Purple Team Logistics & Guidelines Handbook
Edition 7 (2019-2020)

Compiled by:
Alaina K. Kipps, MD, MS
Sara Heller, RN, MSN, CPNP-AC

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Important Phone Numbers and Pagers for PCU 200/Purple Team

PCU 200 Front Desk: 497-8890
PCU 200 Charge RN: 721-9625
PCU 200 Fax: 497-8037
Purple Team Case Manager: 721-0821
Purple Team Pharmacist: 721-0165

CVICU Front desk: 724-2926
CVICU Red team MD/NP: 721-9846
CVICU Blue team MD/NP: 721-9847
CVICU Charge RN: 721-9757
CVICU NP/PA: 721-9861

CV Surgery Main Office: 724-2925
CV Surgery PA Office: 736-7664
CV Anesthesia NP: 724-5260

Heart Center Main Line: 721-2121
Heart Center Fax: 497-8422

Cath Scheduling: 725-6537
Cath Lab Room 15: 19715
Cath Lab Room 16: 19744
EP Lab Room 17: 19751

Short Stay Unit: 721-1880

NICU Front Desk: 497-8800
NICU Fellow: 721-9686 and 721-9689
NICU NP: 721-9693 and 721-9692

PICU Front Desk: 497-8850
PICU Fellow: 721-9748

Vascular access: 19650
Child Life: 19832

PACU: 4-3452
PACU RSN: 19528

Echo Lab, Tech: 497-8683 or 7-8678
Echo Lab, MD Reader: 723-2492

Radiology Dept.: 497-8376
X-ray Reading: 497-8758
CT Reading: 724-2706
CT Schedule: 721-6143
US Reading: 497-8757
MRI: 724-2676
Portable X-ray Tech PGR: 18604
IR Schedule PGR: 2RADS

Inpatient Lab Results: 724-4750
Blood Bank: 723-6445
TPN: 497-8779
Newborn Screen: 724-0387

Transfer Center: 723-7342
Bed Control: 725-8877
Emergency Dept.: 723-7337

Inpatient Pharmacy: 497-8287
Outpatient Pharmacy: 497-8289 (opt 2)
Children’s Home Pharmacy: 497-8316

Transcription Services: 497-8611
IT HelpDesk: 498-7500

Pagers for Services
Vascular Access: 4PICC
Wound Care/Ostomy: 18611
Resp. Therapy: 18581
Lactation Support: 16585
ALGO Testing: 18602
Purple Team Resident and Nurse Practitioner Work Hours and Sign-out Times:

Work hours: 
6:30 a.m. - 4:30 p.m. NP/PAs
7:00 a.m. - 6:00 p.m. Resident

6:30 a.m. Night float supervisor calls to give night fellow update for new patients
6:30 a.m. NP/PAs arrive, night fellow signs out NP/PA patients
7:00 a.m. Resident arrives, night fellow signs out resident patients
*During the 6:30 - 7:30 time period the day fellow is present and listening to sign-out.
3:00 p.m. Afternoon rounds and sign-out to the day fellow
~4:30 p.m. NP/PAs leave after updating day fellow and signing out expected admissions to the night float
6:00 p.m. Resident leaves after updating the day fellow and signing out expected admissions to the night float (Note: Afternoon when resident in clinic, the day fellow will need to update the night float resident regarding these expected admissions)
6:30 p.m. Night fellow arrives, day fellow signs out to night fellow

Resident Guidelines and Tips for PURPLE TEAM:

1. There will be two attendings on the floor each week – a PACT attending and a general cardiology attending.
2. Read about your patient’s diagnosis, then ask questions for clarification. You will get more out of the rotation this way.
3. The NPs will provide coverage for you during the times listed below:
   a. Morning report and noon conference (for urgent questions)
   b. You are expected to help cover the NP patients after the NPs leave at 4:30, until 6 p.m. when the fellow takes over.
   ** The fellow will cover your patients when you are at continuity clinic.
4. Morning sign-out:
   a. You will receive sign-out from the team at 7:00 in the PCU 200 workroom.
5. CVICU transfers to Purple Team occur in the CVICU. If you will be receiving new admissions, you should go to the CVICU with the team to directly receive the sign-out. In the morning the anticipated transfers from the CVICU to Purple team should be discussed briefly to identify which NP/R2 will take each. Later afternoon transfers should go to the R2 since the NPs leave at ~4:30 p.m.
6. Afternoon/Evening sign-out:
   a. Prior to signout you should meet with the fellows and NPs to determine who is due for admissions, if any come in after hours.
7. You will update the day fellow and attending about your patients during afternoon rounds at 3:00. You are expected to remain until 6:00 when you sign-out to the fellow.
8. Patient management:
   a. Progress notes should include the name of the referring cardiologist, as well as the surgeon, the date, and the type of surgery performed if applicable.
   b. Regarding chest tube output, see the chest tube protocol. When tubes or pacing wires need to be coordinated, speak with Purple team NPs as they can pull chest tubes. Temporary pacer wires should be removed; patient needs
postoperative EKG beforehand. Helpful EPIC dotphrases:

| .REMOVECTPW | Universal protocol was followed. ***chest tube(s) and A/V pacing wires were removed without incident. |
| .REMOVECT | Universal protocol was followed. ***chest tube(s) were removed without incident. |
| .REMOVEPW | Universal protocol was followed. A/V wires were removed without incident. |

c. All postoperative patients should have a complete echocardiogram before discharge. If an echo was already done before you picked up the patient, make sure it was not a limited study (i.e. for effusion or function).

d. Part of 3pm afternoon rounds is to help in discharge planning. Use this time to make sure there are no last-minute surprises, such as ordering equipment or prescriptions from another source (e.g. Kaiser patients). We will highlight patients going home the next day, including ones who can be “early” discharges.

9. **Discharges:**
a. Please call and sign out/update the patients’ pediatrician near time of dc. (Note: The fellow or attending will update the referring cardiologist).
b. All patients should have a follow-up appointment scheduled with their cardiologist before discharge. ** Ask the CCL to help with these appointments – give desired date range and reason **
c. Patients who are being discharged and are followed by outside cardiologists need to have packets made before they leave (one for the cardiologist with an echo CD and one for the PCP). The USA makes the packets, but make sure to let them know ahead of time that you need them.
d. Sternal precautions are required for anyone who had a sternotomy, for 6 weeks from surgery date.
e. If there are no tests pending on the day of discharge, your patient may be eligible for early discharge. Check with the attending or fellow the day before to see if you should plan for this.
f. Our discharge goal is to have family and patient out of room by 11 a.m.

**HELPFUL DOT PHRASES FOR D/C SUMMARIES:**

<p>| .DCRN | Please follow discharge instructions provided by your nurse for diet, activity, pain control, care of surgical incision, expectations following surgery/hospitalization and follow up care. |
| .DCHMP | D/C instructions for HMP (single ventricle patients) |
| .DCCVS | D/C instructions for CV surgery patient |
| .DCHF | D/C instructions for Heart failure patient |
| .DCMAPCA | D/C instructions for MAPCAs patient |
| .DCOHT | D/C instructions for heart transplant patient |</p>
<table>
<thead>
<tr>
<th>Time</th>
<th>Purple Team NP and Resident Standard Work</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0630</strong></td>
<td>NPs arrive &amp; receive signout from overnight cardiology fellow; point person identified to work with RSN on flow.</td>
</tr>
<tr>
<td><strong>0700</strong></td>
<td>R2 arrives &amp; receive sign-out from overnight fellow.</td>
</tr>
<tr>
<td><strong>0700-0830</strong></td>
<td>Pre-rounds</td>
</tr>
<tr>
<td></td>
<td>For each patient, review Epic data: clipboard, RN documented vital signs, intake/output &amp; lab results; replete electrolytes as needed.</td>
</tr>
<tr>
<td></td>
<td>Review MAR summary.</td>
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<tr>
<td></td>
<td>Review weight trend &amp; current ml/kg/day and kcal/kg/day.</td>
</tr>
<tr>
<td></td>
<td>Review chest tube output; if meets criteria for removal (guideline in Purple Team book), order single dose narcotic or Ativan for procedure &amp; define which NP will do procedure.</td>
</tr>
<tr>
<td></td>
<td>For each patient, view CXR. If not available and pt is d/c that day, ask RN to call X-ray tech.</td>
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<tr>
<td></td>
<td>Review any consult notes and recommendations.</td>
</tr>
<tr>
<td></td>
<td>Know last echocardiogram date and summary of findings; was it a full discharge study?</td>
</tr>
<tr>
<td></td>
<td>Know last EKG date and summary of findings. If post-op and temporary wires still in, did it document sinus rhythm?</td>
</tr>
<tr>
<td></td>
<td>For VAD patients: review VAD settings and VAD check charting by RN; check for deposits if patient has a Berlin Heart.</td>
</tr>
<tr>
<td></td>
<td>For pre- or post-cardiac transplant patients: review last HLA results. When is next PRA (if pre-OHT) or DSA (if post-OHT) due?</td>
</tr>
<tr>
<td><strong>0730-0830</strong></td>
<td>Attend a.m. cardiology lecture or resident morning report.</td>
</tr>
<tr>
<td><strong>0830-1030</strong></td>
<td>FCR purple team rounds.</td>
</tr>
<tr>
<td>~<strong>1030</strong></td>
<td>When not presenting, input orders and “read back” from COW.</td>
</tr>
<tr>
<td><strong>1200-1300</strong></td>
<td>1st CVICU transfer, in person team signout. (R2 should not take a CV transfer or admit on day of clinic).</td>
</tr>
<tr>
<td><strong>1300-1500</strong></td>
<td>Prep for next CVICU transfer. Document accept note once patient on the floor.</td>
</tr>
<tr>
<td><strong>1100-1500</strong></td>
<td>Prep discharges anticipated in next 1-2 days. Keep ad hoc DC summary page updated.</td>
</tr>
<tr>
<td></td>
<td>- Review home medications to potentially restart those held during stay.</td>
</tr>
<tr>
<td></td>
<td>- Complete Nasogastric tube or DME supplies ordering/delivery/teaching.</td>
</tr>
<tr>
<td></td>
<td>- Address special medication circumstances (e.g. compound medications / insurance pre-authorization).</td>
</tr>
<tr>
<td></td>
<td>- Schedule clinic appointment with outpatient cardiologist &amp; include date range for removal of sternal incision sutures and chest tube sutures in discharge paperwork</td>
</tr>
<tr>
<td></td>
<td>- Schedule any other specialty clinic appointments, if applicable (Ask CCL for help).</td>
</tr>
<tr>
<td></td>
<td>- Please call and sign out/update the patients’ pediatrician near time of dc.</td>
</tr>
<tr>
<td><strong>1100-1500</strong></td>
<td>New admits:</td>
</tr>
<tr>
<td></td>
<td>- If from clinic, go to the clinic for signout. Write Cardiology Admission Note.</td>
</tr>
<tr>
<td></td>
<td>Complete medication reconciliation.</td>
</tr>
<tr>
<td><strong>1500-1530</strong></td>
<td>Afternoon rounds with attending, fellow, and case manager. Highlight probable discharges, discuss needs and discharge checklist. Confirm patient distribution for next morning. NPs depart at ~4:30 p.m.</td>
</tr>
<tr>
<td><strong>1600-1800</strong></td>
<td>R2 admissions and CVICU transfers.</td>
</tr>
<tr>
<td><strong>1800</strong></td>
<td>R2 Signout to overnight cardiology fellow.</td>
</tr>
</tbody>
</table>
**Purple Team Standard Work – “Swing Shift” M-F 3-11pm**

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<thead>
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<th>Time</th>
<th>Swing Shift Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>~12:30pm</td>
<td>Call PCU 200 and connect with fellow or NP “point person” to determine if projected census at or above 17. If so, plan to work full shift. Text or email Alaina Kipps with the census prediction and to confirm you are working (for bookkeeping).</td>
</tr>
<tr>
<td>1500-1600</td>
<td>Receive sign out during afternoon rounds with attendings, fellow, day NPs, Resident. Highlighting probable discharges. Daytime NPs depart ~4pm. Resident(s) ~6pm.</td>
</tr>
<tr>
<td>16:00 AND 19:00</td>
<td><strong>Notify charge RN (day and then night) that you are here and happy to take calls from RNs (RSN can send blast Voalte message to all PCU 200 RNs).</strong></td>
</tr>
<tr>
<td>1500-23:00</td>
<td>Help with afternoon/evening CVICU transfers &amp; admits. Document accept note/admission H&amp;P once patient on the floor/Add information to HANDOFF and to the shared discharge summary (see below) – this is different than “hospital course.”</td>
</tr>
<tr>
<td>15:00-23:00</td>
<td>For early discharges predicted for tomorrow, go to family to address any questions, reinforce that we plan to dc before 10:30am, ask re: transportation, etc. Address other family/RN concerns as they come up.</td>
</tr>
<tr>
<td>~21:30-22:15</td>
<td>Evening rounds with charge RN +/- fellow in the team room. Each night shift RN comes in to review patients etc.</td>
</tr>
<tr>
<td>22:30</td>
<td>Swing shift NP or MD Sign-out to overnight cardiology fellow.</td>
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**Specific Tasks by Activity:**

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<th><strong>Transfers</strong></th>
<th><strong>Discharges</strong> ****</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. H&amp;P</td>
<td>2. Transfer/accept note</td>
<td>2. Cardiology follow up appt scheduled</td>
</tr>
<tr>
<td>4. EPIC Handoff</td>
<td></td>
<td>4. Complete AVS</td>
</tr>
<tr>
<td>5. Start DC summary</td>
<td>4. Start DC Summary</td>
<td>5. DC home order</td>
</tr>
<tr>
<td>6. Problem list, Pt care coordination note</td>
<td>5. Brief Hosp Stay</td>
<td>6. Discharge – Navigator and Inpt AVS*</td>
</tr>
</tbody>
</table>

* Inpatient Provider Tip sheet website:  

** See Comprehensive discharge checklist in the PCU 200 Logistics Guide
CHECKLIST for Purple Team:

Scheduled Rounds:
Monday-Thursday: PACT starts 8:35 am (10 min ea), General Cardiology after (8 min ea)
Friday: PACT starts 9:05 am after Grand Rounds, General Cardiology patients after
Saturday and Sunday (and holidays): General Cardiology starts 9:05 am, PACT starts

10:30am Sign-outs:

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<th>06:30: Overnight fellow → NP's</th>
<th>15:00: NP/Resident → Fellow/Attending</th>
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<td>07:00: Overnight fellow → Resident</td>
<td>18:30: Day fellow → Overnight fellow</td>
</tr>
</tbody>
</table>

