CARDIOLOGY 2024

Multicenter Quality Improvement Project Exploring the Implementation of Heart Center Watcher Programs to Prevent Cardiac Arrests Outside of the Intensive Care Unit

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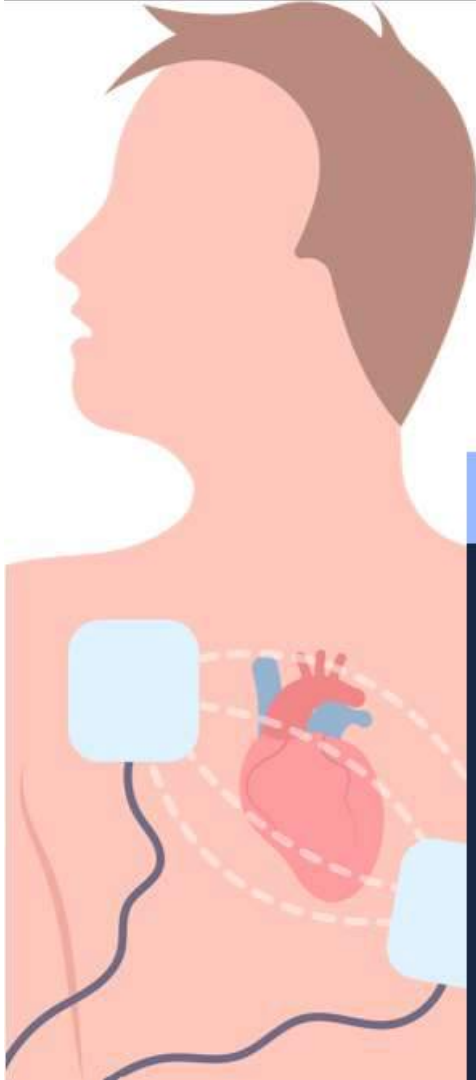
DISCLOSURES

- I have no relevant financial disclosures

DEFINING THE PROBLEM

- **Dallas**: twofold increase in cardiac arrest events on ACCU
- 0.7 cardiac arrests per 1000 patient days



Pediatric cardiac patients - 13x higher risk for cardiac arrest than other populations

Sperotto, F., Gearhart, A., Hoskote, A. et al. Eur J Pediatr (2023).

Increased morbidity & mortality from events outside ICU

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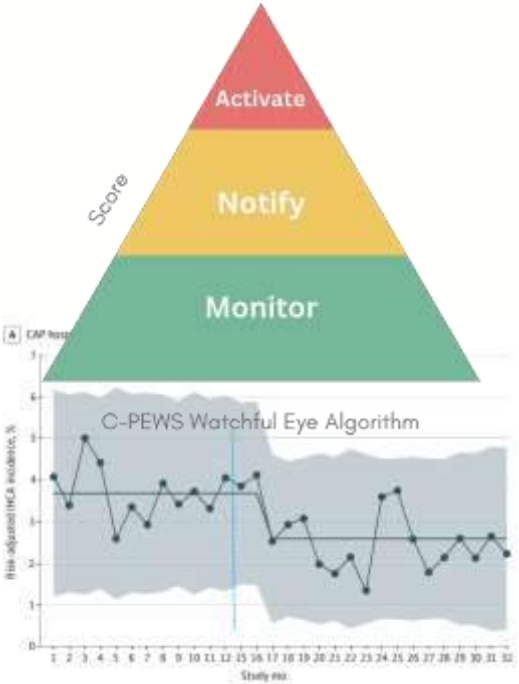
CARDIAC ARREST PREVENTION

