It's Not Always About the Surgeons – Optimizing Medical Outcomes in the CICU

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Children's
HOSPITAL
BJC HealthCare

PC4 PAC3

WashU
Medicine

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CME Objectives

- To leverage experience from centers with a high volume of medical admissions regarding pearls of management of select conditions (ie: decompensated L and R heart failure, fontan failure, pulmonary hypertension)
- To share processes and programs in place at centers with a high volume of medical admissions and strong outcomes.
- To learn about initiatives to combat cardiac arrest in the cardiac medical population from centers with a high volume of medical admissions and strong outcomes.

Giving Medical Admissions Their Due!

- Of the admissions captured in PC4, roughly 30-40% are medical admissions
- A key metric of overall CICU and team performance
  - We REALLY own these kids from start to finish
  - Vulnerable populations
    - Heart failure
    - Pulmonary HTN
    - Intractable arrhythmias…
  - Sometimes can be the most challenging/require the most amount of teamwork

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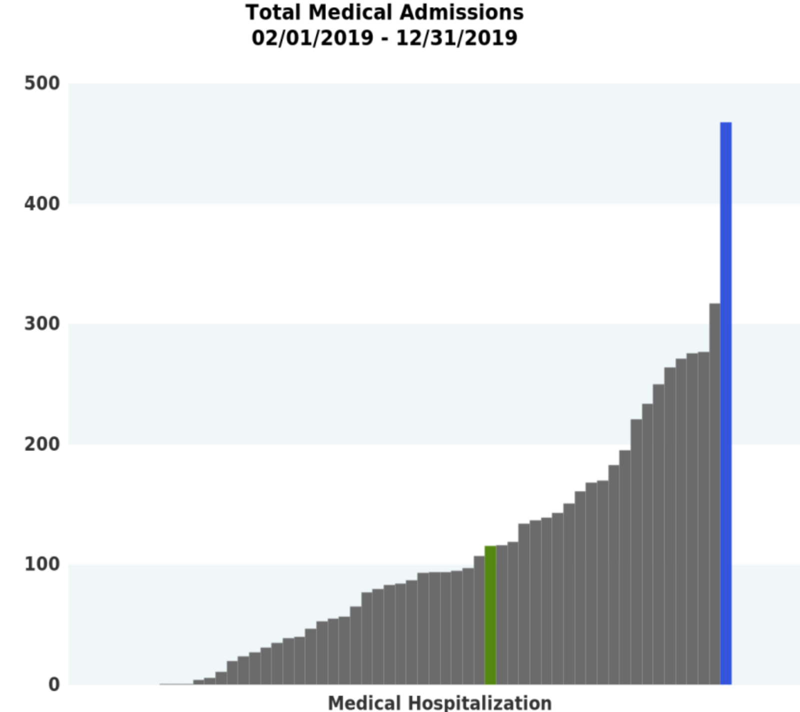
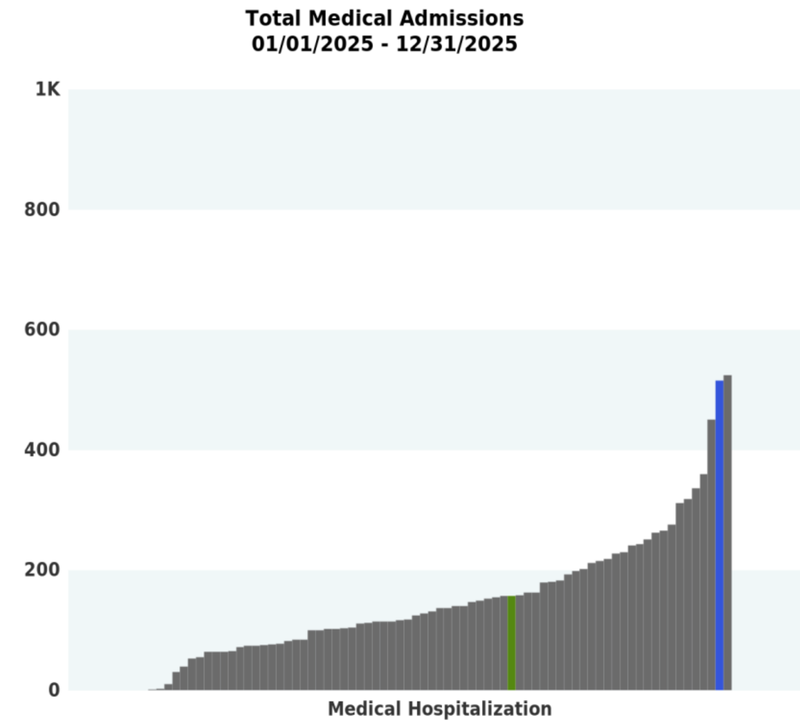
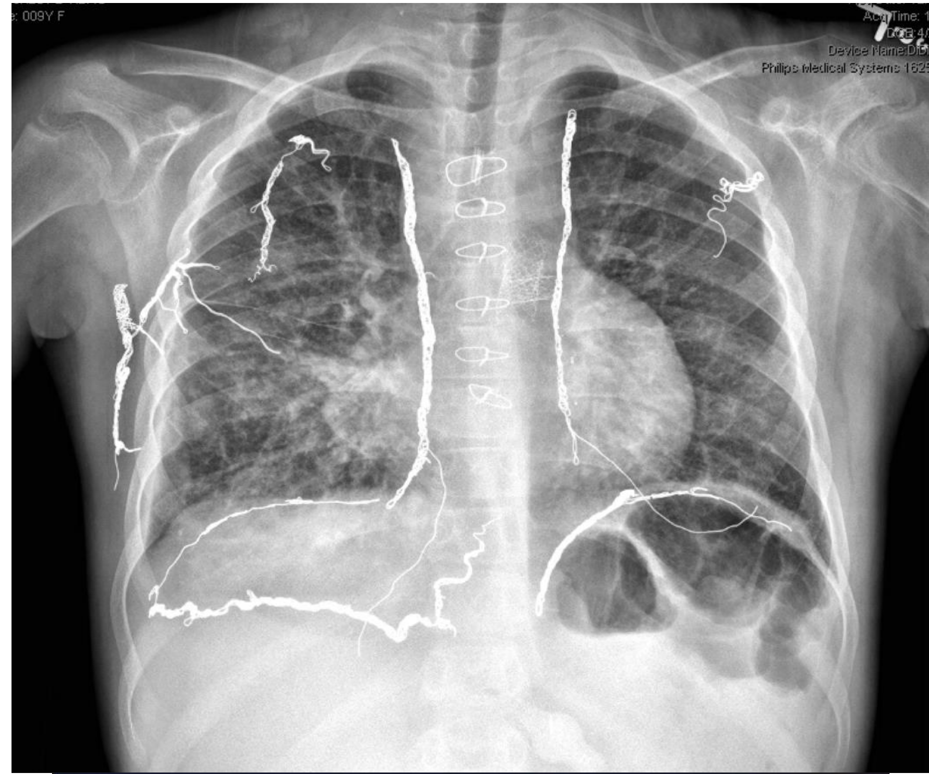


