have been properly instructed in their removal as serious complications can occur if done incorrectly.

PA LINES AND LEFT ATRIAL LINES: Done in ICU only. Often taken out on postop day #1, if cardiac output is good, patient is stable and off inotropes. Don't remove before

checking with senior resident or attending. Check coags and platelet count prior to removal.

CHEST TUBES: Usually are out POD #2. Do not removed if LA line still in. These are for postoperative drainage and are usually removed on POD#2. If there is an air leak or significant drainage, the tubes may remain for a few more days. If an air leak was present previously, the chest tube should be placed to water seal and a CXR obtained when the air leak has resolved. If no PTX is seen then the tube may be removed.

PACER WIRES: Usually out on POD #3-4. These wires (atrial and/or ventricular) are for potential postoperative epicardial pacing; if no conduction abnormalities are present and coagulation studies are normal, these may be removed.

CHEST PAIN/ST SEGMENT ELEVATION: Chest pain is a common complaint after surgery, either due to incisional or chest tube discomfort which can be treated with pain medication. Patients can experience angina if a graft is threatened or if they are incompletely revascularized. In this case, obtain an EKG and compare it to previous ones. If changes are noted, obtain cardiac enzymes and notify fellow/senior. Global ST elevations postoperatively may be due to pericarditis, this may be treated with NSAIDS. Pericarditis can lead to chest discomfort, low grade temps and atrial fibrillation.

GENERAL GUIDELINES

PATIENT DIETS: Most Cardiothoracic patients are able to resume a regular diet unless the gastrointestinal tract has been entered (esophagectomy patients). Other dietary considerations may be necessary, ie: diabetes or fluid restrictions. The dieticians provide dietary instruction to the patient prior to discharge. The Nutrition Support Service can assist with the management of patients or parenteral and enteral nutrition.

RESPIRATORY THERAPY: All patients undergoing cardiac and thoracic surgery receive coughing and deep breathing exercises after surgery. If more aggressive pulmonary toilet is required, a therapy form must be filled out, reevaluated and reordered every three days.

PHYSICAL THERAPY is included as part of standing transfer orders.

PATIENT AND FAMILY SUPPORT SERVICES: Many patient and family support services are available to our patients and their families. The hospital has an open heart volunteer group that can provide valuable information to the CP patient. Support is also

available from our doctors, social workers, nurses, dieticians and physical therapists. These resources are available and essential for successful discharge planning.

PATIENT DISCHARGE PLANNING (CARDIAC PATIENTS) Cardiac patients are usually discharged on the 4-5th postop day providing there are no complications. All wounds should be clean with sutures, staples, and wires removed. The patient, nurses, case managers, social worker and ward secretary should be informed to the discharge date. At discharge, all unnecessary medications should be eliminated.

Most patients who were on diuretics or antihypertensives preoperatively will need them on discharge. Many patients will and should resume their preoperative medication unless their condition requires adjustment.

Arrhythmia prophylaxis: All patients undergoing cardiac surgery receive prophylaxis against SVT. Lopressor, or Tenormin are usual unless the patient has contraindications to beta blockers (asthma, wheezing, COPD, decreased LVF, history of intolerance).

Anticoagulation: Most valve patients who have their valve replaced will require long-term anticoagulation after discharge. Coumadin should be adjusted to an INR of 2.5 for aortic valves and 3.0 for mitral valves. (see anticoagulation section). Coumadin is started after chest tubes are out and if ordered daily on an individual basis. We begin with 5 mg daily. Remember, you don't see the effect of Coumadin for 2 days.

Antiplatelets: Baby aspirin is given to the coronary bypass patients to prevent platelet aggregation and improve the graft patency.

Diuretics: Most CABG patients do not need diuretics at discharge unless they have poor left ventricular function. Valve patients frequently will require a diuretic upon discharge. Patients requiring diuretics need K⁺ supplements.