Pre-rounding:

- [ ] Telemetry check
- [ ] Vital signs
- [ ] I’s & O’s: net balance
- [ ] Weight and change from dry weight or growth trend.
- [ ] Assess patient
- [ ] Plan for day (by problem)
- [ ] Notify NP team of any CT/wires/sutures that need to be removed

Rounds: (See SBFCR in PCU 200 Logistics Guide for details)

Nurse presents identification statement (from EPIC handoff), I’s/O’s, weight & any concerns or events overnight
MD/NP presents interval history (any changes made in past 24 hrs), assessment, plan by problem

AFTER Rounds:

- Update/Add orders
- Progress Note (if not discharging)
- Update DC Summary & Handoff, Problem List, Patient Care Coordination note

Specific Tasks by Activity:

**Admits**
8. Med rec
9. H&P
10. Orders: See General Cardiology orderset
11. EPIC Handoff
   a. Handoff- Document & Print Report*
12. Start DC summary
13. Problem list, Pt care coordination note

**Transfers**
7. Transfer orders
8. Transfer/accept note
9. Update Handoff
   a. Handoff- Document & Print Report*
10. Start DC Summary
11. Brief Hosp. Stay
12. Update Problem List, patient care coordination note

**Discharges**
8. Sign DC summary
9. Cardiology follow up appt. scheduled
10. Complete AVS
   a. Discharge – Provider Workflow*
11. Complete Med Rec
   a. Discharge – Med Reconciliation*
12. DC home order
   a. Discharge – Navigator and Inpt. AVS*
13. Update PCARD/PMD
14. Request DC packets from unit clerk

* Inpatient Provider Tip sheet website:

** See Comprehensive discharge checklist in the PCU 200 Logistics Guide
<table>
<thead>
<tr>
<th>Time</th>
<th>Purple Team Fellow Standard Work</th>
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</thead>
<tbody>
<tr>
<td>0630 - 0700</td>
<td>Fellow arrives for sign-out from overnight fellow and identify the sickest patients together; finalize patient assignments to NP/R2</td>
</tr>
<tr>
<td>0630 - 0720</td>
<td>Fellow reviews data on ENTIRE patient list: clipboard, vital signs, intake/output (CT output), lab results, radiographic studies, echo, telemetry. If there are any adult patients over the age of 25, you are the primary for those patients. Pre-round as usual. You will round with ACHD attending and team without the PCU 200 APP or attendings. Please send your daily progress notes and the discharge summary to the SURGEON of record (he will be listed as the attending in EPIC; however all questions and concerns will be fielded by the ACHD team).</td>
</tr>
<tr>
<td>0720 - 0730</td>
<td>Fellow to examine sickest patients, determine continued suitability for the floor.</td>
</tr>
<tr>
<td>0730-0830</td>
<td>AM cardiology lecture</td>
</tr>
<tr>
<td>0830-1030</td>
<td>FCR purple team rounds. For each patient: Introduce team and FCR process to new Patients and summarize plan of care after NP/R2 complete presentation.</td>
</tr>
<tr>
<td>~1030</td>
<td>1st CVICU transfer, in person team sign-out.</td>
</tr>
</tbody>
</table>
| 1030-1500  | Fellow duties: 1. **CVICU transfers**  
- Tuck in CVICU transfer, double check orders, "to-do" list prior to discharge (echo, LPS, d/c CT and PW) and facilitate studies as needed.  
2. **PCU 200 patients**  
- Examine patients not examined before/during rounds.  
- Help with obtaining studies as needed (echoes etc.).  
3. **New admits**  
- Review orders, ensure that “to-do” list for new patient is complete, patient is suitable for floor status.                                                        |
| 1200-1800  | - When resident in clinic, be primary for his/her patients.  
- Help resident/APPs with updates to PMD; determine with attending who will call referring cardiologist prior to discharge.                                                                                       |
| 1300-1500  | Prep for next CVICU transfer, in person team sign-out                                                                                                                                                                               |
| 1500-1530  | Afternoon rounds with attending. Highlight probable discharges and **barriers** to discharge. Draft next day patient assignments among NP/R2.                                                                                       |
| 1530-1830  | Continued CVICU transfers, new admissions, new consults.  
- Receive sign-out from EP team and Cath team on patients in SSU or PCU 200 overnight. These are primary cardiology fellow patients overnight (NOT resident or NP patients).  
- Receive sign-out from consult fellow.                                                                                                                                 |
<p>| 1830       | Fellow sign-out to overnight fellow.                                                                                                                                                                                              |
| 1830-0630  | Night fellow duties: Consults and Purple Team admissions, ongoing care. Perform all urgent echocardiograms.                                                                                                                     |
| ~2100      | Night fellow rounds on all Purple team patients with night Charge RN.                                                                                                                                                             |
| ~6am       | Night fellow checks that any new transfer or admit has concise MD handoff ID statement. This is the statement used by the RNs during rounds, so keep it accurate!                                                                 |</p>
<table>
<thead>
<tr>
<th>Time</th>
<th>Purple Team Attending Standard Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>0815</td>
<td>Get sign-out from overnight sub-specialty attending if new admits. Check rounds schedule. See early discharge patients before rounds start. Call CV anesthesiologist for any patients going for procedures that day.</td>
</tr>
<tr>
<td>0830-1030</td>
<td>FCR purple team rounds (start with heart failure patients &amp; discharges).</td>
</tr>
<tr>
<td></td>
<td>Attending role on rounds includes teaching, making sure fellow summarizes plan of care and that family understands. Encourages the RN to “speak first” and voice concerns. Examine patient and discuss any differences in physical exam findings (e.g. murmur description) with team.</td>
</tr>
<tr>
<td></td>
<td><strong>Rounds Checklist for Purple Team</strong></td>
</tr>
<tr>
<td></td>
<td>✓ Pain plan</td>
</tr>
<tr>
<td></td>
<td>✓ IV access/Central line need?</td>
</tr>
<tr>
<td></td>
<td>✓ Telemetry need? Do VS parameter orders match monitor?</td>
</tr>
<tr>
<td></td>
<td>✓ Summary plan of care</td>
</tr>
<tr>
<td></td>
<td>✓ Read Back Orders</td>
</tr>
<tr>
<td></td>
<td>✓ TDD/DC needs</td>
</tr>
<tr>
<td></td>
<td>✓ Family/RN participation</td>
</tr>
<tr>
<td></td>
<td>✓ PCP Assignment/Call</td>
</tr>
<tr>
<td>~1030</td>
<td>1st CVICU transfer, in person team sign-out.</td>
</tr>
<tr>
<td>1200-1400</td>
<td>Round with <strong>CONSULT fellow</strong> – new one-time consults, once-a-week check in patients (for non-NICU or PICU consults).</td>
</tr>
<tr>
<td>1100-1500</td>
<td>New consults/admits/transfers</td>
</tr>
<tr>
<td></td>
<td>• <strong>CV anesthesiologist should call with sign-out!</strong></td>
</tr>
<tr>
<td></td>
<td>• If from cardiology clinic, go to the clinic for sign-out with fellow and NP or RN.</td>
</tr>
<tr>
<td></td>
<td>Sign notes and do billing.</td>
</tr>
<tr>
<td></td>
<td>Teaching.</td>
</tr>
<tr>
<td></td>
<td>Facilitate team preparing for discharges in next 1-2 days.</td>
</tr>
<tr>
<td></td>
<td>• Confirm NP, resident has called the pediatrician</td>
</tr>
<tr>
<td></td>
<td>Call primary cardiologists to update/document communication in Epic.</td>
</tr>
<tr>
<td></td>
<td>For CPMC patients discharged over the weekend, please page CPMC cardiologist on call at 415-600-0770.</td>
</tr>
<tr>
<td>1500-1530</td>
<td>Afternoon rounds with NPs, R2, and fellow with case manager and charge RN. Highlight probable discharges (especially early am discharges) and <em>barriers</em> to discharge. Name patients who could move off PCU 200 as needed (CM will bring this info to 4PM Flow Huddle). Identify “watchers”.</td>
</tr>
<tr>
<td>1630</td>
<td>Inform CVICU physicians of watchers; get info on &quot;movers&quot; &amp; do brief exam in case late transfers are needed.</td>
</tr>
<tr>
<td>1700-0800</td>
<td>New consults/admissions of established PACT, EP, or PH patients go to proper subspecialists on call. M-F <em>general cardiology</em> patients in ER/new consults/admissions will be staffed by day attending. Sat/Sun these will be staffed by echocardiography attending.</td>
</tr>
</tbody>
</table>
Schedule-Based Family Centered Rounds

- The PACT attending will round on all PACT patients; the general cardiology attending will round on all other patients.
- M-F we have pharmacist (Kwai Mak, Pharm.D), dietician (Cindy Loaiza), and case manager (Mary Farfaglia) on rounds. As needed, SW and interpreter will attend.
- Our nurses start rounds and “speak first” by giving the patient’s ID statement + data + their concerns.
  - **KEY: Equip them with the correct, concise ID statement in MD handoff!**
- Rounds are scheduled so RNs and parents know when patient’s “appointment” is.
- Case management will make final adjustments and distribute – the Team leader RN posts to the white board so that bedside RNs sign up for breaks so they can attend rounds on their patients.
- We do SBFCR every day.
  - M-Thurs – start at 8:35am; Friday-Sunday – start at 9:05am.
- Schedule in EPIC: Click on “Web-links”, then “SBFCR” (near bottom) and select Cardio Service Team.
- The ACHD attending and team will round with the cardiology fellow on all patients >25 years old. Typically they will be assigned the first spot on the schedule (e.g. at 8:35 M-Th, 9am F-Sun).
## Family-Centered Rounds for Each Patient

*Team gathers outside patient room • Begin when medical team/RN/interpreter are present*

<table>
<thead>
<tr>
<th>Role</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident/NP</td>
<td>Invite family to participate.</td>
</tr>
<tr>
<td>Fellow</td>
<td>(First day rounding on patient on PCU 200) Intro team.</td>
</tr>
<tr>
<td>Bedside RN</td>
<td>Present introductory line [from MD handoff] ; note “post op day #” if applicable. Overnights / issues in the last few hours. Confirm with family.</td>
</tr>
<tr>
<td></td>
<td>Any specific concerns for their shift.</td>
</tr>
<tr>
<td></td>
<td>Report pain management and WAT scores.</td>
</tr>
<tr>
<td></td>
<td>Current VS + Trends.</td>
</tr>
<tr>
<td></td>
<td>Today’s weight &amp; weight trend.</td>
</tr>
<tr>
<td></td>
<td>Total ins + outs and balance and (if applicable) last 24hrs CT output. Use d/c teaching poster and update team of d/c teaching status.</td>
</tr>
<tr>
<td>Resident/NP</td>
<td>Telemetry review. If no alarms, state: “No concerns on telemetry”. Cardiac Exam/Other <strong>key</strong> exam findings (do not need ALL systems). Labs: BUN/creatinine;</td>
</tr>
<tr>
<td>Attending &amp; Fellow</td>
<td>Examine patient; exam teaching opportunity.</td>
</tr>
<tr>
<td>Attending</td>
<td>What are most important issues/data to review for this patient today? (briefly) = Teaching and focuses team on key aspects of assessment and plan.</td>
</tr>
<tr>
<td>Other R2/NP</td>
<td>Show CXR on the computer in the room.</td>
</tr>
<tr>
<td>Resident/NP</td>
<td><strong>Assessment</strong> and Plan of Care – by problem. Name meds in active problem. Any consult information or recommendations. (As needed) Central line – why</td>
</tr>
<tr>
<td></td>
<td>needed, and target d/c date. Pain issues: Report back on family perception on pain control, and any changes to pain meds. <strong>Or “no pain issues.”</strong></td>
</tr>
<tr>
<td></td>
<td>Target d/c date and time (a.m., p.m.) + review discharge criteria/needs + outpatient appointments.</td>
</tr>
<tr>
<td>Other R2/NP</td>
<td>Enter orders in Epic, then read back to confirm. Attending may ask to review full med list.</td>
</tr>
<tr>
<td>Fellow</td>
<td>Summarize plan of care for the day—directed to patient’s family.</td>
</tr>
<tr>
<td>Resident/NP</td>
<td>Ask if family understands and agrees with plan &amp; DC goals. Any questions? Offer to return if discussion &gt; 2 min required. Thank family for participating.</td>
</tr>
<tr>
<td>Case Manager/</td>
<td>Once team moving away from bedside, as mini-feedback on rounds for that pt: Go through Epic Rounds Checklist: <strong>PAIN, CENTRAL LINE, MONITORS, TDD.</strong></td>
</tr>
<tr>
<td>Rounds Coordinator</td>
<td>Did we follow the kata?</td>
</tr>
</tbody>
</table>
GOAL: Maintain the flow of Rounds and Sustain the Parent Partnership

Opening Communication
(Teaches FCR process, encourages family input, sets appropriate expectations)

- Welcome: “Glad you are here.” “We value your input.” “It’s important to us to have your input into the plan.”
- Describe parent role: “We will look to you for information as well.” “Let us know if we mis-state something.” “We will turn to you at certain points in the discussion.” “Let us know if you don’t understand something.”
- Set expectations: “We will meet for about 10 minutes.” “I may have to come back to you later to answer more questions.”
- Validate: “Is that correct?” “Any input?” “Is that what you see?” “That’s a good point to consider.” “I understand your concern about that.”
- Solicit input and questions: “Do you have thoughts on this?” “Any questions about that?” “How will that idea work for your child?”

Framing Communication
(Focuses disparate input, gets conversation back on track)

- Reset expectations: “I will get to that point when we talk about the plan.” “We have just a few minutes left and I want to talk about X.” “I am going to have you hold your questions until after presentation.”
- Summarize: “You’ve told me 3 important things (list).” “We’ll take a look at the issues in this order (list).” “Sounds like you are concerned about X, X, and X.” “So, the key points are…”
- Refocus: “Ok, thanks (continue presentation).” “What are the 3 most important things you want us to consider?” “Let’s come back to the X issue.” “Let’s move on to the next topic.”
- Prioritize: “The most pressing issue right now is X.” “What is the most important to you at this point?” “X is the most concerning to us right now.” “X does not concern us as much as Y.”