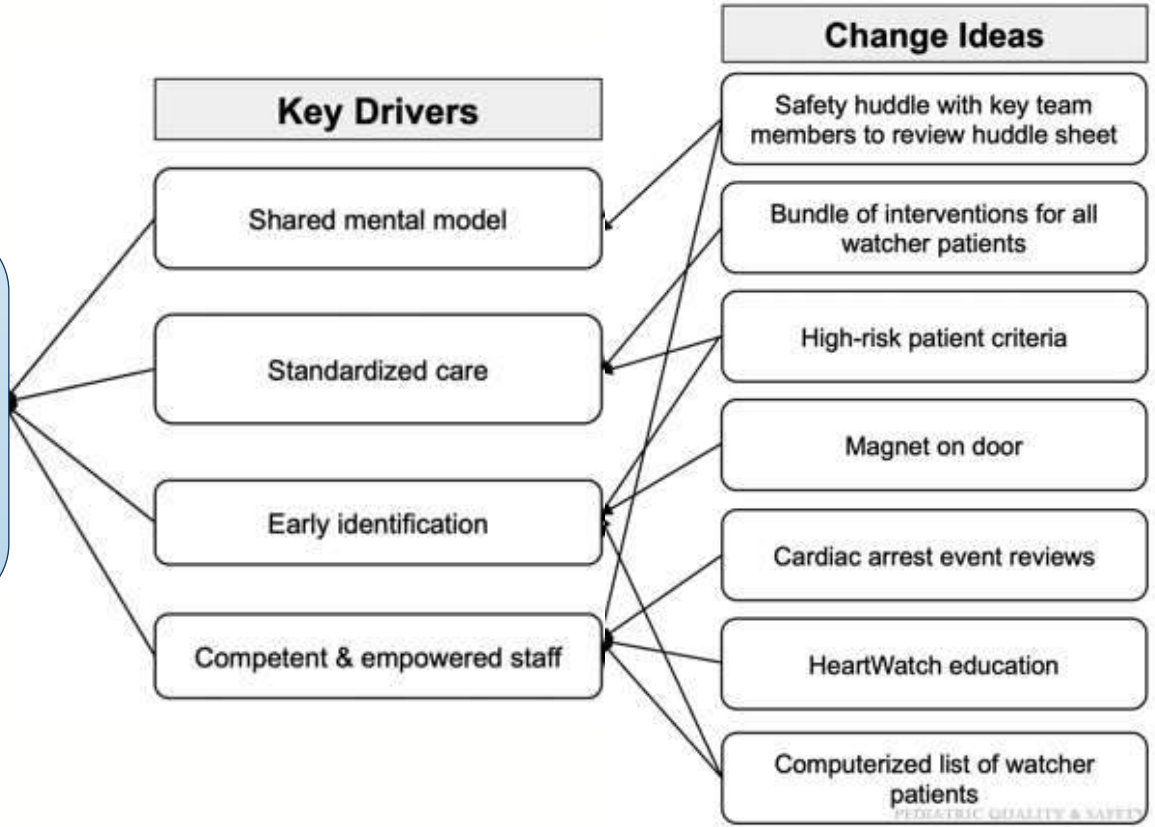
- Early recognition of decompensation is critical→ Early warning scoring tools
- Cannot detect inherent risk & sudden events
- PC_4 Cardiac Arrest Prevention (CAP) bundle → reduction in arrests in Cardiac Intensive Care Unit (CICU)
  - multidisciplinary huddles improve outcomes for high-risk patients
  - promote situational awareness



Alten J, Cooper DS, Klugman D, et al. Preventing Cardiac Arrest in the Pediatric Cardiac Intensive Care Unit Through Multicenter Collaboration. *JAMA Pediatr*. 2022;176(10):1027–1036.

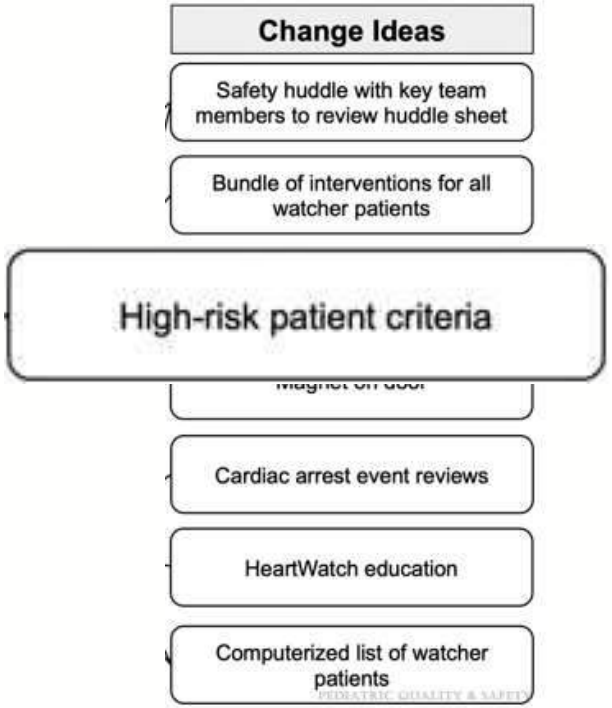
HEARTWATCH KEY DRIVER DIAGRAM

SMART Aim: Reduce rate cardiac arrests outside of ICU by 50% (from 0.7 to 0.35 CA/1000 patient days) by December 31, 2020



Birely, A. et al. (2022). HeartWatch: Implementing a Pediatric Heart Center Program to Prevent Cardiac Arrests Outside the ICU. *Pediatric Quality & Safety*, *7*(6), e617.

