Clinical Pathway: Norwood Operation

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Path initiated on _____
(Date)

Expected length of stay: 21 days

Attending physician _____

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Eligibility Criteria: Diagnosis – Hypoplastic Left Heart or functional single ventricle variants treated with Stage I Norwood palliation.
Age less than 1 month. No significant comorbidities.

Timeline	Pre-op*	Day of Surgery*	Post-op Day #1
Unit/Dept.	CICU	OR/CICU	CICU
Date			
Assessment/Monitoring	Weight, Height. vital signs per routine	Vital signs per routine	Vital signs per routine, 4 limb BP
Cardiac	Cardiorespiratory (CR) monitor	CR monitor, atrial lines, SVC A-line, NIRS (near-infrared spectroscopy)	CR monitor, atrial line/s, A-line, NIRS
Resp/Pulm.	Assess breath sounds, O_2 sat	√ breath sounds, O_2 sat, CT drng	√ breath sounds, O_2 sat, CT drng
		Ventilator	ventilator
Fluid status	Measure I&O.	Measure I&O. Foley. NG output.	Measure I & O. Foley.
Diagnostics	CXR, EKG, ECHO CBC/diff, renal panel, T&C, (newborn screen) ABG, lactate BID + PRN	On arrival in CICU: CXR, EKG, CBC, PT/PTT, renal panel, Glu, Mg, Ca^{++}, lactate, ABG, S_{vO2} ABG, lactate, K^+, Ca^{++}, S_{vO2}** every 4 hrs x 24 hrs CBC, renal panel, glucose every 8 hrs	CXR in a.m. CBC, renal panel, Mg, PT/PTT, S_{vO2} in am BID ABG, lactate, Ca^{++}, Glu, K^+ every 4 hrs
Medications/ IV therapy	Prostaglandin E_1 +/- Dopamine or Dobutamine Nitrogen or CO_2 PRN	Antibiotic (Cefazolin) *(G11[B])* Dopamine, Milrinone *(G19 [B])*, Epinephrine , +/- Nipride, Fentanyl infusion *(G20 [B])* IV maintenance fluids Heparin	Antibiotic (Cefazolin) *(G11[B])* Dopamine, Milrinone, *(G19 [B])*, Epinephrine, +/- Nipride Fentanyl infusion Midazolam PRN Heparin Furosemide
Treatments/ Procedures	PICC or other central access	Norwood operation	
Nutrition/GI	NPO TPN, $D_{20}W$ $D_{10}W$ 12 hrs prior to OR	NPO (NG → low continuous suction)	NPO Start TPN
Activity	Ad lib Hibiclens bath in pm	Bed rest	Bed rest
Consults/referrals	Anesthesia		
Psychosocial	Psychosocial assessment, emotional support.	Family updated re: patient status. Patient comfort measures.	Family updated. Patient comfort measures.
Education	Pre-op teaching re: monitors, ventilator, tubes, lines, etc.	Teaching re: CICU routines, care	Postoperative care.
Discharge planning			Education as above.

***order set** [ ] Indicates strongest strength of evidence (see guideline for evidence scale).

** S_{vO2} =mixed venous oxygen saturation

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Clinical Pathway: Norwood Operation

EXPECTED OUTCOMES

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Signatures/ Credentials												
Timeline	Pre-op				Day of Surgery				Post-op day #1			
Unit/Dept.	CICU				OR/CICU				CICU			
Date		**D**	**E**	**N**		**D**	**E**	**N**		**D**	**E**	**N**
Physiologic	No signs of intercurrent illness. Pre-op tests completed. Newborn screen done. Hemodynamic stability.				Hemodynamic stability. Respiratory stability No signs of infection.				Hemodynamic stability. Respiratory stability O_2 sat greater than 65% and less than 85 % No signs of infection.			
Psychosocial/ Comfort	Patient/family are prepared for surgery.				Family informed. Adequate sedation and pain control.				Family informed. Adequate sedation and pain control.			
Educational	Parent/s informed. Consent signed.				Family informed.				Family informed.			
Other												
Outcome not met due to:	Fever O_2 sat less than 70% and pO_2 greater than 30 Hemodynamic instability Respiratory Sx NEC Parent anxiety Incomplete tests Other: _____				Arrhythmia Hemodynamic instability Bleeding O_2 sat less than 60% $S_{AO2} - S_{vO2}$ greater than 30 Fever Inadequate sedation Other: _____				Arrhythmia Hemodynamic instability Bleeding O_2 sat less than 60% $S_{AO2} - S_{vO2}$ greater than 30 Fever Inadequate sedation Other: _____			