Containing and Exiting Communication
(stops conversation when necessary, allows for respectful exit)

- Reset expectations: “I’d like to hear more, but right now…” “We need to round on the rest of the patients now.” “I will be able to tell you more about that this afternoon.”
- Interrupt: “I am going to stop you there.” “Let me have the team comment on that.” “That’s a good point—let’s move on to X.” “Hold that point for a moment.” “Excuse me for interrupting, let me have the RN comment on that point.”
- Exit: “I will come back to discuss that point.” “I just have 5 minutes now but more time this afternoon.” “I need to move on now, and will work on that this pm.” “I am going to need to come back and spend more time with you to answer those questions.”
Look for this poster in the team room:

Purple Team Care Coordination Liaison (CCL)
My name is________ and I am your CCL today
Contact me via voalte at (650) XXX-XXXX
Email ________________

DATE: _______________  HOURS: _______________

Additional information:

The Care Coordination Liaison serves as an advocate and point of contact for assigned patients and families by assisting with medical systems navigation, resources, and/or referrals to community assistance programs. The CCL is responsible for performing delegated functions related to discharge planning, utilization management, and patient care communication by collaborating with interdisciplinary team members (case managers, social workers, physicians and advance practice practitioners etc.) The goal of the liaison is to identify barriers to medical treatment, ensure access to appropriate resources, improve patient experience and resolve issues that could impact smooth care progression.

To find out who your team’s CCL is feel free to send your request or inquiry to our team distribution list at DL-lpch-ccl@stanfordchildrens.org

Feedback or suggestions feel free to contact, Care Coordination Manager, Maribel Gutierrez at marigutierrez@stanfordchildrens.org
<p>| <strong>ALCAPA</strong> | Anomalous left coronary artery from the pulmonary artery |
| <strong>AoAs</strong> | Ascending aorta |
| <strong>AoDT</strong> | Descending thoracic aorta |
| <strong>AP window</strong> | Aorto-pulmonary window (direct connection between the aorta and MPA) |
| <strong>AR</strong> | Aortic regurgitation |
| <strong>AS</strong> | Aortic stenosis |
| <strong>ASD</strong> | Atrial septal defect |
| <strong>AVVR</strong> | Atroventricular valve regurgitation (insufficiency of mitral, tricuspid or common atrioventricular valve) |
| <strong>BAS</strong> | Balloon atrial septostomy (catheter procedure to enlarge ASD, commonly performed for D-transposition of the great arteries) |
| <strong>BDG</strong> | Bidirectional Glenn (anastomosis of superior vena cava to the pulmonary artery so that blood can passively flow to either lung) |
| <strong>BBDG</strong> | Bilateral bidirectional Glenn (both SVCs drain to the pulmonary arteries) |
| <strong>CHB</strong> | Complete heart block |
| <strong>CI</strong> | Cardiac index (cardiac output/body surface area) |
| <strong>Classic BTS</strong> | Blalock-Taussig shunt (type of systemic to pulmonary shunt to provide pulmonary blood flow; direct end-to-side anastomosis of subclavian artery to ipsilateral pulmonary artery – causing decreased or absent pulse in that arm) |
| <strong>CoA</strong> | Coarctation of the aorta |
| <strong>CS</strong> | Coronary sinus |
| <strong>DCRV</strong> | Double chamber right ventricle (obstructive muscle bundle that divides right ventricle into inflow and outflow portion, often associated with VSD) |
| <strong>DILV</strong> | Double inlet left ventricle (both atrioventricular valves empty into the left ventricle) |
| <strong>DORV</strong> | Double outlet right ventricle (both great arteries arise from the right ventricle) |
| <strong>D-TGA</strong> | Dextro-transposition of the great arteries (aorta is anterior and rightward of the pulmonary artery) |
| <strong>HLHS</strong> | Hypoplastic left heart syndrome |
| <strong>IAA</strong> | Interrupted aortic arch |
| <strong>IVS</strong> | Intact ventricular septum |
| <strong>LPA</strong> | Left pulmonary artery |
| <strong>LPCW</strong> | Left pulmonary capillary wedge (in cath, used as surrogate for left atrial pressure) |
| <strong>LSVC</strong> | Left sided superior vena cava |
| <strong>L-TGA</strong> | Levo-transposition of the great arteries (aorta is anterior and leftward of the pulmonary artery) |
| <strong>LVEDP</strong> | Left ventricular end diastolic pressure |
| <strong>LVOT</strong> | Left ventricular outflow tract |
| <strong>LVOTO</strong> | Left ventricular outflow tract obstruction |
| <strong>MIG</strong> | Mean instantaneous gradient |
| <strong>MPA</strong> | Main pulmonary artery |
| <strong>MR</strong> | Mitral regurgitation |
| <strong>MS</strong> | Mitral stenosis |
| <strong>NSR</strong> | Normal sinus rhythm |
| <strong>PA</strong> | Pulmonary artery |
| <strong>PAB</strong> | Pulmonary artery band (surgical constriction to reduce blood flow to the lungs) |
| <strong>PA/IVS</strong> | Pulmonary atresia/intact ventricular septum |
| <strong>PAPVR</strong> | Partial anomalous pulmonary venous return |
| <strong>PDA</strong> | Patent ductus arteriosus (vessel connecting aorta and pulmonary artery, normally present in fetal life) |
| <strong>PFO</strong> | Patent foramen ovale (normal in fetal life and first few months as newborn) |
| <strong>PIPG</strong> | Peak instantaneous pressure gradient |
| <strong>PR</strong> | Pulmonary regurgitation |
| <strong>PS</strong> | Pulmonary stenosis |
| <strong>PSEG</strong> | Peak systolic ejection gradient |
| <strong>PVR</strong> | Pulmonary vascular resistance |</p>
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qp</td>
<td>Pulmonary blood flow</td>
</tr>
<tr>
<td>Qs</td>
<td>Systemic blood flow</td>
</tr>
<tr>
<td>Qp/Qs</td>
<td>Ratio of pulmonary to systemic blood flow (used to determine degree of shunt; value &gt;1 signifies predominantly left-to-right shunt; value &lt;1 signifies predominantly right-to-left shunt)</td>
</tr>
<tr>
<td>QTc</td>
<td>Corrected QT interval (corrected for rate)</td>
</tr>
<tr>
<td>RBBB</td>
<td>Right bundle branch block</td>
</tr>
<tr>
<td>RmBTS</td>
<td>Right modified Blalock-Taussig shunt (type of systemic to pulmonary shunt to provide pulmonary blood flow; interposition of Gore-Tex tube graft from right subclavian artery to right pulmonary artery)</td>
</tr>
<tr>
<td>RPA</td>
<td>Right pulmonary artery</td>
</tr>
<tr>
<td>RPCW</td>
<td>Right pulmonary capillary wedge (in cath, used as surrogate for left atrial pressure)</td>
</tr>
<tr>
<td>RVEDP</td>
<td>Right ventricular end diastolic pressure</td>
</tr>
<tr>
<td>RVH</td>
<td>Right ventricular hypertrophy</td>
</tr>
<tr>
<td>RVOT</td>
<td>Right ventricular outflow tract</td>
</tr>
<tr>
<td>SBE</td>
<td>Subacute bacterial endocarditis</td>
</tr>
<tr>
<td>SVR</td>
<td>Systemic vascular resistance</td>
</tr>
<tr>
<td>TA</td>
<td>Tricuspid atresia or truncus arteriosus</td>
</tr>
<tr>
<td>TAPVR</td>
<td>Total anomalous pulmonary venous return</td>
</tr>
<tr>
<td>TOF</td>
<td>Tetralogy of Fallot</td>
</tr>
<tr>
<td>TOF/PA</td>
<td>Tetralogy of Fallot with pulmonary atresia and major aortopulmonary MAPCAs collateral arteries</td>
</tr>
<tr>
<td>TR</td>
<td>Tricuspid regurgitation</td>
</tr>
<tr>
<td>TS</td>
<td>Tricuspid stenosis</td>
</tr>
<tr>
<td>VSD</td>
<td>Ventricular septal defect</td>
</tr>
<tr>
<td>WPW</td>
<td>Wolff-Parkinson-White syndrome</td>
</tr>
</tbody>
</table>
CVICU to Purple Team Handoff: iPASS One Message – One Time

This is what you should expect to hear at team sign-out when patients move from CVICU to Purple Team. The iPASS is delivered by one of the CVICU fellows or NP/PAs, with the attendance of both ICU and PCU 200 bedside RNs, both ICU and ward attendings, the Purple team fellow, and the accepting NP or resident.

I: Illness severity: Stable/Improving/Watcher;
   Code status - only if different than FULL code.
P "Patient Summary"
ID statement
Primary cardiologist/when last updated + CT surgeon.

Brief Hospital Course by Systems:
- **Cardiac:** Include type of repair/palliation + evidence of adequacy of repair; arrhythmias, chest tube status, last echo date and key results.
- **Resp:** When extubated, Expected sats/RA or how much support
- **FEN/GI:** Feeds + recent growth (esp < 1 year old) + dry weight/fluid management goals (esp heart failure pts).
- **Neuro/Pain** plan
- **Access:** IV? Does pt have PICC - if so, when was it placed + ? still needed

List all scheduled Meds (these must be reconciled at end of signout)

A: Action List & Active consults (PT/OT, subspecialists)
   - Target discharge date & key to-do items for next 24 hrs + for d/c to happen on time (e.g. still needs d/c echo and lung perfusion scan).

S: Situational Awareness & Synthesis
   - Any team member can ask questions/NP will summarize her own patients; Purple team fellow summarizes patient for resident/attending closes by saying “We accept this patient.”

**TASK** Pull up problem list in EPIC -- resolve/add as needed for it to be accurate at time of transfer**

Purple team accepting NP/Resident/Fellow needs to reconcile all orders in CVICU before returning to PCU 200 so orders and meds are accurate upon patient arrival to PCU 200.

Once patient is physically on PCU 200, the RN should immediately release the orders so all can see the reconciled orders.
CVICU to Purple Team Transfer Summary: What You Should Expect

In general, the CVICU to PCU 200 transfer summary should tell the story of the admission so far and highlight specific issues that should be resolved prior to discharge or by their PCP/referring cardiologist as outpatients. They should be more formal than a progress note, and have full sentences etc.

CV:
1. For surgical kids: brief summary of OR course + known residual lesions; if PACT/EP/other a concise history and reason for admission.
2. Inotropes and when weaned off.
3. Rhythm problems/meds. Are wires still in? (Do they need to be?)
4. Diuretics – when started, when changed from IV to oral. Are they on aldactone if on >BID Lasix? How is renal function – Did they have AKI this admit (peak creatinine and date) and current state.
5. Last echo – TEE in OR? Or TTE?
6. Last cath (if done pre-op for this surgery or if done postop this hospitalization) – key numbers/findings.
7. If on PH meds: When started, how long anticipated and **Have you started the pre-authorization process?**
8. When was chest tube removed (so we know when the sutures need to come out).
9. **Primary cardiologist and when last updated**

Resp: When extubated, when off CPAP/high flow, current oxygen need, current pulmonary meds/therapies.

GI: Feeds started on what date, when patient got to full calories, current regimen. If NG still in place did patient have in the past? Admitted on NG feeds?

ENT/OT: Pre-op or post-op evaluation of vocal cords/airway? Safe to eat by mouth?

Heme:
1. Important post op bleeding, if transfused postoperatively, last Hct.
2. Anticoagulation – brief history and goals (INR or ant Xa) and how long anticipated (e.g. lovenox for clot; when was ultrasound that documented the thrombus).

ID: All courses of abx for specific known infections or empiric courses. If still on abx at transfer, when is anticipated end date?

Neuro: When off IV sedation meds, how long was kid on IV meds, current regimen – wean plan established?

Skin/wound care: Any issues with sternal wound or other skin healing? Is patient followed by wound care RN?
## ED to Heart Center (PCU 200) Process Flow

<table>
<thead>
<tr>
<th>Phase 1: Identification of Admit</th>
<th>Phase 2: Communication of Admitting Patients</th>
<th>Phase 3: IPASS Tele-Handoff</th>
<th>Phase 4: Patient Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bed Control</strong></td>
<td><strong>USA</strong></td>
<td><strong>Nurses</strong></td>
<td><strong>Provider</strong></td>
</tr>
<tr>
<td><strong>Charge nurses</strong> will coordinate tele-handoff time with each of their respective teams. **</td>
<td><strong>ED USA</strong> will monitor bed board for room availability: When a bed is assigned will notify ED RSN.</td>
<td><strong>ED RSN confirms admit &amp; coordinate iPASS with PCU 200 RSN</strong></td>
<td><strong>ED MD identifies patient needs admission</strong></td>
</tr>
<tr>
<td><strong>GOAL = handoff begins &lt;20 min from bed assigned time</strong> <strong>ED RSN (724-0057) calls PCU 200 RSN (721-9625).</strong> <strong>ED USA (723-4422) pages cardiology fellow 1-HART</strong></td>
<td><strong>PCU 200 USA pulls patient into EPIC</strong></td>
<td><strong>PCU 200 RN goes to DX-80</strong></td>
<td><strong>Cardio MD in person consultation/Determine disposition CVICU vs. PCU 200 with attending and inform CV or PCU 200 RSN.</strong></td>
</tr>
<tr>
<td><strong>ED USA notifies bed control</strong></td>
<td></td>
<td><strong>ED RN meets with ED team at bedside with iPAD</strong></td>
<td><strong>ED MD notifies LPCH patient placement with admit attending name and dx; informs family</strong></td>
</tr>
<tr>
<td><strong>ED Bedside nurse, ED Resource Nurse (RSN) identifies patient will need to be admitted</strong></td>
<td><strong>Bed control</strong></td>
<td><strong>ED MD gathers ED team to meet at patient’s bedside; login to Jabber</strong></td>
<td><strong>Cardio Fellow go to &amp; dial in at DX-80 screen</strong></td>
</tr>
<tr>
<td><strong>PCU200 RSN assigns patient to bedside RN</strong></td>
<td></td>
<td><strong>Cardio Fellow goes to &amp; dial in at DX-80 in small team rm</strong></td>
<td><strong>Family can see iPAD screen and invited to participate in handoff communication</strong></td>
</tr>
</tbody>
</table>

**Family discussion regarding potential admit**

**ONE MESSAGE ONE TIME: iPASS based Handoff from ED to Cardiology Team**

**Daytime: PCU 200 USA sends blast page with time of tele-handoff**

**Night: PCU200 RSN informs bedside RN and 1-HART fellow**

**PDSA data: Time from request to tx**

**PDSA data: Survey of all providers – giving and receiving teams RN, MD, etc.**

**Cardio Medical team updates remainder of the team not present at the handoff**

**Patient/Family**

**ED MD identifies patient needs admission**

**ED MD gathers ED team to meet at patient’s bedside; login to Jabber**

**Cardio MD accepts pt and generates admit orders**

**Daytime: PCU 200 attending & APP/Resident meet at DX-80 in small team rm**

**Cardio Fellow in person consultation/Determine disposition CVICU vs. PCU 200 with attending and inform CV or PCU 200 RSN.**

**Family discussion regarding potential admit**
Emergency Dept. to Heart Center Tele-health
Handoff: iPASS One Message – One Time

This is what information should be signed-out when patients move from ED to CVICU or PCU 200/Purple Team. The iPASS is delivered by one of the ED providers by Tele-video link with the “attendance” of both ED and CVICU/PCU 200 bedside RNs, the 1-HART cardiology fellow and CVICU fellow (if patient going to CVICU), and (daytime) the accepting NP or resident. We also aim to have the ER and heart center accepting attendings.