METHODS



HeartWatch Patient Criteria	
Direct admissions from outside hospitals	Unpalliated neonate with potential for unbalanced circulation
Concern for NEC	Interstage single ventricle transfer from ICU
Initiation/titration of inotropes	Heart failure or transplant transfer from ICU
Rapid increase in respiratory support	Severe ventricular dysfunction (EF <35% or SF<17%)
Rapid response within 24 h	Restrictive or hypertrophic cardiomyopathy
Medication error requiring additional monitoring	Transplant with active rejection
Wedge pressure >18	History of TCAD or cardiac allograft vasculopathy
Team member concern	VAD or heart failure - known history of arrhythmia

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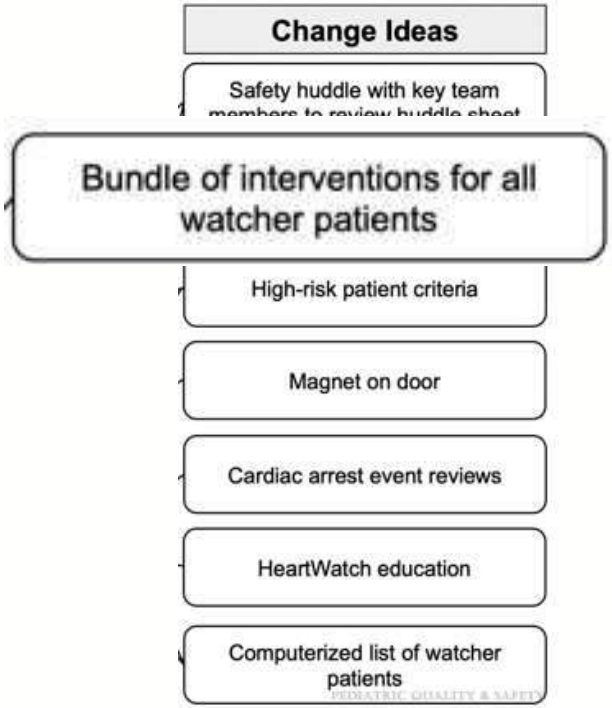
METHODS



BUNDLE ELEMENTS

- Complete huddle sheet during AM rounds:
  - Most likely cause of decompensation
  - Clinical changes to watch for
  - Code & ECMO status
- Consider need for closer surveillance
  - More frequent vitals/labs
  - 2:1 nursing ratio
  - Afternoon huddle
- HeartWatch magnet on patient door