For each met outcome, initial = met

- **= not met (see progress notes)**

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Clinical Pathway: Norwood Operation

Expected length of stay: 21 days

Attending physician _____

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Eligibility Criteria: Hypoplastic Left Heart or functional single ventricle variants treated with Stage I Norwood palliation. *Age less than 1 month*
No significant comorbidities.

Timeline	Post-op day #2	Post-op day #3	Post-op day #4
Unit/Dept.	CICU	CICU	CICU
Date			
Assessment/Monitoring	Vital signs per CICU routine	Vital signs per CICU routine	Vital signs per CICU routine.
Cardiac	CR monitor, atrial line/s, A-line √ pacing wires secure	CR monitor, atrial line/s, A-line √ pacing wires secure	CR monitor, atrial line/s, A-line √ pacing wires secure
Resp/Pulm.	√ breath sounds, O_2 sat, CT drng ventilator	√ breath sounds, O_2 sat, CT drng ventilator	√ breath sounds, O_2 sat, CT drng ventilator
Fluid status	Measure I & O, foley	Measure I & O, foley	Measure I & O, foley
Diagnostics	CXR in a.m. CBC, renal panel, Mg, PTT in am & BID ABG, lactate, Ca^{++}, Glu, K^+, S_{vO2} every 6 hrs for 24 hrs post sternal closure	CXR in a.m. CBC, renal panel, Mg, PTT in am & BID ABG, lactate, Ca^{++}, Glu, K^+, S_{vO2} every 6 hrs for 24 hrs post sternal closure	CXR in a.m. CBC, renal panel, Mg, ABG, lactate, Ca^{++}, Glu, S_{vO2} , PT/PTT in am & BID
Medications/ IV therapy	Antibiotic (Cefazolin) x 3 doses after sternal closure *(G11[B])* Dopamine, Milrinone, *(G19 [B]),* Epinephrine. Fentanyl infusion Midazolam Heparin Furosemide	Antibiotic (Cefazolin) x 3 doses after sternal closure *(G11[B])* Dopamine, Milrinone, *(G19 [B]),* Epinephrine wean D/C Fentanyl infusion post sternal closure morphine, midazolam Heparin Furosemide	Dopamine, Milrinone, *(G19 [B]),* Epinephrine wean morphine, midazolam Heparin Furosemide
Treatments/ Procedures	Sternal closure		D/C CA line per protocol D/C chest tube per protocol Ventilator wean.
Nutrition	TPN	TPN	TPN +/- NG trophic feeding
Activity	Bedrest	Bedrest	Bedrest
Consults/referrals			
Psychosocial/Comfort	Patient comfort measures. Family/patient support.	Patient comfort measures. Family/patient support.	Patient comfort measures. Family/patient support.
Education	Postoperative care	Postoperative care	Postoperative care
Discharge planning			

***order set** [ ] Indicates strongest strength of evidence (see guideline for evidence scale).

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EXPECTED OUTCOMES

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Signatures/ Credentials												
Timeline	Post-op day #2				Post-op day #3				Post-op day #4			
Unit/Dept.	CICU				CICU				CICU			
Date		**D**	**E**	**N**		**D**	**E**	**N**		**D**	**E**	**N**
Physiologic	Hemodynamic stability. Respiratory stability. O_2 sat greater than 65% and less than 85 % No signs of infection.				Hemodynamic stability. Respiratory stability. O_2 sat greater than 65% and less than 85 % No signs of infection.				Hemodynamic stability. Respiratory stability. No effusion. No signs of infection. Chest tube removed without evidence of pneumothorax or effusion. Incision healing.			
Psychosocial	Family informed. Adequate sedation / pain control.				Family informed. Adequate sedation / pain control.				Family informed. Adequate sedation / pain control.			
Educational	Family teaching in progress.				Family teaching in progress.				Family teaching in progress.			
Other												
Outcome not met due to:	Arrhythmia Hypotension O_2 sat less than 60% Poor perfusion Atelectasis/effusion Agitation/inadequate sedation Fever Other: _____				Arrhythmia Hypotension O_2 sat less than 60% Atelectasis/effusion Agitation/inadequate sedation Fever Other _____				Arrhythmia Hypotension O_2 sat less than 60% Atelectasis/effusion Fever Inadequate pain control Other: _____			