DISCHARGES: Discharges must be announced to the ward clerk that day or as soon as determined. All prescriptions and discharge papers may be filled out before discharge. Notify jail 24 hours in advance of a prisoner discharge. The nurse practitioner is responsible for coordinating discharge with the patient, physicians, nurses, social worker, physical therapist, case manager, and all others involved with patient care. The discharge panel (PA and lateral chest x-ray, BMP, MG, CBC&diff) must be checked prior to discharge. The nurse practitioner is responsible for providing follow-up with the attending surgeon and arranging any follow-up x-rays, labs, or tests required. Contact is made with the referring physician and follow-up is arranged. This ensures communication between our service and the referring services. Initial follow-up appointments are usually within the first four weeks of discharge.

If the nurse practitioner is not available, it is the resident's responsibility to instruct the patient to call the attending's office for follow-up appointment. They should be instructed to contact their cardiologist, internist and set up an appointment one week after discharge. If the patient is on Coumadin they should be given a script for prothrombin time to be drawn 3-4 days after discharge and the results called or faxed to the cardiologist or internist.

Discharge must meet certain criteria, IE: medical stability should be met. If any criterion is not met, plan for out patient treatment, patient instructions and follow-up should be arranged and documented in the chart. The same applies to small residual postoperative chest x-ray changes such as pleural effusions, etc. Check nurses notes for abnormal findings and patient complaints. Document resolution on chart. Discharge to rehab floor (2 North) or other rehab facility require STAT dictation and all discharge paper work filled out. Prescriptions not necessary for rehab discharges.

Discharge Screens

Findings within 24 hours prior to discharge of:

1. BP systolic <85 or >180 or diastolic <50 or >110
2. Temperature >101 F (38.3 C) oral or 102 F (38.9C) rectal
3. Pulse <50 (or <45) if the patient is on a beta blocker
4. Purulent or bloody drainage or wound or open area
5. Abnormal diagnostic findings which are not addressed and resolved or where the record does not explain why they are not resolved

6. IV fluids or drugs after 12:00 midnight on day of discharge.
7. Medication or treatment changes, including discontinuation within 24 hrs prior to without adequate observation.
8. Discharge planning: lack of documentation regarding appropriate or adequate post discharge referrals.

If patients expire, it is the responsibility of the senior resident to contact the attending or the covering attending. Make every attempt to get consent for an autopsy. This may help determine what problems existed. If you experience problems, contact the fellow or the attending.

THORACIC SURGERY GUIDELINES:

CHEST TUBE GUIDELINES

Spontaneous pneumothorax, Blebs and Bullae: If evaluated in the ER and asymptomatic, (no shortness of breath), consider small tube (arrow pneumothorax kit, #8 Fr) and Heimlich valve for home management.

If the patient is symptomatic, lives a long distance from the hospital and is uneasy about being discharge, or lung drops without suction; you may admit to 23 hour stay. Obtain CXR in early a.m. off suction to determine if admission to the hospital is necessary.

If chest tube has no air leak after tube is inserted, leave it on wall suction for 24 hours. Order should state: chest tube to pleurevac with 20 cm water and wall suction. After 24 hours, placed on waterseal x 4 hours and they get CXR. Should be PA and lateral unless there is a good reason for a portable. If x-ray on waterseal is without PTX, remove the chest tube and repeat the x-ray.

If there is a small or intermittent air leak, continue suction and check with attending regarding allowing the patient to be off suction for short intervals to ambulate in the hallway.

If there is a moderate leak, place on high wall suction. There are various types of pleurovacs so you have to order the high suction as indicated for the one your patient has. If leak persists > 2 days, you may have to take to the OR for surgical repair.

If there is questionable intermittent air leak that is small, you may need to clamp chest tube and send for an x-ray. **CLAMPING CHEST TUBE CAN BE POTENTIALLY DANGEROUS. MAKE SURE SOMEONE IS WITH THE PATIENT WHO CAN REMOVE THE CLAMP IF HE OR SHE BECOMES SHORT OF BREATH.**

Iatrogenic Pneumothorax: If immediately after FNA, may be observed or treated with small tube (pigtail placed by Interventional Radiology or #8 FR. Arrow pneumothorax kit) and placed on Heimlich valve for home management if re-expanded.

If lung does not expand on Heimlich, patient is short of breath, lives a long distance from hospital, admit to 23 hour stay and get early CXR off suction to determine if hospital admission is necessary.