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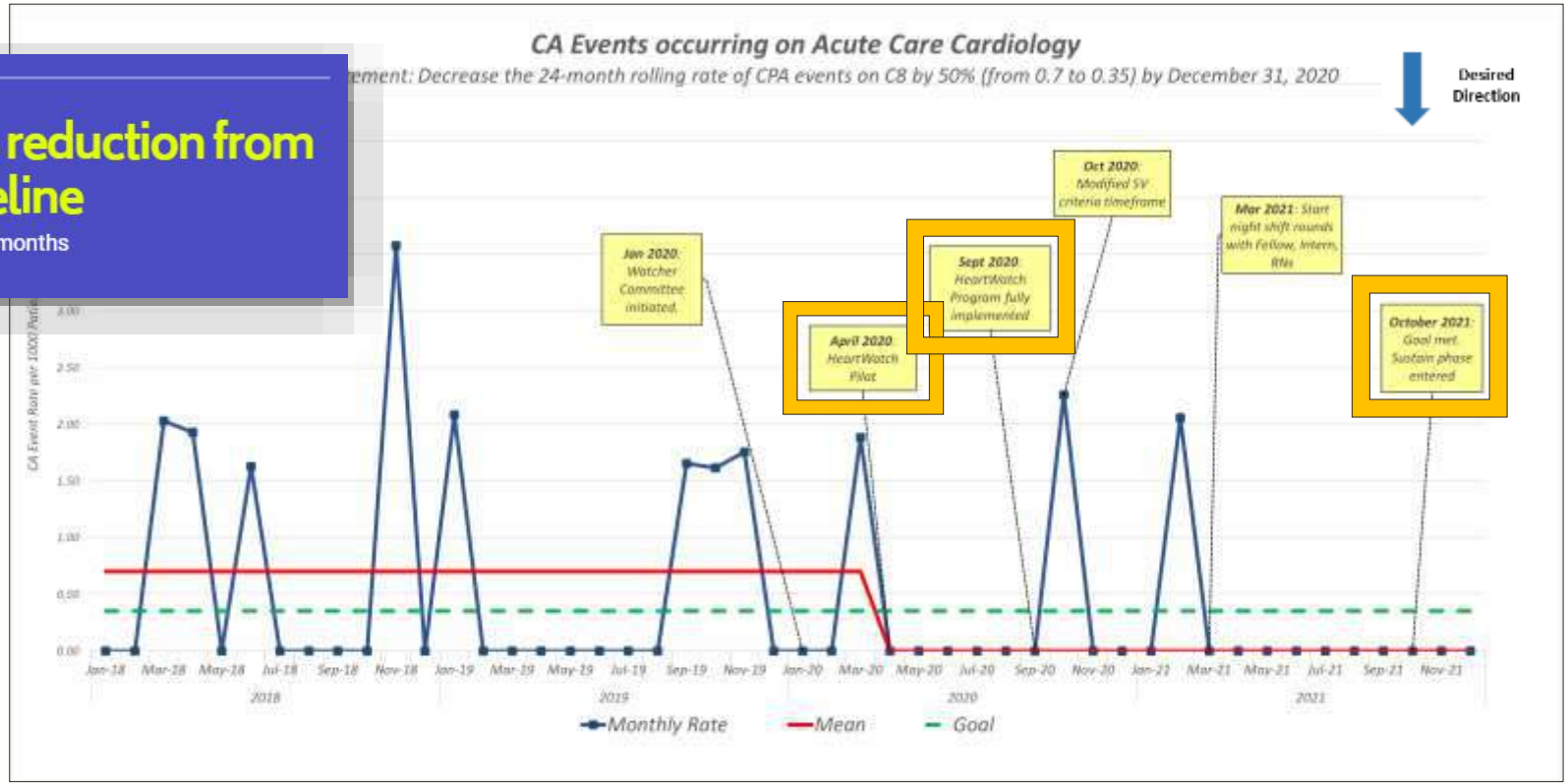
RESULTS

67% reduction from baseline
after 18 months



SPREAD

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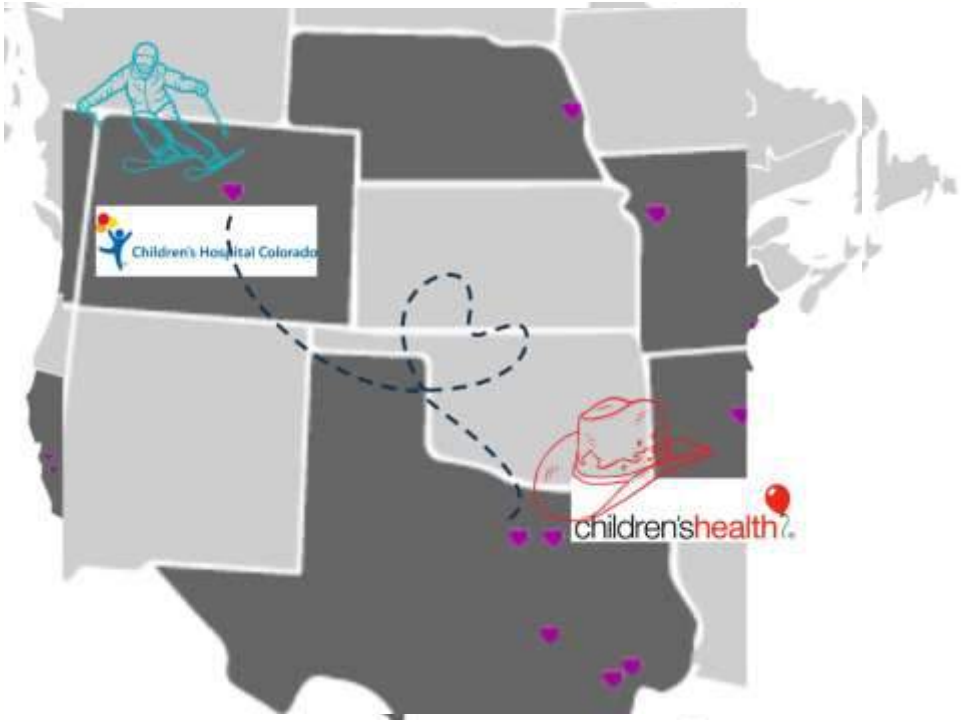
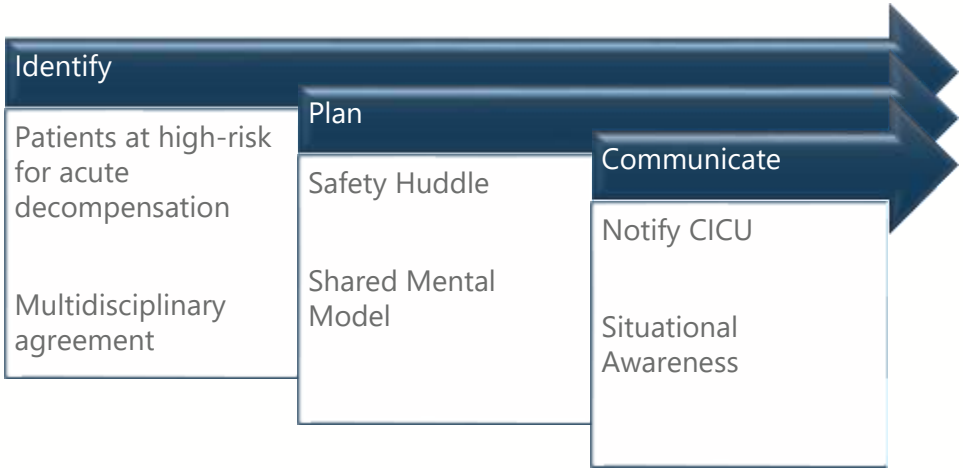


