Cardiac Interstage
Patient in Extremis:
Home to ER to CVICU
Clinical Pathway
Johns Hopkins All Children’s Hospital

Cardiac Interstage Patient in Extremis:
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This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient’s individualized circumstances and the practitioner’s professional judgment.

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Cardiac Interstage Patient in Extremis:
Home to ER to CVICU Clinical Pathway

Rationale:
This clinical pathway was developed by a consensus group of JHACH physicians, advanced practice providers, nurses and pharmacists to standardize the management of children arriving to the ER for the following patient population:

- Infants (< 12 mo old) with Single Ventricle Physiology and undergone only the 1st stage of palliation:
  - Norwood with Blaylock-Taussig-Thomas Shunt (BTTS)
  - Norwood with Sano Modification
  - Damus-Kaye-Stansel (DKS) with BTTS
  - DKS with Sano Modification
  - Hybrid Norwood = Hybrid Stage 1
  - BTTS only
  - Patent Ductus Arteriosus Stent = PDA Stent
- Infants (< 12 mo old) with pulmonary artery blood flow dependent on shunt but will have biventricular repair in the future:
  - BTTS or PDA stent (For example, Tetralogy of Fallot with a BTTS)

It addresses the following clinical questions or problems:
1. When to expedite admission to the CVICU for further evaluation and management

Background
Infants with single ventricle physiology who have undergone Stage 1 Palliation or infants with “shunt dependent” physiology are at high risk for sudden cardiac death. Prior to a home monitoring program, the estimated mortality was approximately 15-20%. The development of home monitoring programs has significantly reduced the mortality to approximately 6% nationally. Our institution has participated in a home monitoring program since 2010.

As part of a home monitoring program, the families have 24/7 access to the Interstage Monitoring Program (IMP) team members via the Interstage Concierge Phone. The families are taught specific warning signs, called Red Flags for which to contact us. Because of this system, the IMP is often alerted to earlier potential impending cardiopulmonary collapse.

JHACH institutional experience has shown that initiating ECMO in the ER has over utilized personnel such that: ER attending, CVICU attending, PICU attending, Cardiac surgeon(s), ER RN staff, CVOR staff and Perfusion are all in the ER Trauma Room resuscitating the patient. Also, staff may frequently need to get surgical equipment from the 5th floor CVOR.
To expedite care upon arrival to the hospital in situations where critical vital signs (Red Flags) were obtained in the home, this clinical pathway was developed to assist in communication prior to hospital arrival and expediting admission to the CVICU. The CVICU has the ability to convert the patient room into an OR in a scenario where the patient needs to go onto ECMO. Also the CVICU and Cardiac Operating Rooms are on the same floor, facilitating access to appropriate OR equipment and supplies.

**Diagnosis**
The patients who would enter this clinical pathway are:

- *Infants (< 12 mo old) with Single Ventricle Physiology and undergone only the 1st stage of palliation:
  - Norwood with Blaylock-Taussig-Thomas Shunt (BTTS)
  - Norwood with Sano Modification
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  - DKS with Sano Modification
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- *Infants (< 12 mo old) with pulmonary artery blood flow dependent on shunt but will have biventricular repair in the future:
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**Clinical Management**
A patient with the above clinical criteria will contact the Interstage Monitoring Program (IMP) Concierge Phone. This conversation will determine which Red Flags have been breached. The conversation with the caregiver at home will include pertinent vitals including:

- O2 sat < 75%
- HR > 170 bpm
- Poor perfusion
- Respiratory Distress

Based on the conversation with the caregiver, the IMP Clinician will send the patient to the JHACH ED for an evaluation by the appropriate mode of transportation. The IMP Clinician will then call the Transfer Center at 727-767-7337. The Transfer Center team member will then coordinate a phone conference between:

- ED attending
- Cardiologist on-call
- CV Surgeon on-call
- CVICU Attending

A plan of care will be reviewed that includes, but not limited to, the following details:

- Send Viral Panel (including COVID)
- Start O2 for Sats < 75%
• Place PIV
• Send CBC, CMP
• Send VBG or CBG
• CXR in ER or CVICU
• Echo in ER or CVICU

The results of these tests do not need to be known prior to admission/transfer to the CVICU. The following algorithm illustrates the patient’s pre-arrival communication process and the post-arrival plan of care.
Emergency Center Cardiac Interstage Patient in Extremis: Home to ER to CVICU Clinical Pathway

Clinical Pathway for infants with Single Ventricle or Shunt Dependent Physiology* who have not had 2nd stage palliation

- Caregiver calls Interstage Monitoring Program (IMP) with concerning vitals*
- IMP determines Pt needs to be seen in ED
- Send Patient to JHACH ED
- Arrive in JHACH ED
- Evaluation in JHACH ED Trauma Room
- ED Attending
- CVICU Attending
- CV Surgeon On-Call
- Cardiologist On-Call

Conference Call Team Members
Thru Transfer Center: 727-767-7337
And review plan of care that includes:
- Send Viral Panel (including COVID)
- Start O2 for sats < 75%
- Place PIV
- Send CBC, CMP
- Send VBG or CBG
- CXR in ER or CVICU

- Notify
- Administrative Supervisor RN & CVICU Charge RN to arrange bed
- ECMO Standby
- On-Call Sonographer
- Consider
- Contacting Interventional Cardiologist
- Consider

Emergently Admit to CVICU

- Initial clinical care based on pre-arrival phone conversation
- Do not wait for lab results
- Consider ER RN accompany patient to CVICU to help with patient care
**Emergency Center Management**
When the patient arrives in the ER, she/he will be brought back immediately to the ED Trauma Room for assessment. A CVICU team member may be available to assist in the evaluation.

Based on the clinical picture in the ER, the team present will then determine the next steps to expedite admission to the CVICU. The plan of care that was reviewed on the pre-arrival phone call will be initiated as best as possible.

**Admission**
Patient will be admitted as soon as possible to the CVICU. To help in the transfer of care and transfer of information, the ER RN will accompany the patient to the CVICU. Consider having the ER RN responsibilities in the CVICU will be to continue to assist with patient stabilization and peripheral IV placement.
References

- https://www.npcqic.org/
Outcome Measures:

- Pathway Utilization Rate: # of IMP patients that used this pathway / total IMP patients for that calendar year
- Time taken (minutes) to be admitted to the CVICU from the ER
- Number of IMP patients that survived from ECMO that used this pathway / total number of IMP patients that used this pathway
- Number of IMP patients that had cardiopulmonary arrest in the ER that used this pathway / total number of IMP patients that used this pathway
- Number of IMP patients that arrest in the CVICU that used this pathway / total number of IMP patients that used this pathway

Clinical Pathway Team

**Cardiac Interstage Patient in Extremis: Home to ER to CVICU Clinical Pathway**

*Johns Hopkins All Children’s Hospital*

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Disclaimer

Clinical Pathways are intended to assist physicians, physician assistants, nurse practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. The ultimate judgment regarding care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.

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