Use oxygen while in hospital for all size leaks.

Small and intermittent air leaks should be on 29 cm water and wall suction. Can be off suction to ambulate

Moderate and large air leaks should be on high wall suction. Continue to observe.

Patients on mechanical ventilation should have chest tube in for several days after air leak stops.

AIR LEAKS AFTER LOBECTOMY:

RR Check connections. Make sure that they are tight and secured with tape.

- POD#1 Leave chest tube on suction. Write an order to be off suction to ambulate unless there is a large air leak. If large air leak, write an order to add extra suction tubing so patient may ambulate in room
- POD#2 If minimal output and no air leak, consider tube removal. If air leak persists leave on suction. If no air leak but output is high, leave on suction and ambulate off suction
- POD#3 If no PTX or one is present but unchanged, place on waterseal. Check chest x-ray on waterseal. If lung is expanded on waterseal, remove when air leak stops. If PTX gets larger, return to suction and consider talc.
- POD#4 If air leak persists, proceed with talc or place on Heimlich valve and get chest x-ray. If lung expanded on Heimlich valve then discharge home and follow-up in clinic 4-7 days with CXR.

HEIMLICH VALVE

Instruct patient how to see positive air leak through valve.
Discharge appointment should be in 4-7 days.

If no air through valve and fluid in tube remove and check with CXR.

If there is a leak, clamp the tube for 1 hour and get CXR. If lung remains expanded, pull the tube and repeat CXR.

PNEUMOTHORAX AFTER TUBE REMOVAL (FNA OR SPONTANEOUS)

Small apical-observe. Check with attending and possibly send home. Instruct patient on Returning to local ER if they become symptomatic to get a CXR.

If large, may need to put in new tube or pigtail.

PNEUMOTHORAX AFTER TUBE REMOVAL AFTER LOBECTOMY

If small apical, observe. Check with attending prior to discharge.

If large or enlarging and the patient is symptomatic may need a chest tube that is proper Size and placed in the appropriate position. Check with attending.

CHEST TUBE DRAINAGE- PLEURAL

First time unknown etiology or benign. Send fluid for chemistry (glucose, LDH, protein, PH and amylase), cultures, AFB, fungus and cytology. Send as much drainage as Possible for cytology. If benign, when output slows down to 150 cc/24 hours or less, remove tube and get CXR.

Recurrent effusions – sclerose. Use the protocol for talc pleurodesis.

Malignant effusions – If chest tube is placed and there is > 10000 cc –1500 cc of fluid DO NOT DRAIN ALL AT ONCE. Stop drainage intermittently by clamping tube. If patient becomes symptomatic while fluid is draining (Cough, pain in chest or shoulder), STOP IMMEDIATELY and clamp tube. Allow the fluid to drain again after the patient has recovered. This process may take several hours if the effusion is large enough. Once fluid is evacuated, check a CXR to see if the lung has re-expanded. If the lung is expanded, and there is not a large volume of residual fluid, sclerose per protocol. If the lung does not expand or there is residual fluid, consider alternative management such as pleurX cath. If chest tube drainage slows to > 150cc/day, remove the tube and get a CXR.

PERICARDIAL EFFUSION

If large enough or patient is symptomatic they may need to go to the OR for pericardial window. If cytology is positive for malignancy, sclerose with bleomycin per protocol. If cytology is negative and output slows to < 50cc/24 hours, remove tube and get CXR.

THORACIC SURGERY GUIDELINES

ESOPHAGECTOMY

- Day 0
- d5LR at 1.25 x maintenance
 - Fluid boluses of 5% albumin for urine output <30 cc/hr
 - Keep intubated/sedated with protocol if cervical anastomosis
 - Instill NGT and Jtube with 20 cc saline q shift
 - Sign over bed “DO NOT MANIPULATE TUBE”
 - NG tube is not sewn in so verify positive with postop CXR.
 - Verify tape is secure.
 - Postop labs should be Hct/k+/CXR
 - Write orders to keep HOB elevated 30 degrees at all times
 - Needs continuous cardiac monitoring and ICU bed, preferably CPICU for SUNY Patients
- Day 1
- Wean to extubate if stable. Discontinue protocol and obtain respiratory parameters when awake.
 - Decrease IV fluid to maintenance and start TPN with H2 blocker
 - Portable CXR CBC/lytes

If stable transfer to floor on telemetry. All SUNY patients should be transferred to the Cardiothoracic (CT) floor.
All tubes stay. Should be OOB to chair.