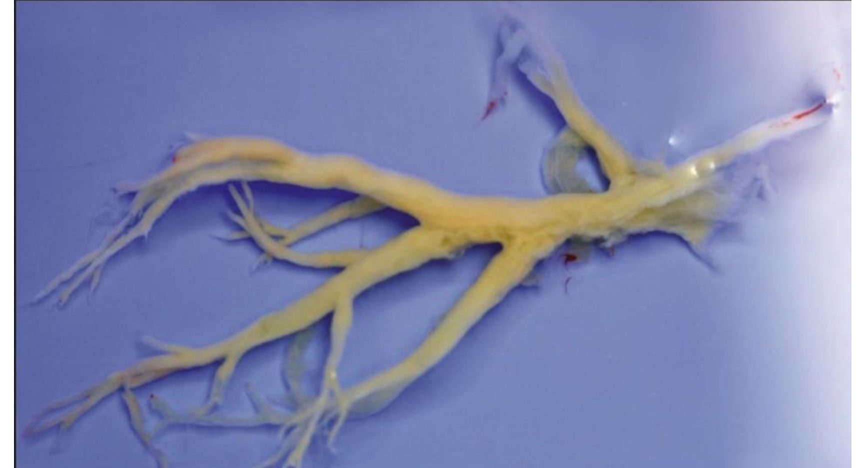


Case #1

What Would You Do?

- 9 year old F with HLHS s/p staged palliation c/b multiple episodes of recoarctation s/p stenting, now s/p extracardiac fenestrated Fontan
- Recent URI but started coughing up these things…
- Diarrhea at baseline worse this week
- Arrives to ER → HR 100's, BP 100/50's, RR 30's with work of breathing, SpO2 62%
- BNP 3,000, BUN 40, Cr 1.2, AST/ALT 300's, TBili 1.3, INR 1.6





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What Would You Do?

- Placed on BiPAP 12/6, 100% with minimal improvement
- Echo with mildly depressed RV function, moderate TR
- Worsening oliguria, BUN/Cr increased after 12 hours to 70/1.8
- cNIRS 30's with SpO2 60%
- You're making moves to intubate…

Presenting Site - CHOP

WWGBD?

Children's Hospital of Philadelphia

- CHOP is a large enterprise that is always full
  - PHL Campus ~640 beds, 100 NICU, 75 PICU, 38 CICU
  - KOP Campus 100 beds, 22 NICU, 14 PICU, no CICU
  - Cedar Campus 36 Bed Behavioral Health and Crisis Center
- Robust response to unplanned acute critical care needs requires
  - Communication and coordination
  - Robust resources in many domains
  - Refined and extensive systems of care

WWGBD?