BACKGROUND – COLORADO

- Change in proximity to ICU identified lack of standardized escalation process
- **Purpose**: implement HeartWatch as basis of 'escalation of care bundle'



AIMS

Inotropes, intubation, ECMO, fluid boluses, or cardiac arrest within 1 hour of transfer to ICU

Decrease	**Emergent transfers from CPCU** • **25% reduction by June 2022 (1.7/1000 pt days to 1.3/1000 pt days)**

60% reduction in ET from baseline
after 24 months

ET Events occurring on Acute Care Cardiology

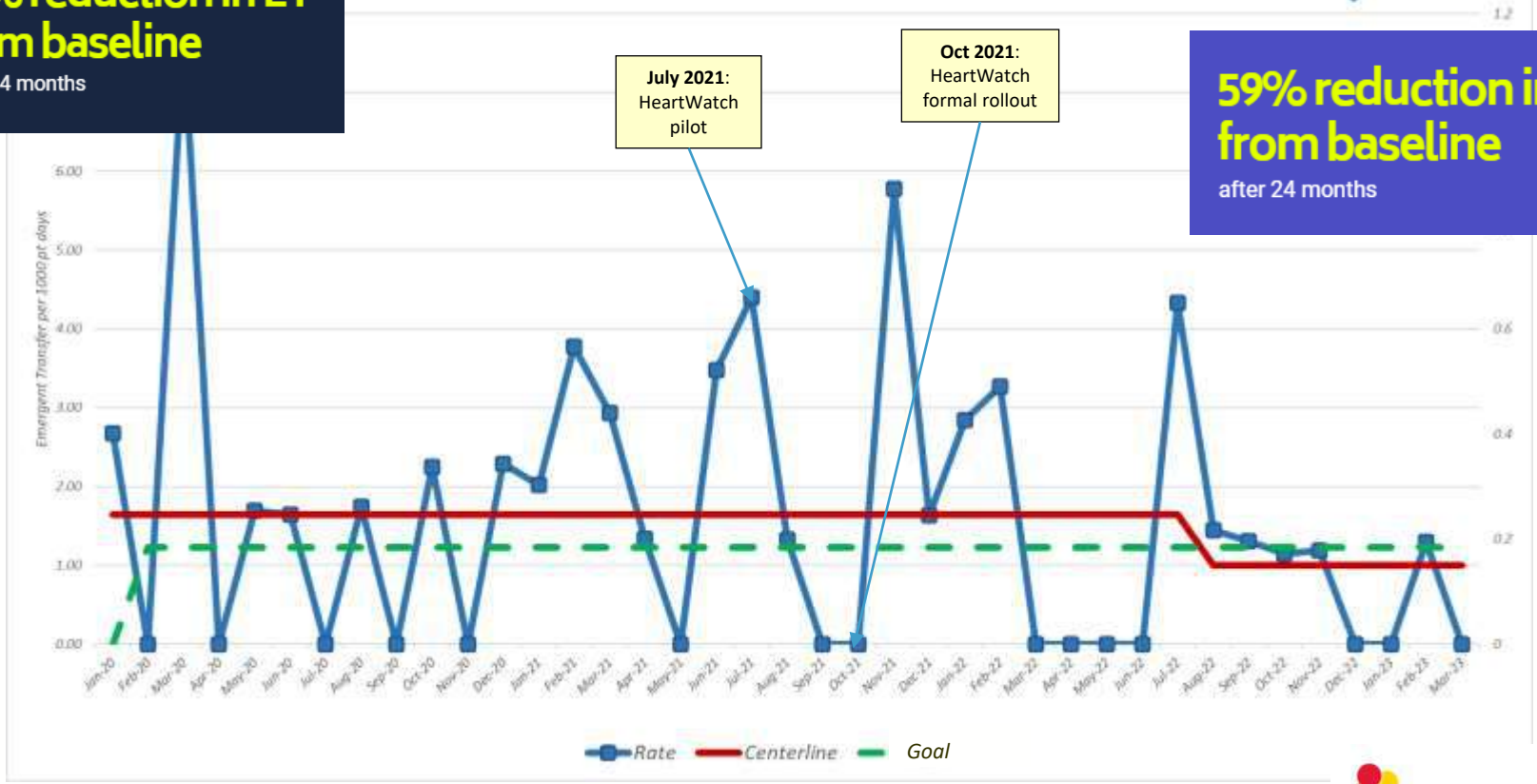
M Statement: Decrease the rate of ET events by 25% (from 1.7 to 1.3) by June 2022