- Day 2-6
CXR every day for three days
Ht/K+QOD
TPN with H2 blocker
Start tube feeding very slowly when bowel function returns.
(Check with the attending first)
All tubes stay, keep epidural
Ambulate
- Day 7
Barium swallow
Once swallow is reviewed, remove NG. Needs to be done by team member.
Start sips of water.
- Day 7-10
Increase diet as tolerated.
Diet should be 6 small feedings, no carbonated beverages
Avoid foods like broccoli, breads, big chunks of meat, etc.
Have dietary begin teaching on 6 small feedings with supplements prn
Instruct patient on crushing pills
Discharge home on H2 blocker and pain pills or elixir
Have nurses begin teaching family care of Jtube
If tube feedings will be needed at home start arranging home care with social worker and case manager.
Discontinue epidural, change PO meds, including H2 blocker (possibly sooner if appropriate).

LOBECTOMY

- Day 0
Patient should be extubated in recovery room
All patients should go to the recovery room postop and remain there until postop CXR has been reviewed. This includes patients going to the ICU.
Review the CXR immediately. If major abnormality notify attending immediately to determine corrective measures.
Crouse patients will go to ICU postop and should have continuous cardiac monitoring.
SUNY patients will either go to CPICU or CT floor w/ telemetry
Chest tube should be on suction
If there is no air leak may be off suction to ambulate for short intervals.
IV should be D51/2Ns at maintenance rate or less
Sips of clears

Investigate low urine output, consider Lasix
No fluid boluses without clearing with CP fellow or attending
OOB to chair
Sequential Stockings while in bed

Start Sub Q heparin unless contraindicated
Resp treatments and physical therapy should be ordered.

Day 1-3
OOB ambulating
Follow chest tube guidelines for lobectomy
After chest tubes are removed, switch to PO pain pills
Increase diet when bowel function returns
Avoid constipation. Make sure patient is on Colace
Use MOM, ducolax as needed.
Continue to follow chest tube guidelines
Keep foley in male patients until epidural is discontinued
Heplock IV when taking PO

Day 4-5
Begin to plan for discharge
Address home care needs with social worker/case manager
Discharge when appropriate and make sure patient gets a copy of thoracic surgery discharge instructions.

PNEUMONECTOMY

Day 0
CXR in recovery room. Needs to be check immediately
If air in mediastinum shifted away from opposite side surgical resection, notify CP fellow or attending. May need to aspirate air.
Need to go to ICU postoperatively
IV fluid should be D 5 ½ NS at ½ to ¾ maintenance or less
Small fluid boluses only if urine output <20 cc hour for 2 consecutive hours and okayed by fellow or attending first
OOB to chair
Aggressive pulmonary toilet should start in recovery room
Treat atrial fib if it occurs (start with IV cardizem) may need to consult cardiology
Closely monitor fluid status, consider Lasix and avoid IV boluses unless absolutely necessary
If HCT is less than 30, use albumin or blood

Day 1
Portable CXR early a.m. so that it can be viewed at board rounds
Start diet and heplock IV as soon as possible.
Fluid restriction 1500-2000 cc/day
Transfer to floor if stable. SUNY patients need to go to CT floor with telemetry
Ambulate in hall

Physical therapy consult

Day 2-5

Daily CXR x 3.

If stable can have PA – lat starting on postop day #2

Follow guidelines for lobectomy

Discontinue fluid restriction after 4 days

Epidural out on postop day #4 if all is well start pain pills

Discharge when appropriate

ALL PULMONARY RESTRICTIONS

Antibiotics should continue for 2 doses postop. Usually Kefzol 1 gm IV Q 8 x 2 doses or Vancomycin 1 gm IV q 12 x 2 doses.