- Get ready for cath?
  - Interventional Cardiologists x8
- Get ready for intubation/bronchoscopy?
  - Pulmonology ICU Bronch Service
  - CT Anesthesiology x17
- Get ready for ECMO "Standby"?
  - Cardiothoracic Surgeons x5
  - ELSO Platinum Level Center of Excellence

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CHOP CICU Team Architecture

Children's Hospital of Philadelphia

- 38 patients / 3 teams of 10-13 patients
- Each team with one attending +/- Sr Fellow and 3 Fellows/APPs per team
- APP team ~30 CRNPs, PAs, and Hospitalists
- Fellows from Cardiology, Critical Care, Anesth, and NICU
- M-F daytime and afternoon hours intake/flow/bed management is led by
  - Fourth CICU Attending with an additional Fellow/APP
  - Cardiac Flow Facilitator (Experienced Acute Care/ICU Care RN)
- Nights/Weekends Triage/Flow/Bed Mgmt is handled by one of the 3 main teams

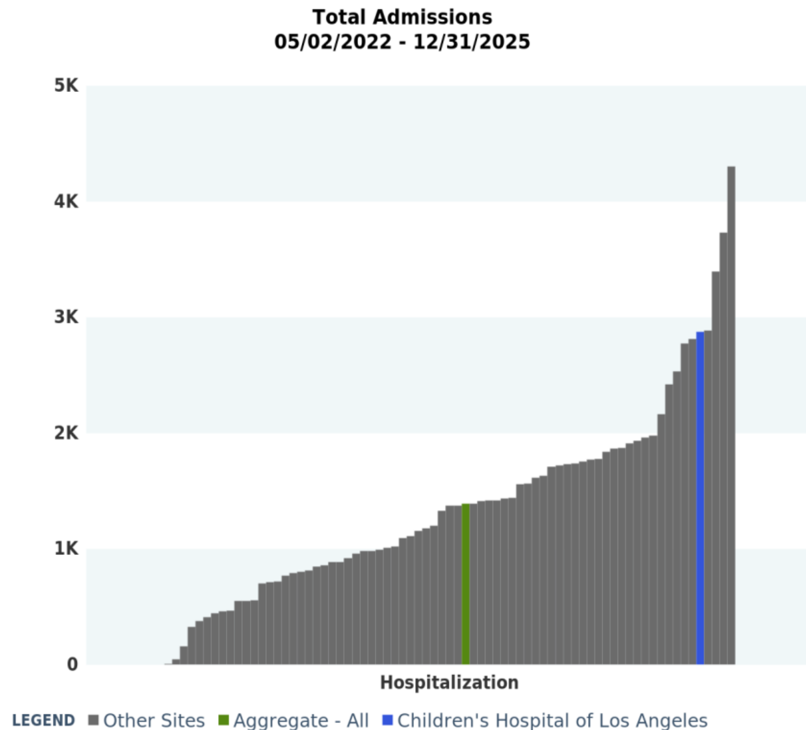
Complex Care Escalation/Coordination

Children's Hospital of Philadelphia

- During the busy week of scheduled/add-on care, we have talented & resourced team mates to help the pieces all fit together.
- Similar escalation on nights and weekends requires more "creativity" by the CICU Attending, ie, more work, phone calls, texts, and Epic Secure Chats.
- Guidelines, Epic Ordersets, Clinical Pathways (Search: "CHOP Pathways")
- Tools, people, other resources too numerous to mention:
  - Robust Teams of Nurses, Respiratory Therapists, Technologists, Pharmacists, Dieticians
  - Cardiac Arrest Prevention algorithm running in real time on Epic
  - One click access to SickBay direct from Epic
  - Safety Huddles 2x/d EVERY day, dedicated Registered Dietician and Pharmacist on rounds M-F for *EACH* team, younger staff RNs well and visibly supported by Resource Nurses and other roles in Nursing Leadership

Presenting Site - CHLA

Welcome to CHLA!



- 386 bed free-standing children's hospital in northeast Los Angeles
  - 24 bed cardiac ICU, 21 bed ACCU
  - 30 bed PICU, 58 bed NICCU
- Day time (7a-5p):
  - Two teams with one attending, fellow, and APP per team, plus one "float fellow"
- Night time (5p-7a):
  - One attending and one fellow

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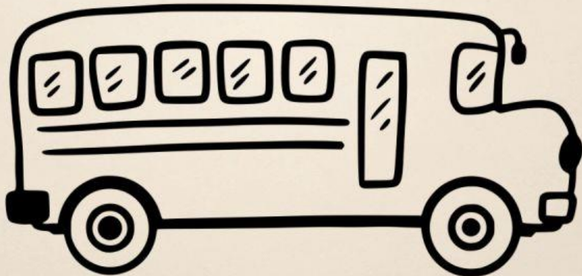
Factors Impacting Medical Outcomes

"If we get the right people on the bus, the right people in the right seats, and the wrong people off the bus, then we'll figure out how to take it someplace great"

GOOD TO GREAT BY JIM COLLINS



DANIEL CORDERO SAENZ
COMMUNICATIONS SPECIALIST

- Phenomenal nursing leadership and mentorship
  - Most new hires come from 6-month RN residency program cohort
- Strong multidisciplinary collaboration between key stakeholders
- Heart Institute APP Service Line
  - 15 APPs that rotate through CICU, ACCU, and clinic
- Meticulous data and event review

Failing Fontan

- It's not always about the surgeons…
  - … but we would call the surgeons for ECMO back-up for intubation.