Desired Direction

July 2021: HeartWatch pilot

Oct 2021: HeartWatch formal rollout

59% reduction in CA from baseline
after 24 months



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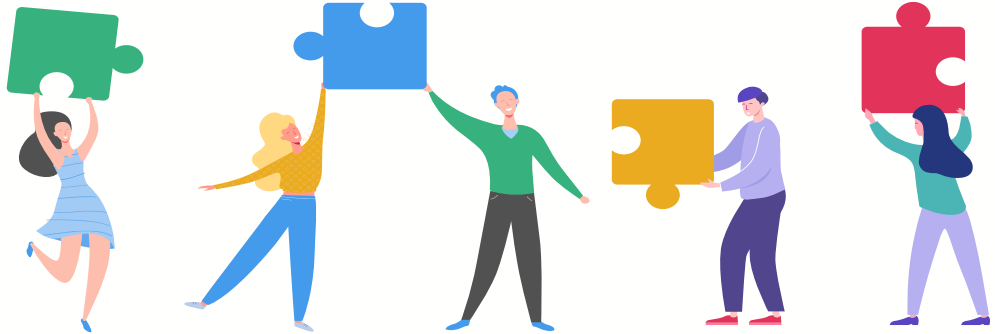
CONCLUSIONS

- **Effective**: HeartWatch implementation associated with meaningful reduction in cardiac arrest
  - identification of high-risk patients
  - shared mental model
- **Generalizable**: easily tailored to individual centers workflow & population
- **Sustainable**: daily safety huddles embedded in culture

Idea sharing & collaborating beyond our local center can drive improvement more rapidly



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ACKNOWLEDGEMENTS

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REFERENCES

1. Sperotto, F., Gearhart, A., Hoskote, A. et al. Cardiac arrest and cardiopulmonary resuscitation in pediatric patients with cardiac disease: a narrative review. Eur J Pediatr 182, 4289–4308 (2023).
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3. Alten J, Cooper DS, Klugman D, et al. Preventing Cardiac Arrest in the Pediatric Cardiac Intensive Care Unit Through Multicenter Collaboration. JAMA Pediatr. 2022;176(10):1027–1036. doi:10.1001/jamapediatrics.2022.2238
4. Birely, A., Avula, S., Butts, R. J., Wolovits, J. S., Lemler, M. S., & Hoffman, O. L. (2022). HeartWatch: Implementing a Pediatric Heart Center Program to Prevent Cardiac Arrests Outside the ICU. Pediatric Quality & Safety, 7(6), e617.