Should have order to wean oxygen to 2 liters NC to keep sat >92%

Do not wean off for at least 3 days even if sat is good

If sat is marginal, write an order for respiratory therapy to evaluate for home oxygen on postop day 4-5 or 1-2 days prior to discharge.

Physical therapy consults for all.

Respiratory treatment should include (minimally) chest PT/PD to remaining lobes BID and PRN.

Albuterol aerosols/or normal saline aerosols q 4h and q 2 prn.

Need to reorder other puffers patient was on prior to admission

May need to write an order to stimulate cough prn if secretions are a problem

If telecasts is a problem and patient is unable to clear secretions despite pulmonary toilet, may need to do a bronchoscopy at bedside.

If bronchial washings were sent for cultures during operative course, need to follow-up on report

If patient is coughing sputum that is discolored and/or is febrile, need to send a sputum for gram stain c&s.

Unless medically contradicted, all patients should be on Sub Q heparin until the day of discharge and should have sequential stockings until up ambulating

Pre-printed orders for thoracic patients postop and upon transfer from ICU are available at SUNY in the recovery room, CPICU and CT floor. Unless there is good reason, there is no excuse for not using them.

If patient has an intrapleural catheter, it needs to be injected every 8 hours with 30 cc of 0.25% bupivacaine. This is the responsibility of the thoracic team.

Discharge instructions should include a copy of thoracic surgery discharge instructions.

STANDARD PROTOCOL FOR PLEURAL SCLEROSIS

Purpose: To achieve pleurodesis. This procedure may be performed by an M.D. and/or NP.

PROCEDURE:

1. Premedicate patient with Morphine 2-5 mg IV, 8-10 mg IM.
2. Equipment needed:
 - a. Toomey syringe
 - b. Kelly clamp
 - c. Lidocaine 1% without Epinephrine 30 cc
 - d. Doxycycline 500 mg or sterile talc 4-5 gm or Bleomycin 60u
 - e. Normal saline
 - f. Blue bowl
3. Prepare sclerosing preparation per M.D. order
 - a. 30 cc Lidocaine 1% plain in Toomey syringe maintaining ASEPSIS.
 - b. Doxycycline 500 mg 30-50 cc NS
 - c. Sterile talc 4-5 gm in 100 cc NS
 - d. Bleomycin 60 units pleural sclerose in normal saline 60 cc mixed by pharmacy
 1. Bleomycin 30 units in 30 cc normal saline for pericardial sclerosis
 2. Premedicate with Tylenol and Benadryl; may repeat in 4hr x24 hour for low grade fevers
 3. If patient develop allergic reaction to Bleomycin usually within 2 hours give Hydrocortisone 100 mg IV x1 (usually resolves in 10-20 minutes).

Injection of sclerosing preparation

- a. Clamp tube proximal to connection; disconnect from pleurevac tubing
- b. Inject sclerosing agent through the chest tube using Toomey syringe for chest tubes or leur lock for pig tail catheters.
- c. Clamp chest tube using Kelly clamp(s) proximal to connection, reconnect tubing
- d. Leave chest tube clamped for four hours

In patients with active air leaks; do not clamp tube or turn stop cock to off but raise tubing above the level of patient, leave on waterseal.

The patient is repositioned every hour as tolerated, side supine to other side sitting up and flat. (Do not persist if patient is uncomfortable). Prone if possible

After four hours, unclamp the chest tube and reconnect pleurevac to suction.

This procedure may be painful. The patient may become tachypnic and/or diaphoretic. This should resolve in a few minutes.

Talc may cause a fever up to 39 degrees in 24-48 hours. No need to culture.

Physician must write in physician orders:

- a. If patient is unable to tolerate completion of one or more positions, move patient to the next position.
- b. Change chest tube dressing, prn
- c. Give a specific time for the nursing staff to unclamp the chest tube and reconnect pleurevac to suction
- d. Patient can sit up, eat or go to the bathroom
- e. Oximetry may be ordered PRN.

After tube removal, patient may “gush” large quantity of fluid out of chest tube site once or more over the next few days. Just change dressing. Do not worry.