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ECMO at CHLA

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- Culture of "activate early and often" to avoid eCPR
  - No penalty for activating and not going on
  - In past 3 years, approximately 33% eCPR, 66% elective cannulation
- All ECMO Charge RN/RCP can prime an ECMO circuit
- Collaboration with Blood Bank for "Emergency Release Blood for ECMO"
- Commitment to simulation/wet lab experience

Minutes from Activation to Flowing on ECMO			
	7a-4p	4p-9p	9p-7a
2022-2023	38 min	43 min	59 min
2024-2025	26 min	33 min	56 min

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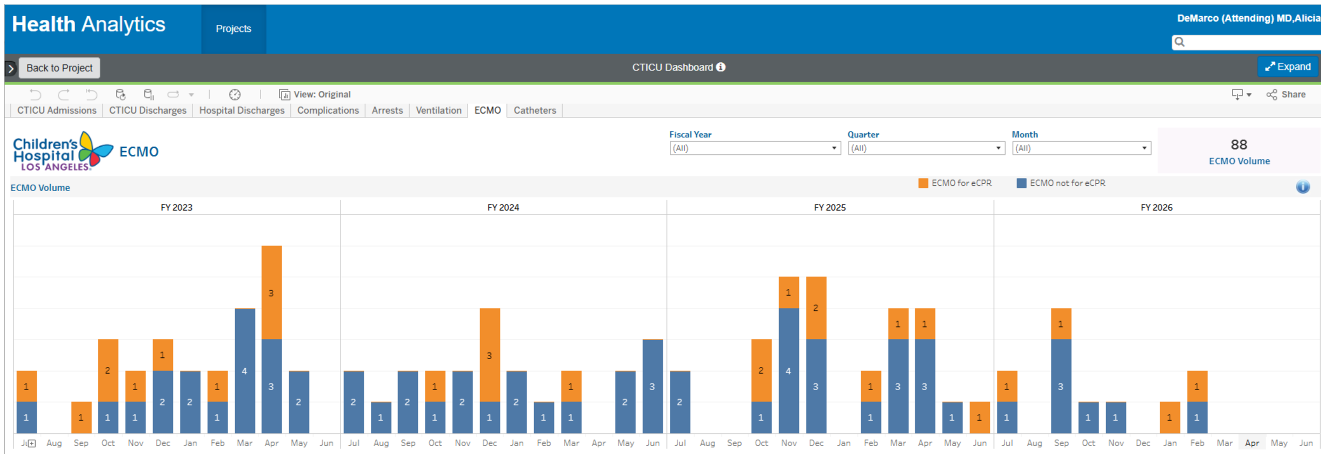
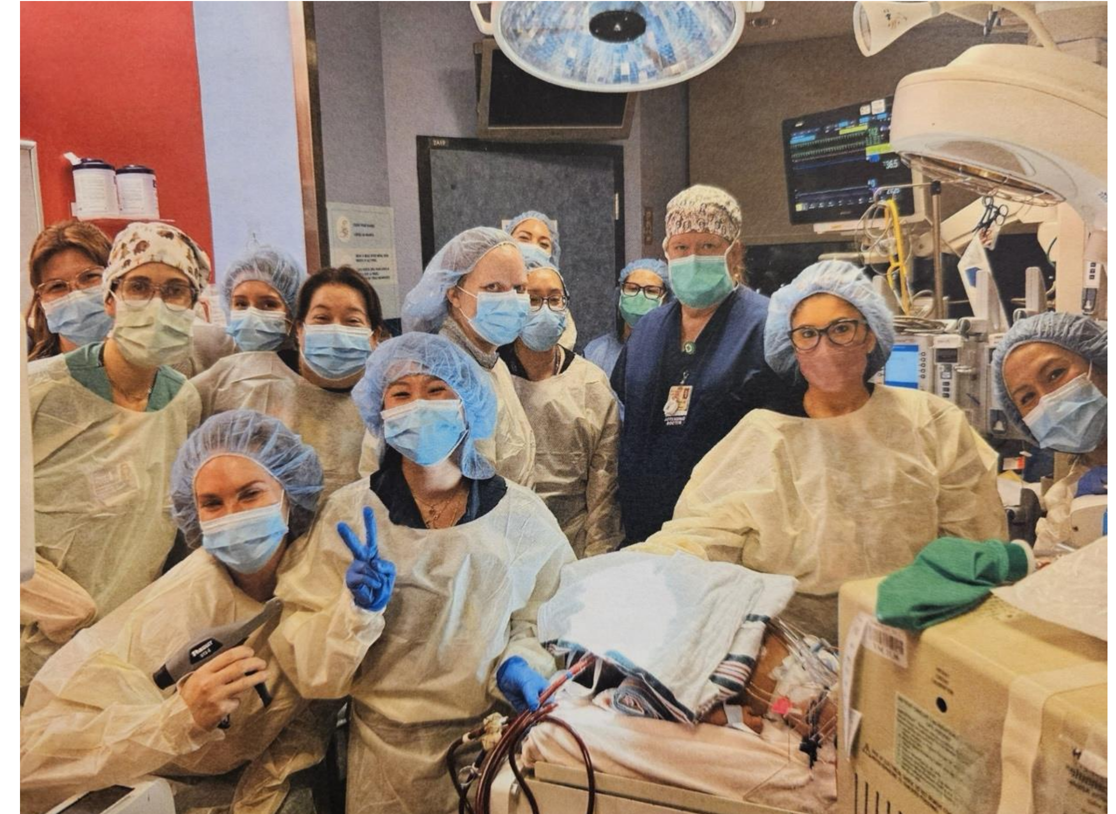
ECMO at CHLA