I: Illness severity.

P "Patient Summary"
   ID statement/Chief complaint prompting ER visit

   Brief ED Course by Systems:
   - **Cardiac**: Include original congenital lesions + type of repair/palliation + evidence of adequacy of repair; any arrhythmias in ER? History of arrhythmias? last echo date + key results.
   - **Resp**: Expected saturations/RA or how much support
   - **FEN/GI**: Feeds + dry weight/fluid management goals (esp. heart failure pts).
   - **Neuro/Pain** as pertinent
   - **Access**: IV? What meds or fluids administered?

   List all outpatient Meds and which ones given during ER stay

A: Action List

S: Situational Awareness & Synthesis
   - Any team member can ask questions; Purple team or CVICU fellow summarizes patient and closes by saying “We accept this patient.”

Patient should be physically transported after this acceptance, ideally within 15 min of this tele-health handoff. Medicine reconciliation and orders done during this transport so they can be released by the RN upon arrival to the unit.

At minimum: ER nurse and ER provider + accepting bedside nurse and accepting fellow.
Purple Team Handoff: Fridays at 3pm

We meet in the team room each Friday to review patients as new attendings start service. The attending or fellow will present each patient with this IPASS format.

**I: Illness severity:** Stable/Improving/Watcher;

[Code status - only if different than FULL code.]

**P "Patient Summary"
ID statement:** Use 1-liner from MD handoff.

**Primary cardiologist/when last updated** + CT surgeon.

**Attending TASK:** Check that PCP call documented in EPIC

**Brief Hospital Course by Systems:**
- **Cardiac:** Include type of repair/palliation + evidence of adequacy of repair; arrhythmias, chest tube status, last echo date and key results.
- **Resp:** Expected sats/RA or how much support
- **FEN/GI:** Feeds + How much growth past week (esp < 1 year old) + dry weight/fluid management goals (esp heart failure pts).
- **Neuro/Pain** plan.

**Attending TASK **Pull up problem list in EPIC -- resolve/add as needed for it to be accurate during sign-out**

**Access:** Does child have PICC - if so, when was it placed + why still needed?
For watchers, do they have any IV access?

**A: Action List**
- Target discharge date & key to-do items for next 24 hrs + for d/c to happen on time (e.g. still needs d/c echo and lung perfusion scan).

**S: Situational Awareness**
- Global comment on progress made this past week/ anticipated progress and possible complications in week ahead.
- For patients > 10 days LOS, group discussion of long term plan (outlook for next 3-4 weeks; aim for consensus).

**S: Synthesis**
- Opportunity for team to ask questions/clarify any to-do items for the night.
1) Furosemide (Lasix®)
   a) Mechanism of Action: Inhibits reabsorption of sodium and chloride in the ascending loop of Henle and distal renal tubule. This interferes with the chloride-binding co-transport system, thus causing increased excretion of water, potassium, sodium, chloride, magnesium, and calcium.
   b) Pharmacodynamics:
      i) Onset of action: Oral: within 30-60 minutes  IV: 5 minutes
      ii) Maximum effect: Oral: within 1-2 hours  IV 20-60 minutes
      iii) Duration: Oral: 6-8 hours  IV: 2 hours
   c) Dosing:
      Neonates: Oral, IV: 1-2 mg/kg/dose every 6-8 hours
      Children: Oral, IV: 1-2 mg/kg/dose every 4-12 hours, MAX: 6 mg/kg/DOSE or 10mg/kg/DAY
   d) Dosage forms:
      i) Injection: 10 mg/mL
      ii) Oral Solution: 40 mg/5 mL, 10 mg/mL
      iii) Tablet: 20 mg, 40 mg, 80 mg
   e) Monitor: blood pressure, renal function, urine output, potassium, sodium, chloride, magnesium, and calcium
   f) IV:PO conversion: 1:2
      **Dose equivalency for adult patients with normal renal function (approximate) **
      Furosemide 40 mg = Bumetanide 1 mg = Torsemide 20 mg = Ethacrynic acid 50 mg

2) Bumetanide (Bumex®)
   a) Mechanism of Action: Inhibits reabsorption of sodium and chloride in the ascending loop of Henle and proximal renal tubule. This interferes with the chloride-binding co-transport system, thus causing increased excretion of water, sodium, chloride, magnesium, phosphate, and calcium.
   b) Pharmacodynamics:
      i) Onset of action: Oral: 0.5 to 1 hour  IV: 2 to 3 minutes
      ii) Peak effect: Oral: 1 to 2 hours  IV: 15 to 30 minutes
      iii) Duration: Oral: 4 to 6 hours  IV: 2 to 3 hours
   c) Dosing:
      Preterm infants: Oral, IV: 0.01-0.05 mg/kg/dose every 24 to 48 hours
      Infants and children: Oral, IV: 0.015 to 0.1 mg/kg/dose every 6 to 24 hours, MAX: 10 mg/DAY
   d) Dosage forms:
      i) Injection: 0.25 mg/mL
      ii) Oral suspension: 0.5 mg/mL compounded by LPCH pharmacy
      iii) Tablet: 0.5 mg, 1 mg, 2 mg
   e) Monitor: Blood pressure, renal function, urine output, potassium, sodium, chloride, magnesium and calcium
   f) IV:PO conversion: 1:1
      **Dose equivalency for adult patients with normal renal function (approximate) **
      Bumetanide 1 mg = Furosemide 40 mg = Torsemide 20 mg = Ethacrynic acid 50 mg
Special considerations: Doses greater than 0.05 mg/kg/dose may not yield greater diuresis in infants up to 6 months of age.

3) Spironolactone (Aldactone®)
   a) Mechanism of Action: Competes with aldosterone for receptor sites in the distal renal tubules, increasing sodium chloride and water excretion while conserving potassium and hydrogen ions. May block the effect of aldosterone on arteriolar smooth muscle as well.
   b) Common spironolactone indication for purple team patients: diuretic induced hypokalemia, cardiac remodeling and protein-losing enteropathy
   c) Dosing:
      Children: 1-3.3 mg/kg/day divided into 1 or 2 doses, MAX: 100 mg/DAY
      Gradual onset of diuretic action: maximum effect reached on the third day of therapy
   d) Dosage forms:
      i) Tablet: 25 mg, 50 mg, 100 mg
      ii) Oral suspension: 25 mg/mL compounded by LPCH pharmacy
   e) Monitor: Blood pressure, urine output, SCr, potassium and sodium

Special considerations:
Beware giving with potassium supplements or other agents that increase potassium. Children transferred from the CVICU to PCU 200 will commonly be on high dose of furosemide such as 2mg/kg/dose BID or 1mg/kg/dose TID. If using this level of furosemide, patient should also be on spironolactone (potassium sparing), at ~1mg/kg/dose BID. Once Lasix is weaned to 1mg/kg po BID can discontinue spironolactone.

3) Digoxin
   a) Mechanism of Action:
      Heart failure: Inhibition of the sodium/potassium ATPase pump in myocardial cells, resulting in a transient increase of intracellular sodium. This promotes calcium influx via the sodium-calcium exchange pump leading to increased contractility. May improve baroreflex sensitivity.
      Supraventricular arrhythmias: Direct suppression of the AV node conduction to increase effective refractory period and decrease conduction velocity - positive inotropic effect, enhanced vagal tone, and decreased ventricular rate to fast atrial arrhythmias. Atrial fibrillation may decrease sensitivity and increase tolerance to higher serum digoxin concentrations.
   b) Loading and Maintenance Dosing Guidelines

<table>
<thead>
<tr>
<th>Age</th>
<th>Oral digitalizing dose* (mcg/kg)</th>
<th>Daily oral maintenance dose (mcg/kg/dose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mo-2year</td>
<td>35-60</td>
<td>5 - 7.5 mcg/kg/DOSE q12hr</td>
</tr>
<tr>
<td>2-5 years</td>
<td>30-40</td>
<td>3.75 - 5 mcg/kg/DOSE q12h</td>
</tr>
<tr>
<td>5-10 years</td>
<td>20-35</td>
<td>2.5 - 5 mcg/kg/DOSE q12h</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>10-15</td>
<td>2.5 - 5 mcg/kg/DOSE q24h</td>
</tr>
</tbody>
</table>

*Do not give full total digitalizing dose (TDD) at once. Give one-half of the total digitalizing dose (TDD) for the initial dose, then give one-quarter of the TDD for each of two subsequent doses at 6 to 8 hour intervals. Obtain ECG 6 hours after each dose to assess potential toxicity.
   c) Dosage forms:
      i) Injection: 25 mcg/mL, 100 mcg/mL
      ii) Oral elixir: 50 mcg/mL (60 mL)
      iii) Tablet: 125 mcg, 250 mcg
d) Monitor:
   i) Serum digoxin concentration: If a loading dose is not given: digoxin serum concentration should be obtained after 3-5 days of therapy. Draw level just prior to the next dose or at least 6-8 hours after the last dose.
   ii) Therapeutic concentration for Heart Failure: 0.5-0.9 ng/mL. Toxicity >2 ng/mL
   iii) Heart rate, rhythm, renal function (Scr, BUN), potassium, magnesium and calcium, signs and symptoms of digoxin toxicity.

e) IV:PO conversion: When changing to PO, Increase dose by 20% to 25%

Special Considerations:
Loading dose not recommended for treatment of heart failure
Need dose adjustment in renal impairment

5) Captopril
   a) Mechanism of Action: Competitive inhibitor of angiotensin-converting enzyme (ACE); preventing conversion of angiotensin I to angiotensin II, a potent vasoconstrictor. This results in lower levels of angiotensin II which causes an increase in plasma renin activity and a reduction in aldosterone secretion. A CNS mechanism may also be involved in hypotensive effect as angiotensin II increases adrenergic outflow from CNS. Vasoactive kallikreins may be decreased in conversion to active hormones by ACE inhibitors, thus reducing blood pressure.

   b) Dosing:
      Heart Failure (afterload reduction): Oral
      Term neonates: 0.05-0.1 mg/kg/dose every 8-24 hours with titration;
      MAX: 0.5 mg/kg/dose given every 6-24 hours
      Infants: 0.3-2.5 mg/kg/DAY divided every 8-12 hours
      Children and adolescents: 0.3-6 mg/kg/DAY divided every 8-12 hours
      MAX: 150 mg/DAY
      Hypertension: Oral
      Preterm neonates: 0.01 mg/kg/dose every 8-12 hours
      Infants: 0.15-0.3 mg/kg/dose with titration; MAX: 6 mg/kg/DAY in 1-4 divided doses
      Children and Adolescents: 0.3-0.5 mg/kg/dose every 8 hours with titration
      MAX: 6 mg/kg/DAY in 3 divided doses or MAX: 450 mg/DAY

   c) Dosage forms:
      i) Oral solution: 1 mg/mL compounded by LPCH pharmacy
      ii) Tablet: 12.5 mg, 25 mg, 50 mg, 100 mg
   d) Monitoring: blood pressure, renal function (Scr, BUN), serum potassium, angioedema and anaphylactoid reactions; hypovolemia and postural hypotension

Special Considerations:
Preferred agent in neonates due to shorter half-life; easier to adjust dose to prevent excessive hypotension. Use lower starting doses in preterm infants (risk of poor renal and cerebral blood flow). Dose adjust for renal function (not recommended in neonates with CrCl below 30 mL/minute/1.73 m2).

6) Enalapril
   a) Mechanism of Action Blocks the conversion of angiotensin I to angiotensin II resulting in decreased vasopressor activity and decreased aldosterone secretion. ACE inhibition improves symptoms of heart failure through decreased systemic vascular resistance and pulmonary capillary wedge pressure while improving cardiac output and decreasing heart
b) Dosing: Limited data available
   Hypertension: Oral
   Neonatal: 0.04-0.1 mg/kg/DAY every 24 hours with titration MAX: 0.27 mg/kg/DAY
   Infants, Children and Adolescents: 0.08 mg/kg/dose daily
   (MAX starting dose: 5 mg) with titration (MAX: 0.6 mg/kg/DAY up to 40 mg/DAY)
   Heart Failure: Oral
   Infants, Children, and Adolescents: 0.1 mg/kg/DAY in 1-2 divided doses with
   titration over 2 weeks as needed; MAX: 0.5 mg/kg/DAY
   Goal dose in heart failure is 0.5mg/kg/DAY divided BID

   c) Dosage forms
      i) Oral solution: Epaned® 1 mg/mL, commercially available
      ii) Tablet: 2.5 mg, 5 mg, 10 mg, 20 mg
      iii) Injection: 1.25 mg/mL

   d) Monitoring: Blood pressure, renal function, WBC, serum potassium, serum glucose,
      angioedema and anaphylactoid reactions

Special Considerations:
May be preferred over captopril in older children because of longer duration of action and once-
daily dosing.