HeartWatch Program Comparison		
	Dallas	**Colorado**
Use of Early Warning Scores	Yes (CPEWS)	No
Cardiac Rapid Response	Yes	Yes
HeartWatch Criteria	Standard criteria	Team preference, patient specific
Notification to ICU	No – visible in EMR & in daily huddle email	Yes – during bed huddle
Magnet on door	Yes	Yes
Charge RN report	Yes	Yes

HeartWatch Patient Inclusion Criteria & Bundle Elements

Heart failure/transplant patient criteria *(duration of admission unless otherwise specified)*

- Severe dysfunction (EF <35% or SF <17%)
- Hypertrophic Cardiomyopathy
- Restrictive Cardiomyopathy
- Active Rejection
- Transplant Coronary Artery Disease
- Heart failure or VAD with history of arrhythmia

BUNDLE ELEMENTS

- Discuss and complete bedside HeartWatch sheet during AM rounds
- Place HeartWatch magnet outside patient door
- Charge RN to update handoff including:
  - Duration & indication
  - Code & ECMO status
  - Clinical changes to watch for
- Consider need for closer surveillance
  - More frequent vitals/labs
  - 2:1 nursing ratio
  - Afternoon huddle

General criteria *(place on bundle for **24**h unless otherwise specified; re-evaluate daily)*

- Transfer from ICU (PACC: 48h; high-risk SV*: 7d)
- Direct admits from OSH
- Unpalliated neonate w. potential for unbalanced circulation
- Concern for NEC
- Initiation/discontinuation/titration of milrinone
- Rapid increase in respiratory support or O2 requirement, receiving max support on HHFNC
- CAT or MET in last 24h without transfer to ICU
- Medication error requiring additional monitoring or treatment
- s/p cath with Wedge Pressure > 18
- Team member concern

PACC: heart failure/transplant patients
*High-risk SV: interstage single ventricle

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HeartWatch Daily Huddle Sheet

Name:	**Most Likely Cause of Decompensation:**		**Overall Trajectory:**
Date:	**Plan for Prevention:** 1)	5)	Bundle effective:
Code Status: **Candidate for ECMO:**	2) 3) 4)	6) 7) **Afternoon huddle:** Y / N **Off-unit/out of room restrictions:** _____	**Indication:**
	Resuscitation Action Plan:		**Vascular access:**

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Birely, A. et al. (2022).

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HeartWatch Daily Huddle Sheet

Interstage Single Ventricle (Norwood, BT shunt/Sano modification, PDA stents)

<table>
<tr><td>Name:</td><td colspan="2">Most Likely Cause of Decompensation:

Shunt occlusion or SVR crisis</td><td>Overall Trajectory:</td></tr>
<tr><td>Date:</td><td rowspan="2">Plan for Prevention:

1) ASA

2) Keep Hgb > ____

3) Reduce noxious stimuli

-portable CXR

-nurse at bedside for procedures

-discuss lab frequency</td><td rowspan="2">4) Ensure shunt murmur present

Afternoon huddle: Y / N

Off-unit/out of room restrictions:

_____</td><td>Bundle effective:
7 days from ICU transfer</td></tr>
<tr><td rowspan="2">Code Status:

Candidate for ECMO?

If yes, has mapping been discussed?

Date completed: _____</td><td>Indication:

High-risk SV</td></tr>
<tr><td colspan="2">Resuscitation Action Plan:

<u>Shunt occlusion</u>: stop feeds, 100% Fio2, heparin 100 units/kg

<u>SVR crisis</u>: stop feeds, ↓Fio2, calm down/sedation</td><td>Vascular access:

Include in discussion necessity of access & whether access should be reestablished if lost</td></tr>
</table>

CHCO HeartWatch Safety Huddle Form

Name and Room #:	Diagnosis 1-Liner: High Risk for Decompensation because:	
Date:	Possible clinical signs of Decompensation: (When to notify provider)	Intervention/Prevention Plan: ☐ needs afternoon studies/labs ☐make NPO ☐ discuss 2:1 nursing
Code Status: Candidate for ECMO? Yes / No Current vascular access: Candidate for 2:1 Nursing? Yes / No Afternoon Huddle needed Yes / No	1. 2. 3. 4.	1. 2. 3. ☐ discuss when to call RRT
	☐ Patient may not ambulate ☐Patient may not leave the unit ☐Patient requires CR monitor during ambulation-only allowed to ambulate on unit ☐Patient needs radiology studies completed at bedside	