- PC4 data flows continuously into quality dashboard to facilitate event review and QI



	Survived ECMO
2022	0.52
2023	0.77
2024	0.82
2025	0.87



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Once the ETT is in…

- Cardiac catheterization ± advanced cardiac imaging
- Heart Transplant evaluation
  - Heart Transplant evaluation for Fontan patients at CHLA requires Nephrology consultation for CKD staging, family counseling, and consideration for dual organ transplant
- Careful nutritional assessment and repletion
- Determine best strategy for rehabilitation

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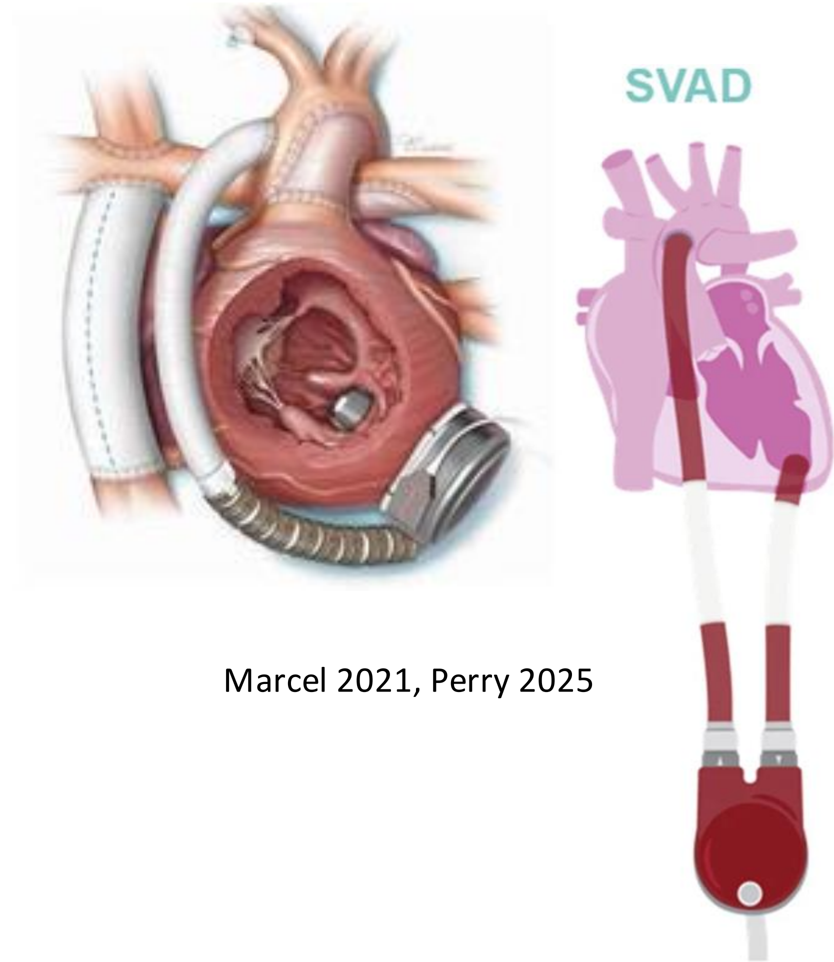
VAD as a bridge to transplant?

- Prefer primary VAD over ECMO->VAD pathway
- Cath for coiling of APC prior to sternotomy/VAD placement if possible (and repeat surveillance caths for additional coiling prior to transplant)
- Grateful to CHOP for sending us back Dr. Imran Masood, since we too now have robust pre-VAD huddles!