7) Aspirin
   a) Mechanism of Action: Irreversibly inhibits cyclooxygenase-1 and 2 (COX-1 and 2)
      enzymes which results in decreased prostaglandin synthesis. This prevents the
      conversion of arachidonic acid to thromboxane A2, thus inhibiting platelet aggregation
      for the remainder of their lifespan (~ 7-10 days).
   b) Pediatric dosage is derived from adult studies and clinical experience and is not well
      established; suggested doses have ranged from 1-5 mg/kg/day (Monagle, 2012) given
      as a single daily dose, with a recent trend toward using the 5 mg/kg/day dose. Doses
      are typically rounded to a convenient amount (eg, 1/2 of 81 mg tablet).
      i) Mechanical prosthetic heart valves: 1-5 mg/kg/day (usual max 81 mg) given as a
         single daily dose (used in combination with an oral anticoagulant). (Monagle et al.
         Chest 2004, 125(3): 645S-687S
      ii) Blalock-Taussig shunts, primary prophylaxis: 1-5 mg/kg/day (usual max 81 mg)
          given as a single daily dose
      iii) Patients following Fontan surgery, primary prophylaxis: 1-5 mg/kg/day (usual max
          81 mg) given as a single daily dose (Monagle, 2012)
      iv) Kawasaki disease: Oral: 80-100 mg/kg/day divided every 6 hours for up to 14 days
          (until fever resolves for at least 48 hours); then decrease dose to 3-5 mg/kg/day
          once daily. In patients without coronary artery abnormalities, give lower dose for 6-8
          weeks. In patients with coronary artery abnormalities, low-dose aspirin should be
          continued indefinitely (in addition to therapy with warfarin) (Monagle, 2012)
      v) Ventricular assist devices: see mechanical circulatory support section on LPCH
         intranet for device-specific guidelines for Berlin Heart and Heartware HVAD.

   c) Dosage forms:
      i) Tablet, oral: 81mg (chewable, can divide to 40.5mg (½ tab) or ~20mg (¼ tab))
8) Clopidogrel (Plavix)

a) **Mechanism of Action:** Clopidogrel is a prodrug; its active metabolite irreversibly inhibits platelet aggregation. The active metabolite modifies the P2Y12 platelet receptor, inhibiting the binding of ADP and prevents ADP activation of the GPIIb/IIIa receptor complex, thereby reducing platelet aggregation. Platelets blocked by clopidogrel’s active metabolite are affected for the remainder of their lifespan (~7-10 days). Note: Not all patients who receive clopidogrel will have adequate platelet inhibition. This is due to the fact that the formation of the active metabolite requires cytochrome P450 enzymes and some of these enzymes are polymorphic or may be inhibited by other medications.

b) **Dosage recommendations for Infants, Children, and Adolescents:** (limited dosing information is available; further pediatric studies are needed):

i) **Infants and Children ≤24 months:** In the PICOLO trial, a dose of 0.2 mg/kg/dose once daily was found to achieve a mean inhibition of platelet aggregation similar to adults receiving the recommended dose; Note: This study included pediatric patients with a systemic-to-pulmonary artery shunt, intracardiac or intravascular stent, Kawasaki disease, or arterial graft; 79% of patients received concomitant aspirin (Li et al. Circulation, 2008 Jan 117(4): 553-9).

ii) **Children >2 years of age:** Some centers use the following: Initial dose: 1 mg/kg once daily; titrate to response; in general, do not exceed adult dose (Finkelstein et al. J Pediatr. 2005 147(5): 657-61).

iii) **Ventricular assist devices:** see mechanical circulatory support section on LPCH intranet for device-specific guidelines for Berlin Heart and Heartware HVAD.

c) **Dosage forms:**

i) Tablet, oral: 75 mg, 300 mg

ii) 5 mg/mL oral suspension may be made using tablets

9) Sildenafil:

a) **Mechanism of Action:** Inhibits phosphodiesterase type 5 (PDE-5) in smooth muscle of pulmonary vasculature where PDE-5 is responsible for the degradation of cyclic guanosine monophosphate (cGMP). Increased cGMP concentration, resulting in pulmonary vasculature relaxation; vasodilation in the pulmonary bed and the systemic circulation (to a lesser degree) may occur.

b) **Dosing:**

0-10 kg: 0.5 mg/kg/dose TID; titrate to 1 mg/kg/dose TID
10-20 kg: 5 mg TID; titrate to 10 mg TID
≥20 kg: 10 mg TiD; titrate to 20 mg TiD; MAX: 20 mg TiD
c) **Weaning:**

1) ½ maintenance dose TiD x 2 weeks
2) ¼ maintenance dose TiD x 2 weeks
3) ¼ maintenance dose BID x 2 weeks
4) STOP
d) **Side effects:** headache, nausea, flushing, photophobia, blurred vision, blue-green visual tint; dizziness, hypotension, priapism, deafness, restlessness
e) **Dosage forms:**

i) Injection: 10 mg/12.5 mL

ii) Oral suspension: Revatio®: 10 mg/mL ($$$) commercially available

iii) Tablet Revatio®: 20 mg; Viagra®: 25 mg, 50 mg, 100 mg
f) Monitoring: Heart rate, blood pressure, oxygen saturation, PaO₂

Special Considerations:
*If new medication for patient, order outpatient Rx ASAP—may need to complete prior-authorization form for insurance to cover.*

Dose adjustment for CrCl below 30 mL/minute/1.73 m²

In pediatric patients (1-17 years of age) with PAH, an increased mortality risk was associated with high dose long-term use (>2 years) in children > 20 kg (Barst et al. Circulation, 2012. 125(2): 324-34) and the FDA recommends against the use of sildenafil (Revatio®) for treatment of PAH in children and adolescents. However we still use this medication in certain patients.

10) Warfarin (Coumadin)

a) Mechanism of Action: Interferes with hepatic synthesis of vitamin K-dependent coagulation factors (II, VII, IX, X), as well as proteins C and S.

b) Dosing is adjusted for INR goals. Common indications and typical INR goals:

<table>
<thead>
<tr>
<th>Indication</th>
<th>INR goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fontan (3-6 months post-op)</td>
<td>1.5-2.5 (LPCH); other centers may use higher goal of 2.0-3.0</td>
</tr>
<tr>
<td>Mechanical mitral valve replacement</td>
<td>2.5-3.5</td>
</tr>
<tr>
<td>Mechanical aortic valve replacement</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Primary prophylaxis for dilated cardiomyopathy</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Treatment of systemic venous thrombosis</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Kawasaki disease with giant coronary aneurysms</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>2.0-3.0</td>
</tr>
</tbody>
</table>

Dosage guidelines for Infants and Children:

1) Loading Dose:

- Day 1 (if baseline INR is 1-1.3): 0.2 mg/kg (maximum dose: 10 mg); use initial loading dose of 0.1 mg/kg if patient has liver dysfunction or has undergone a Fontan procedure (Streif, 1999)
- Day 2-7:
  - If INR is 1.1-1.3, repeat the initial loading dose
  - If INR is 1.4-1.9, give 50% of loading dose
  - If INR 2.0-3.0, give 50% of loading dose
  - If INR 3.0-4.0, give 25% of loading dose
  - If INR is 4.0-4.4, hold dose, check INR following day
    - Resume at 50% of previous dose
  - If INR is >4.5, hold until INR < 4.5
    - Resume at 50% of previous dose
  - If INR is >5.5, hold & check INR daily, when INR is <5.0 resume at 25% of previous dose

2) Maintenance Dose: Once patient has been on warfarin for 7 days, total ALL doses & divide by 7 = maintenance daily dose
*Once a patient has been loaded, adjustments should be made based on weekly dose, NOT the daily dose!

- For maintaining INRs between 2.0-3.0:

| INR 1.1-1.4 | Increase maintenance dose by 20% |
| INR 1.5-1.9 | Increase maintenance dose by 10% |
| INR 2.0-3.0 | No change |
| INR 3.1-4.0 | Decrease maintenance dose by 10% |
| INR 4.1-4.5 | Decrease maintenance dose by 20% |
| INR > 4.5  | Consider holding, restart 20% less than prior dose |
| INR > 5.0  | When INR <4.5, restart 25% less than prior dose |

- For maintaining INRs between 2.5-3.5:

| INR 1.1-2.0 | Increase maintenance dose by 20% |
| INR 2.1-2.4 | Increase maintenance dose by 10% |
| INR 2.5-3.5 | No change |
| INR 3.6-4.5 | Decrease maintenance dose by 10% |
| INR 4.5-5.0 | Decrease maintenance dose by 20% |
| INR > 5.0  | Consider holding 1 dose, restart 20% less than prior dose |

(3) Ventricular assist devices: see mechanical circulatory support section on LPCH intranet for device-specific guidelines for Berlin Heart and Heartware HVAD.

c) Dosage forms:

i) Tablet, oral: 1 mg, 2 mg, 2.5 mg, 3 mg, 4 mg, 5 mg, 6 mg, 7.5 mg, 10 mg

d) Food Interactions:

i) Vitamin K can reverse the anticoagulation effects of warfarin; large amounts of food high in vitamin K (such as beef liver, pork liver, green tea, and green leafy vegetables) may reverse warfarin, decrease prothrombin time, and lead to therapeutic failure. Patients should not change dietary habits once stabilized on warfarin therapy. A balanced diet with a consistent intake of vitamin K is essential. Avoid large amounts of alfalfa, asparagus, broccoli, brussel sprouts, cabbage, cauliflower, green teas, kale, lettuce, spinach, turnip greens, watercress. Avoid enteral feeds high in vitamin K.

Note: Breast-fed infants may be more sensitive to warfarin due to low amounts of vitamin K in breast milk.

ii) High doses of vitamin A, E, or C may alter PT; use caution with fish oils or omega 3 fatty acids; avoid fried or boiled onions as they may increase drug effect by increasing fibrinolytic activity; avoid herbal teas and remedies such as tonka beans, melilot, and woodruff as they contain natural coumarins and will increase effect of warfarin; avoid large amounts of liver, avocado, soy protein, soybean oil, papain.

iii) Cranberry juice or other cranberry products may increase the INR in patients receiving warfarin and cause severe bleeding (flavonoids found in cranberries may inhibit cytochrome P450 isoenzyme CYP2C9 and reduce the metabolism of warfarin). Likewise, grapefruit juice should be avoided.

Tips for Coumadin on PCU 200:

1) Include Coumadin calendar in the daily progress note to track the dose given each night and the INR each morning.

2) Identify who (primary PCP/cardiologist) will be managing outpatient anticoagulation. If
patient will be followed here at LPCH, CHAMPs team will follow them for Coumadin. Place CHAMPs consult order in EPIC.

3) Prior to discharge: Coordinate next INR check date and location with health care provider who will manage this medication as an outpatient. Give family the INR lab slip and directions to the lab. If patient will be followed here at LPCH, CHAMPs team will follow them for Coumadin (discuss details of follow up-timing at time of discharge).

11) Heparin
   a) **Mechanisms of Action:** Binds to antithrombin, inactivates thrombin and factors IX, X, XI, XII
   b) **Dosing guidelines** for Systemic Heparinization from LPCH Housestaff Manual

<table>
<thead>
<tr>
<th>Heparin Activity Level (units/mL)</th>
<th>Heparin Dosage Nomogram, typical goal level 0.3-0.7 units/mL</th>
<th>Round to nearest 10 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.2</td>
<td>Bolus: (80 units/kg) = units I.V. x 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase drip by (4 units/kg/hr) = units/hr increase</td>
<td></td>
</tr>
<tr>
<td>0.2-0.29</td>
<td>Bolus: (40 units/kg) = units I.V. x 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase drip by (2 units/kg/hr) = units/hr increase</td>
<td></td>
</tr>
<tr>
<td>0.3-0.7</td>
<td>No change</td>
<td></td>
</tr>
<tr>
<td>0.71-0.8</td>
<td>Decrease drip by (2 units/kg/hr) = units/hr decrease</td>
<td></td>
</tr>
<tr>
<td>0.81-0.99</td>
<td>Hold drip for 1 hour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Then decrease drip by (2 units/kg/hr) = units/hr decrease</td>
<td></td>
</tr>
<tr>
<td>≥1</td>
<td>Hold drip for 1 hour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Then decrease drip by (3 units/kg/hr) = units/hr decrease</td>
<td></td>
</tr>
</tbody>
</table>

   i) **Neonates and Infants <1 year:** I.V. infusion: Initial loading dose: 75 units/kg given over 10 minutes (never bolus VAD patients); then initial maintenance dose: 28 units/kg/hour; adjust dose to maintain a level of 0.3-0.7.
   ii) **Children >1 year:** I.V. infusion: Initial loading dose: 50 units/kg given over 10 minutes (never bolus VAD patients), then initial maintenance dose: 15-25 units/kg/hour; increase dose by 5 units/kg/hour every 4 hours as required.
   iii) **Teens/Adults:**
       1) Prophylaxis (low dose heparin): SubQ: 5000 units every 8-12 hours.
       2) I.V. Infusion: Initial loading dose: 80 units/kg over 10 minutes (never bolus VAD patients); initial maintenance dose: 15-20 units/kg/hour with dose adjusted according to Heparin Activity level; usual range: 10-30 units/kg/hour.
   iv) **Ventricular assist devices:** see mechanical circulatory support section on LPCH intranet for device-specific guidelines for Berlin Heart and Heartware HVAD.

   c) **Pediatric Protocol for Systemic Heparin Adjustment:**
      i) See nomogram.
      ii) Consider baseline CBC, PT/PTT prior to starting heparin; once 2 consecutive Heparin Activity levels are therapeutic, check Heparin Activity level 2 times daily.

   d) **Monitoring Parameters:** Platelet counts, signs of bleeding, hemoglobin, hematocrit, Heparin Activity level, aPTT, antithrombin III level.
   e) **Heparin activity level (HAL)** must be drawn strictly from a peripheral blood source or a completely heparin-naive line.
12) Low-molecular weight heparin (Enoxaparin, Lovenox)

a) Mechanism of Action: Binds to and potentiates action of antithrombin III to inhibit factor Xa. Also inactivates IIa (thrombin) but to a much lesser degree (thus more specific site of action compared to heparin). Compared with unfractionated heparin, LMWH has less binding to plasma proteins, endothelium and macrophages. These characteristics lead to predictable dosing, longer half-life, better bioavailability at low doses, and dose-independent clearance mechanism.

b) Dosing guidelines (LPCH cardiology); other departments may have different dosing recommendations:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Dosing Guidelines</th>
<th>1.8 mg/kg/dose SC q12 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 months</td>
<td>1.8 mg/kg/dose SC q12 hrs</td>
<td></td>
</tr>
<tr>
<td>3-12 months</td>
<td>1.4 mg/kg/dose SC q12 hrs</td>
<td></td>
</tr>
<tr>
<td>1-5 years</td>
<td>1.2 mg/kg/dose SC q12 hrs</td>
<td></td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>1 mg/kg/dose SC q12 hrs</td>
<td></td>
</tr>
</tbody>
</table>

i) Dosage titration guidelines:

<table>
<thead>
<tr>
<th>Antifactor Xa</th>
<th>Dose Titration</th>
<th>Time to repeat Xa level</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.35 units/mL</td>
<td>Increase dose by 25%</td>
<td>4 hours after next dose</td>
</tr>
<tr>
<td>0.35-0.49 units/mL</td>
<td>Increase dose by 10%</td>
<td>4 hours after next dose</td>
</tr>
<tr>
<td>0.5-1 unit/mL</td>
<td>No change</td>
<td>Next day, then weekly (always 4 hours after a dose)</td>
</tr>
<tr>
<td>1.1-1.5 units/mL</td>
<td>Decrease by 20%</td>
<td>Before next dose</td>
</tr>
<tr>
<td>1.6-2 units/mL</td>
<td>Hold for 3 hrs and decrease dose by 30%</td>
<td>Before next dose &amp; 4 hrs after the next dose</td>
</tr>
<tr>
<td>&gt;2 units/mL</td>
<td>Hold all doses until Xa level &lt;0.5 units/mL and decrease dose by 40%</td>
<td>Before next dose and every 12 hrs until Xa is &lt;0.5 units/mL</td>
</tr>
</tbody>
</table>


ii) Ventricular assist devices: see mechanical circulatory support section on LPCH intranet for device-specific guidelines for Berlin Heart and Heartware HVAD.

iii) LMWH anti-Xa level must be drawn strictly from a peripheral blood source or a completely heparin-naïve line.

c) Dosage forms:

i) Injection, solution, as sodium [preservative free]: 30 mg/0.3 mL (0.3 mL); 40 mg/0.4 mL (0.4 mL); 60 mg/0.6 mL (0.6 mL); 80 mg/0.8 mL (0.8 mL); 100 mg/mL (1 mL); 120 mg/0.8 mL (0.8 mL); 150 mg/mL (1 mL)

If patient will be discharged on this medication, and if followed at LPCH/SHC, please place CHAMPS consult order in EPIC.
Nephrotoxic Injury Negated by Just-in-time Action (NINJA): Basics

**Exposure Criteria:**
1. Receipt of 3 or more nephrotoxins concurrently (see list below).
2. Receipt of an aminoglycoside for ≥ 3 days.
3. Receipt of vancomycin for ≥ 3 days.