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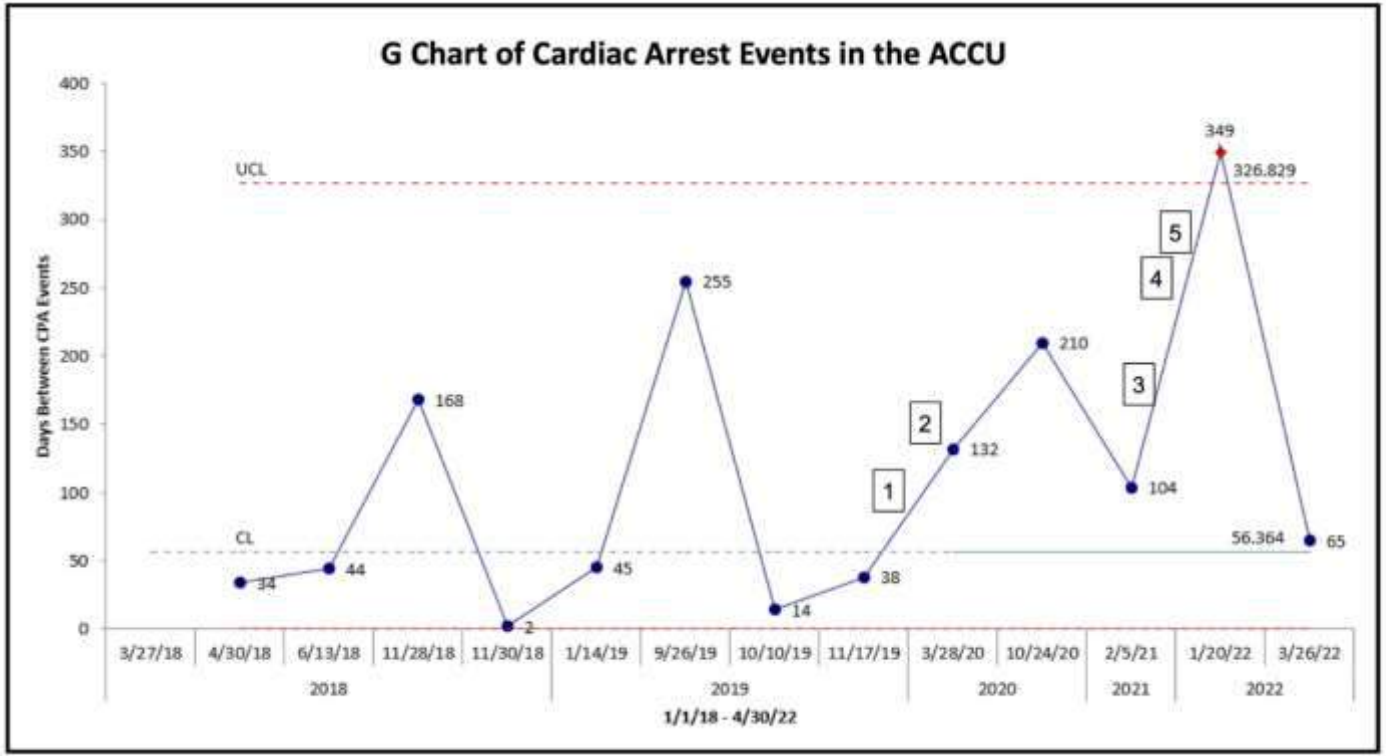
Key Measures	Definitions	Baseline (2020)	Goal	Progress (Jan 2022-July 2023)
Primary Outcome	Incidence of cardiac arrest in CPCU (Per 1000 pt. days)	0.35	0.26	0.14
	Incidence of emergent transfers from CPCU to CICU (Per 1000 pt. days)	2.6	1.9	1.0
Secondary Outcome	Team member stress when managing a high-acuity patient in the CPCU	67/100	Decrease	57/100
	Job dissatisfaction related to identifying, escalating and managing high acuity patients in the CPCU	62/100	Decrease	42/100
Process	% of unplanned transfers initiated with an RRT	6%	Increase	43%
	% of RRTs that transferred to CICU	100%	Decrease	80%
	Code blue activation debriefs	75%	100% events	94%
	In-situ simulations (Rolling Refreshers and First 5-minute drills)	9	120/yr.	135/yr.



Phases

Baseline: Jan 2018 March 2020
Pilot: Apr 2020 – Sept 2020
Implemented: Oct 2020 – Apr 2021
Sustained: May 2021 – June 2022

Interventions

1. Watcher committee established
2. PACC team afternoon rounds adapted
3. Night shift rounds begin
4. HeartWatch list in EMR
5. HeartWatch huddle documented in daily attending progress note