Marcel 2021, Perry 2025

Case #2

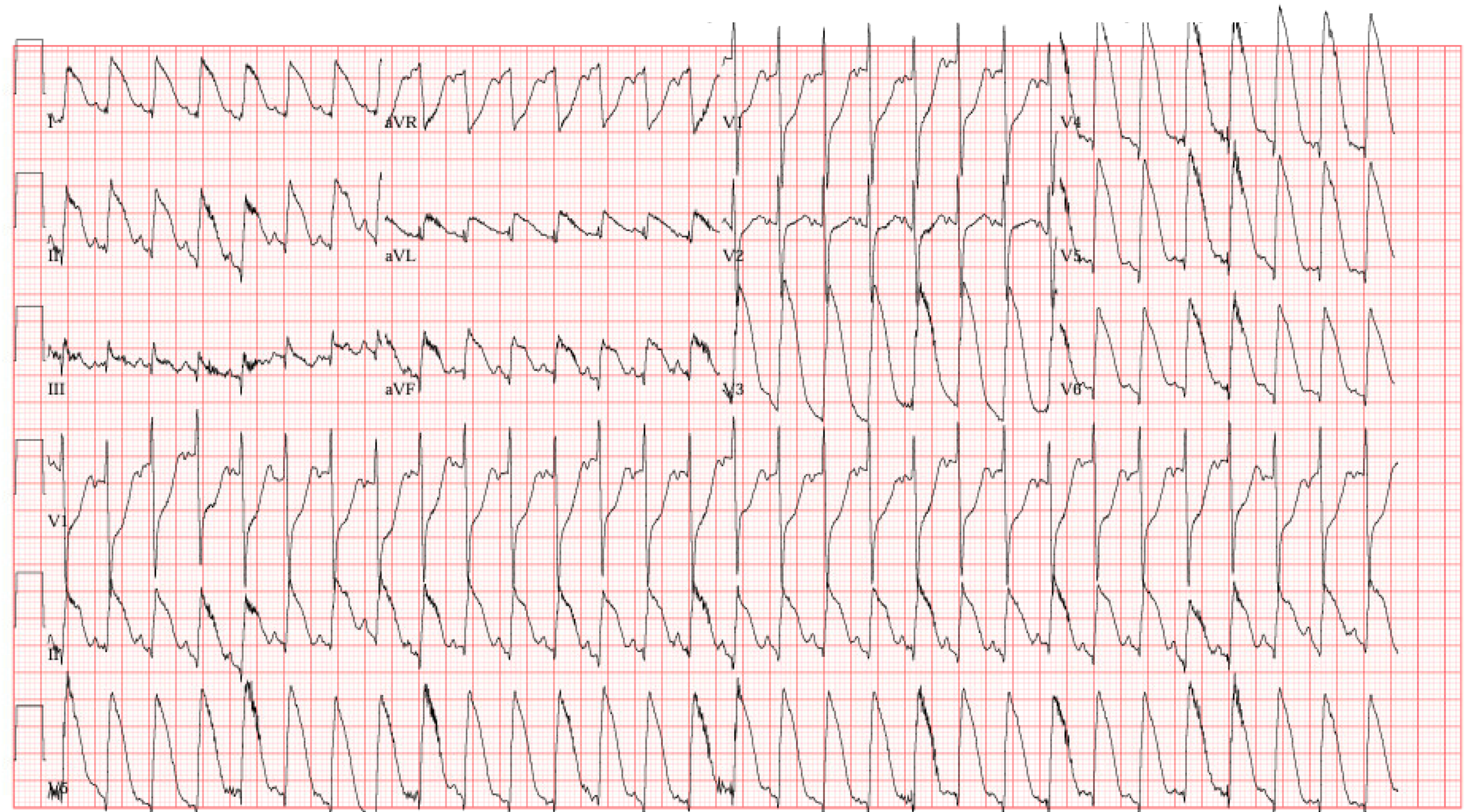
WWYD?

- 7 mo previously healthy girl presents to OSH ED w/ respiratory distress
- Abnormal CR monitor ECG noted; Cardiology called for consult
- Transported uneventfully

BJC HEALTHCARE-SLCHC ROUTINE RECORD

Vent. rate	180	BPM
PR interval	112	ms
QRS duration	162	ms
QT/QTcB	270/467	ms
P-R-T axes	80 40	46

*** Critical Test Result: High HR
** ** ** ** * Pediatric ECG Analysis * ** ** ** **
Sinus tachycardia
ST-elevation in inferior and lateral leads
ST depression in aVR
No previous ECGs available



25mm/s 10mm/mV 150Hz 10.1.8 12SL 245 CID: 24 EID: 1234 EDT: 14:06 18-Nov-2025 ORDER: 1091119549 ACCOUNT: 2296070195