**Intervention:**
1. Patient care teams are notified that their patients are exposed to a large nephrotoxin burden.
2. Since these patients are at risk for nephrotoxic AKI, they are screened for AKI with a daily serum creatinine.

**List of Nephrotoxins for NINJA Program**

<table>
<thead>
<tr>
<th>Nephrotoxin</th>
<th>Gentamicin*</th>
<th>Ibuprofen</th>
<th>Naproxen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclovir</td>
<td>Gentamicin*</td>
<td>Ibuprofen</td>
<td>Naproxen</td>
</tr>
<tr>
<td>Ambisome</td>
<td>Ibuprofen</td>
<td>Pamidronate disodium</td>
<td></td>
</tr>
<tr>
<td>Amikacin*</td>
<td>Ifosfamide</td>
<td>Pamidronate disodium</td>
<td></td>
</tr>
<tr>
<td>Amphotericin B</td>
<td>Indomethacin</td>
<td>Pamidronate disodium</td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td>Iodixanol (Visipaque)</td>
<td>Pamidronate disodium</td>
<td></td>
</tr>
<tr>
<td>Captopril</td>
<td>Iohexol (Omnipaque)</td>
<td>Pamidronate disodium</td>
<td></td>
</tr>
<tr>
<td>Carboplatin</td>
<td>Iopamidol (Isovue)</td>
<td>Sirolimus*</td>
<td></td>
</tr>
<tr>
<td>Celecoxib</td>
<td>Iopromide</td>
<td>Sulfasalazine</td>
<td></td>
</tr>
<tr>
<td>Cidofovir</td>
<td>Ibuprofen</td>
<td>Tacrolimus*</td>
<td></td>
</tr>
<tr>
<td>Cisplatin</td>
<td>Ioxaglate meglumine/sodium</td>
<td>Tenovir</td>
<td></td>
</tr>
<tr>
<td>Colistimethate</td>
<td>Ioxilane</td>
<td>Ticaricilin/Clavulanic Acid</td>
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<tr>
<td>Cyclosporine*</td>
<td>Ketorolac</td>
<td>Tobramycin*</td>
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</tr>
<tr>
<td>Deferasirox</td>
<td>Lisinopril</td>
<td>Topiramate</td>
<td></td>
</tr>
<tr>
<td>Diatrizoate meglumine</td>
<td>Lithium*</td>
<td>Valacyclovir</td>
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<td>Losartan</td>
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<td>Methotrexate*</td>
<td>Vancomycin*</td>
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<td>Mitomycin</td>
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<td>Ganciclovir</td>
<td>Nafcinil</td>
<td>Zonisamide</td>
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Coumadin Teaching

Teaching should begin as soon as the patient arrives on PCU 200; teaching is done by Purple team pharmacist and/or by CHAMPS team. If patient followed at LPCH/SHC, please place CHAMPS consult order in EPIC.

Teaching points for families:

- Coumadin is a blood thinner (prevents blood clots from forming); coumadin blocks the action of vitamin K (vitamin K is needed to allow clotting factors to form clot and stop bleeding).
- The coumadin dose needed is different for each patient. There is no set dose for patient weight; therefore, close monitoring of the effect of coumadin is needed by checking frequent INR (international normalized ratio).
- A normal INR is 1.0-1.3; however, your child’s goal INR range is ________.
- Coumadin metabolism is affected by various factors including other medications (prescription and over-the-counter), diet, and concurrent illnesses.
- Before any health care provider prescribes another medication (including a short course of antibiotics for an ear infection or cold/flu medicines), remind him/her that your child is taking Coumadin, and notify the provider that monitors your INR that your child is being started on a new medication. More frequent INR checks may be required when starting a new medication, as some medications increase INR and others can decrease INR.
- Oftentimes, patients also are taking daily aspirin to thin the blood. It is safe to take both medications, as these medications work on different pathways:
  - Coumadin = anticoagulant; aspirin = antiplatelet
  - Do not take additional doses of aspirin (beyond the once-daily dose).
  - Do not routinely take ibuprofen (Motrin, Advil) as ibuprofen and similar medications (NSAIDs) can affect coagulation pathways.
- Aim for a well-balanced and stable diet. Discuss any plans for major changes in patient’s diet with cardiologist prior to making changes. Eating lots of foods high in vitamin K (including spinach, broccoli and other green leafy vegetables) or taking supplements with vitamin K (such as a multivitamin) will impact how Coumadin works (more vitamin K in your diet means more Coumadin is needed to block its effect). You do not have to eliminate these foods from the patient’s diet; instead, try to keep the amount of these foods consistent. Avoid grapefruit juice.
- Coumadin side effects include: (Keep in mind that bleeding can occur internally and externally):
  - Epistaxis (bloody nose)
  - Blood in urine or stool
  - Bruising
  - Unusual headache
- Safety/bleeding precautions: no collision sports; always wear helmet while riding bicycle; if child falls and hits head, contact MD or Emergency Dept; if patient has a cut from which bleeding does not stop, contact MD or Emergency Dept.
- Call your cardiologist or whoever is managing your child’s Coumadin if side effects present, changes in diet or concurrent illness such as vomiting or diarrhea (as patient can lose vitamin K).
- Document the Coumadin calendar in every discharge summary when going home on Coumadin! Here is the dot-phrase:

<table>
<thead>
<tr>
<th>INRCAL</th>
<th>Coumadin Calendar</th>
</tr>
</thead>
<tbody>
<tr>
<td>INR Goal:</td>
<td></td>
</tr>
<tr>
<td>INR: Value (need to enter Coumadin Dose) Date:</td>
<td></td>
</tr>
</tbody>
</table>
1) Chart review of opiate, benzodiazepine, alpha 2 agonist use, and patient’s withdrawal and pain history.
   a) Determine patient’s steady state requirement.
   b) Prior history of weaning, smooth or problematic: from chart and family.
      i) Periods of poor weaning especially need to be understood - what went wrong?
      ii) Share this knowledge with the pain service when calling for consultation.
   c) For patients needing an opioid or benzodiazepine taper:
      i) Contact your clinical pharmacist.
      ii) Place a Pharmacy Consult Order in Epic.
      iii) The clinical pharmacist will enter a Consult Note with a recommended weaning schedule.

Example of Weaning Plan: This will be supplied by Purple Team Pharmacist.

2) Wean by 20% of the steady state dose for around 4 dose changes.
3) Then wean by 20% of this dose (which is now 20% of the original dose, so you have cut weaning rate to only 4% of the original dose), for 5 dose changes to off. For additional recommended schedules see Table 1.
   a) The trick with small doses is that some reasonable rounding is needed so that the RN/parent can draw it up. See Table 2.

4) Additional Rules applied to steps 2 and 3:
   a) Only wean one drug per day (so if you get into problems you have only one drug to blame).
   b) OK to alternate weaning of drugs or wean one drug at a time, but methadone can only be weaned every other day due to its long half-life.
   c) DO NOT wean on days when other major changes/medical issues are happening (procedures, assessment of moderate or severe symptoms of any kind such as fevers, worsening in respiratory function, unstable GI issues, etc). The rationale for this is that it clouds assessment of the unstable condition, stresses the child, and brings concern for withdrawal into the differential at a time when you want to control for as many variables as possible.

5) Try to make things enteral and on a schedule that's going to be reasonable for going home ASAP. But in doing so, keep intervals logical for pharmacokinetics of drug.
   a) Lorazepam is the biggest issue as it won’t stay steady state if you give q8; keep q6. The only times q8 may work is when child also on methadone that is also being given q8. In those cases the two drugs are staggered q4, and so methadone peak may be covering up the tail end dose lorazepam withdrawal.
   b) Methadone is based more on total daily dose, to determine frequency it's more the practical issue of how high each dose is because you do get a peak effect 1-2 hours after each dose, though most of the time you are steady state. It also has a long and variable half-life, between 17 and 96 hours, not related to any predictable patient factors.
      i) Not everyone needs methadone. If opiate use was closer to the minimum 5-7 days needed to see dependency develop, we just wean the short acting opioid because you can wean off twice as quickly (limited of course by post-op pain requirements).

6) General trouble-shooting:
   a) If patients have had problems weaning when wean rate was reasonable (at or less than the 20% and 4% quoted above), slow down the taper! We have done 10%, down to even as low as 5% every 3 days because the patient didn’t tolerate it.
b) It is important to “control” for patient’s baseline symptoms.
   i) If patient ALWAYS has a bit of infant irritability and/or loose stools, don't count baseline fussiness and pooping pattern as agitation and diarrhea and worry for withdrawal.
   ii) There can be benefit to "parking" the taper (not making changes for several days) to reassure yourself they score 4 even without tapering!
   iii) As you resume tapering, subtract from the score those items of the score reflecting baseline symptoms to get your true score when determining readiness to taper.

7) The clonidine patch is better than q4 oral dosing.
   a) It's just not practical for families to go home on q4 anything for very long unless it's a tiny infant who they're up feeding that often anyway.
   b) Keep a low dose patch on until the taper of opioid and benzodiazepine is complete as clonidine has been shown in the literature to mitigate withdrawal symptoms.

Table 2.
Minimum Oral Doses

<table>
<thead>
<tr>
<th>Medication - Opioids</th>
<th>Oral Concentration</th>
<th>Minimum dose and increment change = 0.05ml</th>
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</thead>
<tbody>
<tr>
<td>methadone</td>
<td>1mg/ml</td>
<td>0.05mg</td>
</tr>
<tr>
<td>morphine</td>
<td>2mg/ml</td>
<td>0.1mg</td>
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<tr>
<td>hydromorphone</td>
<td>1mg/ml</td>
<td>0.05mg</td>
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<thead>
<tr>
<th>Medication - Benzodiazepines</th>
<th>Oral Concentration</th>
<th>Minimum dose and increment change = 0.05ml</th>
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<tbody>
<tr>
<td>lorazepam</td>
<td>2mg/ml</td>
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<tr>
<td>diazepam</td>
<td>1mg/ml</td>
<td>0.05mg</td>
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T. Tesoro 2015.04.14
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<tr>
<th>Step</th>
<th>Opioid</th>
<th>Benzo</th>
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**Table 1.**

<table>
<thead>
<tr>
<th>Step Taper (Low Risk)</th>
<th>Step Taper (Medium Risk)</th>
<th>Step Taper or more (High Risk)</th>
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<tbody>
<tr>
<td>Patients on opioids or benzodiazepines 5-9 days</td>
<td>Patients on opioids or benzodiazepines 10-21 day</td>
<td>Patients on opioids or benzodiazepines &gt; 21 days</td>
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<tr>
<td>DO NOT use methadone</td>
<td>Recommended opioid: methadone</td>
<td>Morphine &gt; 0.1 mg/kg/hour</td>
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<tr>
<td>DO NOT use diazepam</td>
<td></td>
<td>Midazolam &gt; 0.2 mg/kg/hour</td>
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</table>

- Calculate 20% of initial opioid and benzodiazepine dose (Day 0) = increment for each step of wean
- Wean both opioid and benzodiazepine on same day 12 hours apart
- Do not wean both medications on same day

---

**Step 1**
- Opioid: 20% initial
- Benzo: 20% initial

**Step 2**
- Opioid: 20% initial
- Benzo: 20% initial

**Step 3**
- Opioid: 20% initial
- Benzo: 20% initial

**Step 4**
- Opioid: 20% initial
- Benzo: 20% initial

**Step 5**
- Opioid: OFF
- Benzo: 20% initial

**Step 6**
- Opioid: 10% initial
- Benzo: 20% initial

**Step 7**
- Opioid: 10% initial
- Benzo: 10% initial

**Step 8**
- Opioid: 10% initial
- Benzo: 10% initial

**Step 9**
- Opioid: 10% initial
- Benzo: 10% initial

**Step 10**
- Opioid: 10% initial
- Benzo: 10% initial

**Step 11**
- Opioid: 10% initial
- Benzo: 5% initial

**Step 12**
- Opioid: 5% initial
- Benzo: 5% initial

**Step 13**
- Opioid: 5% initial
- Benzo: 5% initial

**Step 14**
- Opioid: 5% initial
- Benzo: 5% initial

**Step 15**
- Opioid: PRN
- Benzo: 5% initial

**Step 16**
- Opioid: OFF
- Benzo: 5% initial

**Step 17**
- Opioid: OFF
- Benzo: OFF
General Feeding Goals and Guidelines for Pediatric Cardiac Patients
(Updated in Spring 2017 by Kaitlyn Dennis, RD)

Caloric Goals:
• Fully repaired minor defects: May not need fortification. See if they grow!
• Non-Single Ventricle: at least 120 kcal/kg/day
• Single Ventricle: at least 140 kcal/kg/day

Key Points:
• Be mindful of total fluid volume taken in (min and max)
• May need to fortify in calories in order to get adequate growth on lower volume for fluid balance or to get NG tube out sooner. For example, if the 5kg patient needs 480kcal/day (90ml q 3hrs at 20kcal/oz for ~96kcal/kg/d) and is able to PO 75ml Q3hr. By fortifying to 24 cal/oz, the baby will get the same calories (with adequate volume at 120ml/kg/d) all via PO. The pediatrician or cardiologist can decrease fortification as PO intake improves as an outpatient.
• For patients who need additional calories after tolerating full feeds and meeting protein needs, MCT oil TID provides concentrated calories (start with 1ml p.o. TID & up-titrate as tolerated to 3ml p.o. TID; monitor for diarrhea).

Transitioning from continuous NG to PO:
• Divide 24-hour intake into 8 bolus feeds, initially administered over 2 hours.
• Decrease duration of feeds to goal of 30min-1hour (depending on volume and patient tolerance)
• Offer PO before bolus and run remainder via NG tube

Chylothorax:
• All infants with Chylothorax should be transitioned to Enfaport (FDA approved for patients <1 year old) or Monogen (FDA approved for patients between 1 year-10 years of age)
• Older children should be on a strict low-fat diet with the following restrictions:
  • For patients <3 years old, <5grams fat/day
  • For patients >3 years old, consider liberalizing restriction in discussion with nutritionist to ensure meeting essential fatty acid needs

Please remember that our Cardiology nutritionist, Katelin Dennis, RD, is available to discuss nutritional goals and devise optimal strategies to meet the needs of individual patients.

Helpful dot-phrases for discharge summaries:

| .MIXFORM | Continue to feed your baby *** formula fortified to ***kcal/oz per instructions provided. Give ***mL every ***hours by mouth/via NG tube/by mouth first then give the remainder via NG tube. Total daily volume goal: ***mL. |
| .MIXBM | Continue to feed your baby Fortified Maternal Breast Milk with *** formula powder to ***kcal/oz per instructions provided. Give ***mL every ***hours by mouth/via NG tube/by mouth first then give the remainder via NG tube. Total daily volume goal: ***mL. |
Chest Tube Management in Post-Operative Patients (Guideline Summer 2018 to current)

The guidelines described below are for patients with congenital heart disease in the post-operative period whether in the CVICU, PICU, NICU or on PCU 200.

Two-ventricle patients:

1. There are no specific recommendations regarding fluids, diuretics, oxygen or diet. Encourage early OOB and ambulation. There is NO REQUIREMENT to ambulate\(^1\) or to have diet restarted\(^2\) to pull chest tubes!

2. Criteria for Chest Tube Removal:
   a. **Goal to remove tubes on POD 1 when these criteria met:**
      i. Closed chest & no atrial lines
      ii. CXR shows no pneumothorax and no significant effusion
      iii. Count drainage **AFTER the first 12 hours** in CVICU. Remove if fluid is serous (non-bloody and non-chyloous) and output is downtrending \((\leq 1\text{cc/kg/HOUR})\).
         E.g. 10kg patient 3pm arrival POD 0 \(\rightarrow\) start looking at 3am on POD 1. If <10cc/hour/tube OK to remove tube(s).
   b. If 1 or more chest tubes stay in past POD 1, tube(s) may be removed if it meets the following volume criteria without evidence of a significant pleural effusion or pneumothorax by chest radiograph:
      i. Drainage of less than 10ml/kg/tube over most recent 24 hr period
      ii. Drainage of less than 5ml/kg/tube over most recent 12 hr period
      iii. Adult size patients (> 30 kg) if drainage <300ml/tube in last 24 hr.

3. Discharge:
   a. Patients ≥ 15 kg:
      i. If chest tubes are removed before 3 p.m., patient may be discharged 3 hours after chest tube removal if post-tube removal chest X-ray is unremarkable, specifically, showing no evidence of pneumothorax.
   b. Patients <15 kg:
      i. Patients should be observed overnight and may be discharged if the repeat chest X-ray the following morning is unremarkable, specifically, showing no evidence of pneumothorax or reaccumulation of pleural fluid.

Management of recurrent pleural effusions:

1. Reinstitute diuretics, oxygen, low fat diet and fluid restriction.
2. Insert chest tube if effusion increasing by chest X-ray two days in a row and if at least moderate in size, or if symptomatic. Email Alaina Kipps or Sara Heller.

Single ventricle patients: Change proposed here is liberalization from 4cc/kg per tube in 24 hrs to 6cc/kg per tube in 24hrs.

1. Fluid management:
   a. For infants not taking solids, restrict intake to 80% maintenance while on IV fluids. In those taking p.o., these restrictions may be liberalized to maintenance (or p.o. ad lib) to allow for adequate caloric intake.

\(^1\) Fine to stand/ambulate but do not need to count the output against them
\(^2\) Unless the surgeon or CVICU attending are particularly concerned for risk of chylothorax.
b. For older patients taking solids restrict intake to 80% maintenance until chest tubes have been removed.

2. Diuretics
   a. Diuretics should be instituted using Lasix 1 mg/kg q8h IV.
   b. Add diuril only to patients with clinical evidence of significant fluid overload.
   c. The regimen should be changed to Lasix 1 mg/kg q8-12h p.o. upon initiation of enteral fluids/feeds.

3. Supplemental Oxygen: In patients after Glenn or Fontan procedure:
   a. Consider supplemental oxygen at a minimum 1 liter/minute by nasal cannula until chest tubes have been removed regardless of O2 saturation (no mandate).

4. Diet
   a. Patients should be maintained on a low fat diet until chest tubes removed.

5. Chest tubes may be removed if they meet the following volume criteria without evidence of significant pleural effusion by chest radiograph:
   i. Drainage of less than 6 cc/kg/tube over any 24 hr period
   ii. Drainage of less than 3 cc/kg/tube over any 12 hr period
   iii. Adult size patients (> 30 kg) if drainage < 200ml/tube in last 24 hr.

6. Discharge:
   a. Observe patient overnight after chest tube removal. If repeat chest x-ray shows no significant accumulation; discharge home on oral Lasix.
   b. Local patients may go home and should be seen for a follow-up chest x-ray with their private cardiologist in 2-3 days.
   c. Non-local patients should stay locally (e.g. Ronald McDonald House) until seen in our clinic for a chest X-ray in 2-3 days. If no recurrence of effusion they may return home.

Management of recurrent pleural effusions:
1. Reinstitute or advance diuretics.
2. Insert chest tube if effusion increasing by CXR two days in a row and if at least moderate in size or if symptomatic. Email Alaina Kipps or Sara Heller as we are tracking all these.

[Patients who need CT replacement or readmission due to recurrence of pleural effusion within 7 days of discharge will be tracked as a balancing measure for this guideline].

Chylous effusions (triglyceride level >100 mg/dl or cell count >1000 cells/mm3 with predominance (>80%) of lymphocytes if being fed, or if pleural TG> serum TG):

** No change made compared to 2016-17 recommendations **
1. Manage diuretics and fluids as outlined in single ventricle patients above.
2. Diet:
   a. Initiate MCT diet at current feeding rate for 24-36hrs.
   b. If CT output < 20mL/kg/day, continue MCT diet another 2 days and advance to full volume (at least 40mL/kg/day).
   c. If CT output < 10mL/kg/day and fluid appears clear/non-cloudy, may remove using SAME guidelines as above for 2V or 1V respectfully.
   d. Consider NPO/TPN if high output (>20mL/kg/day).
   e. Consider octreotide 1mcg/kg/hr IV or 40 mcg/kg/day divided q8 subQ if still high output put after 6 days of NPO/TPN.
3. Remove chest tube as above.
4. Continue diet for 4 weeks after resolution of effusion/removal of the last chest tube.
How to Write a Good Echocardiogram Requisition

In general, communication to the Echo Lab including the **pertinent patient history** (including descriptions of any recent interventions or surgeries) and the **current clinical concern** will lead to the most complete echocardiogram and interpretation. **It's best for patient care!**

It is acceptable to use abbreviations if they are typically used in cardiology. When in doubt, please spell it out.

**Ordering echocardiograms on the Purple Team or CVICU:**

Examples of excellent communication include:

- "hx of OHTx, not taking immunosuppression for 5 days, hx of diastolic dysfunction and CA disease. Eval function, effusion"
- “s/p CoA repair. Please eval MV gradient, ASDs, function, arch repair”
- “h/o Senning and DTGA with PS now s/p double switch and senning takedown, poor fxn in OR, high LAp, eval fxn, anatomy”
- “s/p TOF repair with transannular patch, eval postop anatomy and fxn. Full d/c echo”
- “DORV and D-TGA, severe TR, coarc repair, PAB - new pulm embolus - assess band gradient, function”

**Examples of poor communication include:**

- “Cardiac function”
- “s/p cardiac surgery”
- “Other”
- “Pericardial effusion”
- “Full d/c echo”

**Ordering echocardiograms on ANY other service: NICU, PICU, WBN, or any other team:** There are a handful of reasons to do an echocardiogram that do not require initial consultation with the inpatient cardiology service. These include:

- 2+ POSITIVE BCx: Eval for Endocarditis
- Baby w/multi cong anom: Eval for CHD
- Congenital diaphragmatic hernia PulmHtn
- Fetal dx Cong heart disease
- Pre-chemo/SCT: Evaluate function
- Pre-liver/small bowel Tx: Eval for PFO
- Premature infant: Evaluate for PDA
- Rheum eval: PulmHtn, check for pericardial effusion
- Vasculitis/Kawasaki: Eval CAs, PE, fxn

Depending on the service the patient is admitted to and the indication, you will either be able to place the echo order or it will need to be discussed with the cardiology consult service. In this case, EPIC will inform you that the cardiology fellow on call (1-HART) will call you for more details and may need to do a consultation prior to the echocardiogram. The Echo Lab will wait until the cardiology consult team approves these requisitions. This way if your concern is, for example, “murmur”, they can narrow the differential after the exam of the patient to best guide the echocardiogram.

**STAT echocardiograms reserved for patients with immediate life threatening conditions. These need to be discussed directly with an echocardiography attending. EPIC will prompt you.**
ACC/AAP/AHA/ASE/HRS/SCAI/SCCT/SCMR/SOPE 2014
Appropriate Use Criteria for Initial Transthoracic Echocardiography in Outpatient Pediatric Cardiology.
There is no AUC for Inpatient Pediatric Patients (yet).

The rating of A, M, or R is then followed by the median score in parenthesis for that particular indication.
Abbreviations: A = Appropriate; M = May Be Appropriate; R = Rarely Appropriate; ECG = Electrocardiogram.

J Am Coll Cardiol. 2014;64(19):2039-2060. doi:10.1016/j.jacc.2014.08.003
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# Patient Discharge Checklist

## Medical Care Checklist

<table>
<thead>
<tr>
<th>Task</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Op echocardiogram: Completed and burned to CD</td>
<td></td>
</tr>
<tr>
<td>Post-Operative EKG. Use word “discharge” in order comments if day of d/c</td>
<td></td>
</tr>
<tr>
<td>Perfusion Scan (as needed)</td>
<td></td>
</tr>
<tr>
<td>F/U cardiac catheterization arranged (as needed)</td>
<td></td>
</tr>
<tr>
<td>Rx completed and faxed to pharmacy (Did parent pick them up?)</td>
<td></td>
</tr>
<tr>
<td>Orders for oxygen, NG pump, NG supplies, formula given to case management and signed by attending</td>
<td></td>
</tr>
</tbody>
</table>

**Cardiologist:** ____________________________ M.D.
Follow up appointment made
Cardiologist updated by Attending or Fellow

**PCP** ____________________________ M.D./N.P.
Follow up appointment made
PCP updated by NP/PA/resident

Other consulting services follow up booked

For all CPMC and Walnut Creek patients discharged with NG feeds, please contact NP via EPIC (CPMC: Analise Hagstrom; Walnut Creek: Karen Tang). See next page.

Outpatient orders for Occupational Therapy and/or Physical Therapy

If pt with Down Syndrome, referral to LPCH Down Syndrome Clinic

Nursing education including medications, placement of NG tube, discharge education complete

Influenza vaccination (Children > 6 mo). Also encourage family members to get vaccinated!

Synagis if indicated/winter months

Concerns from social work addressed (as needed)
- Packet made for Cardiologist
- Packet made for PCP

Follow-up diagnostic tests:
- CXR
- Labs
- Echo

Letters of medical necessity written:
- Oxygen on plane
- Safe to return home

**If neonatal discharge, confirm neonatal health maintenance***:
- ALGO screen
- Car seat test
- Immunizations
- Newborn screen results
- Genetics: FISH for 22q11 deletion, CGH results

Estimated discharge date: ____________________________
Karen Tang, NP at Walnut Creek – for Janaki Gokhale and Amy DiPietro’s patients
Analise Hagstrom, NP at CPMC (in Pediatric Cardiology Dept) → for Ellen Chan, Nikola Tede, and Sarina Behera’s patients (anhagstrom@stanfordchildrens.org)

**All patients discharged with NG or g-tube feeds etc. If in doubt, send EPIC inbox message to these NPs**

**Care guidelines for days leading to discharge:**
1. Always obtain a CXR after chest tube removal to evaluate for pneumothorax. (Best to order CXR right after CT removal.)
2. Usually we will also have a CXR for the next morning to assess for re-accumulation of pleural fluid. Most often this is the day of discharge – if so designate “pending discharge” on requisition so it is prioritized.