Page 1 of 1

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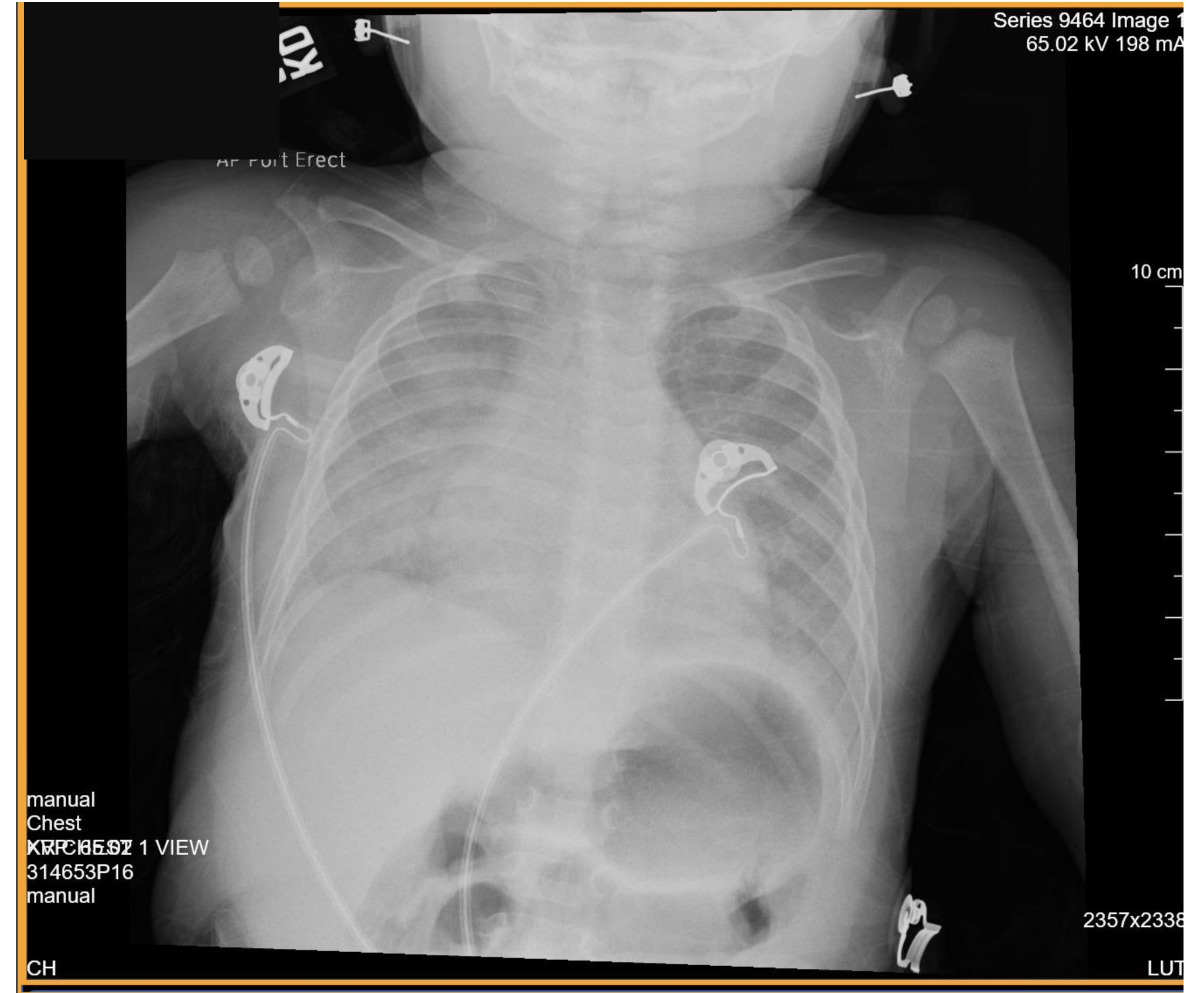
WWYD?

- Awake, alert but fussy/agitated
- + Gallop
- + Hepatomegaly

Arrival Vitals	
Temp	36.8 °C (98.2 °F)
Pulse	178
Resp	55
BP	96/68
SpO2	94 %



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WWYD?

Labs

- Na 139, K 4.4, HCO3 18, BUN 15, crt 0.32
- Normal LFTs
- Hb 10.6
- Lactate 2.8
- NT-proBNP 53,538
- Troponin T hs 292
- TSH 0.46; free T4 1.00 (normal)
- Cortisol 79.5

Echo

Summary:
1. Normal segmental anatomy.
2. Moderate dilatation of the left ventricle. Severely diminished left ventricular systolic function.
3. Moderate to severe mitral valve regurgitation.
4. Moderately dilated left atrium.
5. Normal coronary artery origins.
6. Unobstructed aortic arch.
7. Tiny PFO with left to right flow.
8. Qualitatively normal right ventricular size and systolic function.

Presenting Site - CHOP

WWGBD?

- Everything from my first few slides.
- “Fake it until you make it!” Robust CICU Simulation Program led by Marissa Brunetti.
- Advanced Cardiac Therapies – ACT-ICU with medical, APP, and Nursing leadership roles.
- Heart Failure/VAD/Transplant patients cohorted (largely) on one CICU team.
- Mechanical Circulatory Support walk rounds mid-week.
- MCS Journal Club weekly
- Multidisciplinary Pre VAD Implantation Huddles with minutes/notes distributed to all.

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WWGBD?

- Culture matters
- Psychologically safe communication matters
- Recognition and support matter
- Resources and tools matter, as long as they are robustly available to a well supported and multidisciplinary team
- Registry participation ***REALLY*** matters

WWGBD?