**Follow-up Care – Have CCL help with booking these follow ups.**
1. Cardiologist:
   a. Sees patient within 1-2 weeks of discharge; appointment made before discharge.
   b. Child may be seen at LPCH Heart Center if referring cardiologist unavailable/patient out of state.
2. Pediatrician/PCP:
   a. For infants, try to ensure follow up within one week of discharge
   b. All other patients, recommend family set up appointment within 1-2 weeks
3. Consulting Services:
   a. Services which consulted on patient in hospital may require follow up such as ENT, GI, ID.
   b. For all CPMC and Walnut Creek patients discharged with NG feeds, please contact NP via EPIC (CPMC: Analise Hagstrom; Walnut Creek: Karen Tang). See next page.
4. Follow-up diagnostics:
   a. Patient may require a follow up CXR, INR, echo. Make sure these arrangements are clear with family.
5. May have cardiac cath or surgical date set up:
   a. For example, our Norwood patients or staged unifocalizations will have a pre-surgery cardiac cath and surgical date arranged before discharge.
6. Follow-up at LPCH:
   a. Unless referring cardiologist is at LPCH, patients will be seen by referring cardiologist and PMD (see #1 above).
7. Stitch removal:
   a. Often, stitch will be removed at follow up appt. However, arrangements may be made for patient to return to LPCH Heart Center clinic to have PAs remove any stitches. **Specify when to remove stitch in d/c summary.**
8. If family returns to unit after discharge:
   a. Notify team; most likely patient will need to go to ER. No formal assessment should be made on the floor.
9. Packets:
   a. “Packets” refers to folders containing medical records which are provided to family for their outpatient pediatrician/cardiologist. They contain records of the hospital stay. A HIPAA form is signed to release this medical information. USAs coordinate this.
Physical Activity – Post-Op Guidelines

<table>
<thead>
<tr>
<th>Infants</th>
<th>Older Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternal precautions: No lifting underneath the arms for at least 6 weeks</td>
<td>No heavy lifting, No backpack x 2 months, No swimming for 6 weeks</td>
</tr>
<tr>
<td>Demonstrate scooping method (support head and neck and bottom)</td>
<td>No monkey bars</td>
</tr>
<tr>
<td>Encourage “tummy time” 2 weeks after sternal closure with goal 40 minutes/day (can be broken down into 4 10-minute sessions)</td>
<td>No contact sports (e.g. football, basketball, soccer, rough play, bike riding, wrestling, skating, gymnastics). Avoid activities that might cause injury to chest</td>
</tr>
</tbody>
</table>

10. Special circumstances:
   a. **Oxygen requirement on flight/at home:**
      i. Some patients may require oxygen for a flight
      ii. Case management will help arrange.
      iii. May need extra mask or appropriate nasal cannula dispensed before discharge.
   b. **Pulmonary measures**
      i. Chest physiotherapy, incentive spirometry, cough and deep breath, nebulizers.
      ii. RN and RT can work together to teach family these methods.
   c. **Recommendations for follow up on MAPCAs patients (per Dr. Hanley)**
      i. For patients who have undergone unifocalization but not complete intracardiac repair (VSD still open): Catheterization at 4-6 months postop
      ii. If the patient has an AP window they should have a cath 3 months post-op
      iii. For patients who have undergone unifocalization and complete intracardiac repair: Echo and perfusion scan every 3 months for 1 year and Catheterization at 1 year postop.
      iv. All patients should have an LPS prior to discharge and every 3 months.
   v. **Use the .dcmmapca smart phrase for d/c summary**

Return to School
- Should be able to return to school in 2-4 weeks.
- May go back ½ day or only 3 out of 5 days.
- No gym for 3 months.
- When children can return to school depends on referring cardiologist. Encourage families to have this conversation with providers.
- Discuss with cardiologist letter to school regarding the surgery and any activity restrictions.
- May need letter for school gym class.

Sternal Incision Care
General
- Sternal thoracotomy gauze should be removed 48 hours after surgery. If standard incision, leave open to air if patient is extubated or not a neonate.
- Watch top of incision closely where moisture (drooling or pooling saliva) collects between chin and incision. Consider gauze/barrier if skin is at risk for being irritated.
- Running or interrupted stitches removed 7-14 days after surgery; check with PAs.
- Steri-strips fall off in 2-3 weeks on their own. Do not pull off!
- Sternal wires holding bone together – have medical team show CXR if family wants to see what they look like.
- Itching is a normal sign of healing.
- Protect the incision from sun to decrease darkening of scar (keep it covered with clothing).
- Keep nails short.
- **DO NOT APPLY** creams/lotions to incision, including antibacterial ointments such as Neosporin (this direct moisture is a potential route for bacteria to enter.)
• Emphasize that incision will continue to heal at home and family is seeing it in its most raw state.
• Scar should become lighter and more approximated with surrounding skin.
• Report any redness, swelling, and/or drainage from incision site (anything different than what family is used to seeing.)

**Bathing/Showers**
• No complete submersion in water for 6 weeks from chest closure. Prolonged moisture in sternal site is potential route for bacteria.
• No rough scrubbing at site. Pat towel dry. Have families practice a bath before discharge.
• Babies or older kids can sit waist high in tub. Just not complete submersion.
• Showers can be taken after 2 weeks (but depends on how incision is healing, check with PA’s) and encourage to have water run on back to avoid direct pressure to incision.

**Skin Care – Other**

**Chest tube site**
• Occlusive dressing removed 48 hours after chest tube removal.
• Stitches removed 4-7 days after CT removal (may end up being a follow-up appointment).

**Vascular access**
• D/C PIV’s just prior to discharge.
• Central lines/PICCs: d/c’d by CV surgery, NPs, vascular access nurses, or RNs in CVICU or PCU 200 who have competency.
• PICC wires may remain in place for home infusions.

**Pacer wires**
• Once rhythm stable and EKG reviewed, they are d/c’d prior to discharge. BEST if done with CT removal. For patients < 6 mo, try to coordinate with full d/c echocardiogram to avoid repeat imaging.
• Patient needs BP checked before and vitals checked one hour after removal.
• Infants or patients where there was difficulty removing the wires will need a “targeted echo” to just check for pericardial effusion per CV surgery.

**SBE Prophylaxis**
American Heart Association endocarditis committee changed guidelines in April 2007:
• Antibiotics prior to a dental procedure are reserved for those at highest risk for adverse outcomes resulting from bacterial endocarditis.
• Recommend no routine dental work until patient sees outpatient cardiologist.
• Refer them to cardiologist for decision for antibiotics.

**Immunizations**
Delay all immunizations for 6 weeks post-operatively (for pts s/p cardiopulmonary bypass). Why?
1. Effect of bypass; thought that children who have undergone bypass will not accept vaccine the same way.
2. Also, any fever, rash, or reaction associated with vaccines is difficult to distinguish from fever associated with post-op infection.
3. Synagis (RSV prophylaxis) is not an immunization. It may be given before discharge if child qualifies for it.
4. Children with prolonged hospitalization may be appropriate to immunize during hospital stay.
LPCH Home Monitoring Program for Single Ventricle Patients

The goal of the HMP is to identify physiologic disturbances prior to decompensation and to provide an “early warning” system to allow for timely interventions.

The HMP multidisciplinary team consists of cardiology nurse practitioners, a nurse case manager, a nutritionist, and a single supporting cardiologist (Gail Wright, MD).

Each family receives an “HMP Binder” consisting of an explanation of the HMP, a diagram of the patient’s anatomy, “red flag” indicators, important phone numbers, information for emergency medical providers, and documentation sheets for daily entries.

“Red flag” indicators are signs or symptoms which should prompt an immediate call to the cardiologist or the HMP nurse practitioner (NP):

1. Oxygen saturation < 75%
2. Weight loss of 30 grams or more over a 2-3 day span, or lack of 10-20 gram weight gain over 3 days
3. Respiratory Distress
4. Fussiness

Basic communication algorithm:
1) Parent calls NP with concerns or NP notes a problem during a surveillance call.
2) NP advises parent to have closer than routine phone follow-up with HMP NP, to call primary cardiologist for a visit, or to go to ED, based on NP assessment of severity of the issue.
3) NP notifies HMP cardiologist that problem was identified (timing based on severity of the issue and triage of the patient).
4) HMP cardiologist calls primary cardiologist directly to communicate concern and arrange appropriate follow-up.
5) NP calls parent back later in same day to confirm that patient had been seen and that concerns were being addressed. If for some reason the primary cardiologist was not available, arrangements are made for follow-up at LPCH, with the pediatrician, or a local ED with instructions to notify HMP team upon arrival.
6) NP documents phone call and clinical issues in LPCH electronic medical record so the concerns and plans were accessible to all HMP team members and to on-call cardiology fellows.

The primary NP speaks directly with the pediatrician, and the HMP cardiologist communicates directly with the outpatient cardiologist just prior to hospital discharge.

Throughout the interstage period, the parents record heart rate, oxygen saturation, weight, and enteral intake once daily. Parents are prompted to call for ‘red flags’, changes in trends of surveillance data, or any symptoms they find atypical or concerning.

Weekly phone calls from a primary NP track changes in clinical status. Information from these calls are used in conjunction with assessments by the primary cardiologist and pediatrician to
adjust the medical and nutritional regimen.

When there are clinical concerns—either from the parent or from the care team—or “red flag” criteria, an action plan is created. Depending on the severity of the clinical concern, either HMP call frequency is increased, or the patient is seen by a clinician. This may be by the primary cardiologist or pediatrician, or in the local Emergency Department, or the LPCH Emergency Department.

Overall, clinical concerns are presumed to be cardiac in nature until proven otherwise, and there is a low threshold to have the patient seen whenever issues arise throughout the interstage period.
Provider Discharge Checklist for HMP Patients

Medications:
- [ ] Prescriptions sent to pharmacy
- [ ] Medications have been picked up
- [ ] Parents giving medications

Feeding:
- [ ] Goal feed volume/schedule (~150kcal/kg/day) provided to family
- [ ] Formula mixing recipe provided (including without MBM)

Development:
- [ ] PT/OT Outpatient prescriptions signed and given to parents
- [ ] Neurodevelopmental plan in place and referrals made to appropriate clinics (i.e. HRIF)

Case Management:
- [ ] Pulse ox ordered and vendor has taught parents
- [ ] Scale given and parents taught how to use
- [ ] Other supplies have been ordered and parents taught how to use (i.e. NGT)
- [ ] Confirmation of availability of home formula

HMP Teaching:
- [ ] Give Complete HMP binder to parents
  - [ ] Review anatomy & provide diagram
  - [ ] Review Interstage timeline
  - [ ] Review program goals
  - [ ] Review documentation
  - [ ] Review when and who to call
- [ ] Ask parents to return demonstrate/explain
- [ ] Overnight stay completed with all care provided

Health Care Maintenance:
- [ ] CPR Teaching: Order CPR kit from central supply
- [ ] Car Seat Test
  - [ ] ALGO □ passed □ referred
  - [ ] Newborn Screen, Results of FISH
  - [ ] FeSO4 (for DC regardless of Hct)
  - [ ] Synagis, if indicated by viral season
  - [ ] Head Circumference within 2 days of discharge (for initial d/c of newborns)

Discharge Planning:
- [ ] Ensure discharge teaching has been completed by RN’s
- [ ] Call cardiologist for an update, and make an appointment
- [ ] Call PMD to ensure he/she is comfortable caring for patient, and make appt
- [ ] Place outpatient appointment requests for other specialties (i.e. GI)
- [ ] NPC-QIC consent obtained and data collection started (Norwoods only)
- [ ] Cath Scheduled (~3mo birthday)
- [ ] Glenn Scheduled (1-2 weeks after cath)
- [ ] Discharge plan confirmed with Kelly/Gail
- [ ] Discharge packets made and given to family
  - [ ] Ensure the written action plan form is in the discharge packet
  - [ ] Ensure the PCP letter materials are in the discharge packet
CARING FOR CHILDREN WITH VENTRICULAR ASSIST DEVICES (VADs)

A. Goals of VAD therapy:
   1. Bridge to Transplant:
      a. Most common reason for VAD on 3W: children listed 1A for heart transplant.
   2. Bridge to Recovery:
      a. Myocarditis.
      b. Acute rejection of heart transplant.
   3. Destination Therapy:
      a. Poor transplant candidates (e.g. social concerns).
      b. Short life expectancy (e.g. muscular dystrophy).
      c. Personal choice.

B. Device types used at LPCH:
   1. Berlin EXCOR: Can have LVAD alone or both LVAD and RVAD.

      - **LVAD**
        Inflow – Left Ventricle
        Outflow – Ascending Aorta
      - **RVAD**
        Inflow – Right Atrium
        Outflow – Main PA
      - **VADs are Pneumatic & Pulsatile**
        Blood is drawn out of LV by suction applied to a membrane (negative pressure).
        Air pressure reverses and blood is ejected into the aorta.
        Operates at a fixed rate, completely independent of intrinsic contraction of the heart.
        Complete filling and emptying are not guaranteed.
        Pump-ventricular interactions can either augment or inhibit ventricular ejection.
        Come in many sizes: 10mL, 25mL, 30mL, 50mL, 60mL, and 80mL.
        Goal Hemodynamics: CVP 8-15, normal blood pressure.

      - **Cardiac output = chamber volume x VAD rate + native ejection**

      - What can go wrong?
        Pump Filling (Failure to fill completely)
        - Should fill at least 75% of chamber volume
        - DDX: LV inflow cannula obstruction, hypovolemia, pleural or pericardial effusion, RV failure. Also may not be a problem for certain patients.
        Pump Emptying (Failure to empty completely)
        - Should eject 100% of volume that fills. Always a problem if not 100% ejection.
        - Cannula obstruction, systemic hypertension.
Infection:
- Difficult to clear
- Inflammation interferes with the coagulation cascade
- Can sensitize the patient (makes finding a donor heart more difficult)
- Can interrupt accumulation of active transplant waiting days when listed status VII.

Bleeding and Clotting:
- Finding the right balance can be challenging.
- Typical medications used include heparin, lovenox, Coumadin, aspirin, clopidogrel, and dipyridamole.
- Lab tests for monitoring anticoagulation and antiplatelet functions include: CBC, PT/PTT, INR, heparin level, anti-Xa level, thromboelastography (TEG) monitoring, and platelet mapping.

2. HeartMate II

- Internal Axial flow pump/external power source.
- **How Does It Work?**
  RPMs set to achieve an appropriate cardiac output and appropriate LV decompression.
  Hemodynamics optimized with echocardiography.
  Beware of suction events!
  Goal 1:3 aortic valve opening/contraction.
- **Average Settings/Readings:**
  Speed: ≈ 8000 - 10,000 RPM
  Power: ≈ 5.5-8 W
  Flow: ≈ 4-6 liters/min
  Pulsatility Index: ≈ 4-6
- **Adverse events**: Similar in kind to Berlin Heart: infection, clotting/stroke, bleeding.
- **What is a RAMP echo study?**
  - Performed when there is a question about the function of the HM2 (device obstruction).
  - Test of the devices’ ability to decompress the LV.

3. Rehabilitation:
- Key aspect to PCU 200 care of patients with VADs is facilitating rehab activities including PT/OT and attending school.
- Whereas Berlin VAD patients are inpatient during their wait for transplant, many of our HeartMate patients have been discharged home!