- The truth is I don't really know all of what goes into our good and bad performance.
- I, and many others, have worked hard for years to get us where we are.
- Read Malcolm Gladwell's classic book, *Blink*, again. (Vic Braden's views on learning about tennis from elite tennis professionals.)
- The old adage might be true, that half what I am telling you is unnecessary or just plain wrong – I just don't know which half.
- Registry participation ***REALLY*** matters!

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Presenting Site - CHLA

LV Failure

- Start low-dose inotropy through a PIV
- Start diuresis
- Balance risks of increased metabolic demand and potential RSI with risk of increased VO2 in hangry baby
- Same assessment for HHFNC
- Be very, very cautious about dexmedetomidine

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LV Failure

- And it's not always about the surgeons…
  - … but we would call the surgeons again for ECMO back-up if intubation needed.
- Let the most skilled provider intubate the patient
  - 6 phenomenal cardiac anesthesiologists who always make time when we call for help

LV Failure

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- Close multidisciplinary coordination with Heart Failure team (joint daily rounds on Heart Failure/Transplant patients)
- Early discussion of escalation of support if medically optimized and developing signs of multi-organ dysfunction (including feeding intolerance)

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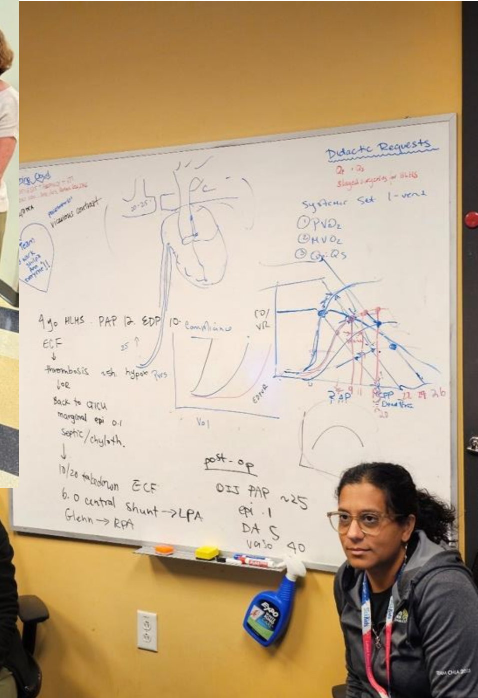
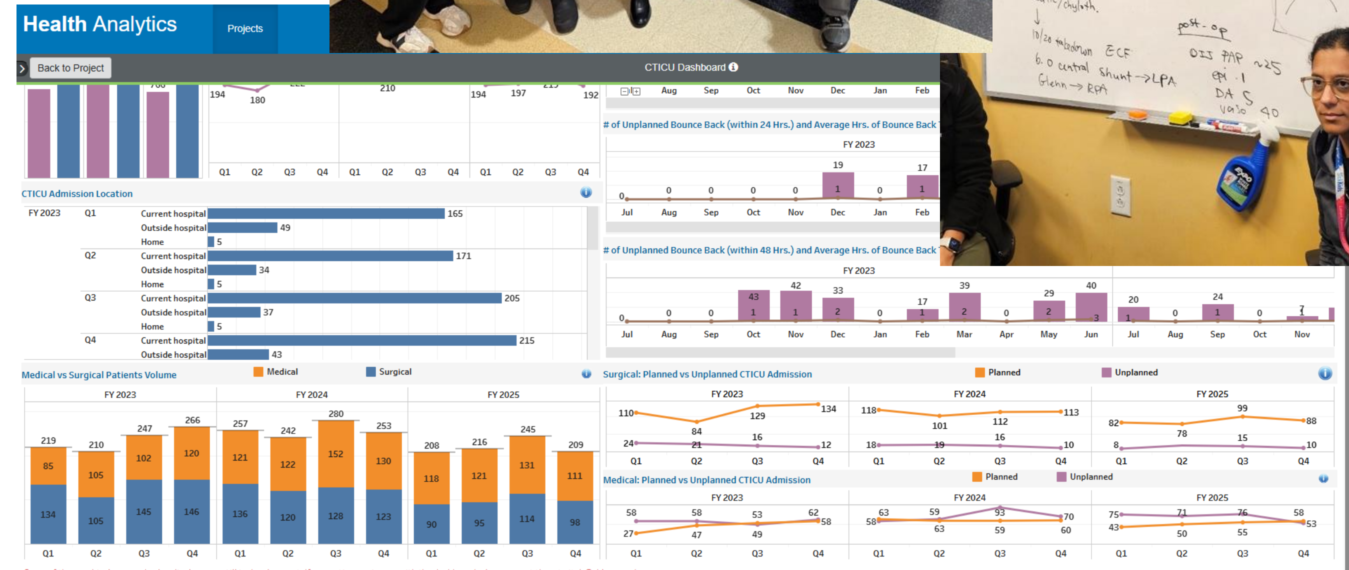
Optimizing Outcomes

- Risk mitigation is better than heroic rescue
- Stay curious and assume goodness of intent
- Use your data to dissect systems failures/barriers
- Use other people's data to highlight opportunities for improvement





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Thank You!