For each met outcome, initial = met
*** = not met (see progress notes)**

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Clinical Pathway: Norwood Operation

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Expected length of stay: 21 days

Attending physician _____

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Eligibility Criteria: Hypoplastic Left Heart or functional single ventricle variants treated with Stage I Norwood palliation. *Age less than 1 month.* *No significant comorbidities.-*	
Timeline	Weaning Phase: Post-op Day # 5 to _____ Extubation & Discontinuation of Inotropic and Vasodilator Infusions / Transfer
Unit/Dept.	CICU
Date Transfer	
Assessment/Monitoring	Vital signs per routine
Cardiac	CR monitor. Discontinue atrial line/s, A-line. √ pacing wires secure
Resp/Pulm.	Assess breath sounds, O_2 sat
Fluid status	Measure I & O
Diagnostics	CBC/diff/platelet count every AM, Renal panel, magnesium, Ca^{++}, ABG BID ABG PRN → extubation
Medications/ IV therapy	D/C Epinephrine Wean Milrinone . Begin captopril/enalapril if no aortic arch obstruction Wean Dopamine. Furosemide, +/- spironolactone D/C heparin →Baby ASA. Consider metoclopramide
Treatments/ Procedures	Dressing/Incision check Routine PICC and IV site care FEEST/vocal cord assessment 24 hrs-48 hrs post extubation.
Nutrition/GI	Daily nutrition evaluation. Daily weights following extubation. Advance NG feeding to target calories as tolerated per protocol Begin PO feeding per protocol
Activity	Bedrest
Consults/referrals	ENT for FEESST (flexible endoscopic evaluation of swallowing with laryngopharyngeal sensory testing) and vocal cord assessment post extubation Home health care Feeding team Early intervention
Psychosocial	Patient comfort measures Family support
Education	Per Health Topic "Going Home after Cardiac Surgery", ICU routines
Discharge planning	Assess transfer readiness. Criteria: Off inotropes x 24 hours Extubated x 48 hours

***order set** [ ] Indicates strongest strength of evidence (see guideline for evidence scale)

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EXPECTED OUTCOMES

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Signatures/ Credentials																
Timeline	Post op Day # _____ to transfer	Post-op Day___			Post-op Day ___			Post-op Day ___			Post-op Day ___			Post-op Day ___		
Unit/Dept.	CICU → A6Central															
Date		**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
Physiologic	Hemodynamic stability.															
	Inotropic and Vasodilator Infusions off **_____date)															
	Stable respiratory status.															
	Extubation date_____															
	O_2 sat greater than 65% and less than 85%															
	No evidence of infection.															
	Target calories _____															
Psychosocial/ Comfort	Family informed.															
	Pain controlled.															
Educational	Teaching (date initiated)															
	Medications _____ (date)															
	Signs of cardiac distress _____(date)															
	Feeding/Nutrition _____ (date)															
	Other: _____															
	_____															
Other	Transfer from ICU _____(date)															
Outcome not met due to:	Unstable vital signs															
	Arrhythmia _____															
	Failure to wean from ventilator due to:															
	Sedation ☐															
	Edema ☐															
	Hemodynamic instability ☐															
	Pulmonary complications (atelectasis/effusion)															
	Other _____															
	Hypoxemia (oxygen saturation less than 60%)															
	Respiratory distress.															
	Fever, signs of infection _____															
	Parent unavailable															
	Delay in ICU transfer due to _____															

For each met outcome, initial = met ***= not met (see progress notes)** ****APN to document dates**

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Clinical Pathway: Norwood Operation

Page _____

Expected length of stay: 21 days

Attending physician _____

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Eligibility Criteria - Hypoplastic Left Heart or functional single ventricle variants treated with Stage I Norwood palliation. Age less than 1 month. ***No significant comorbidities.-***	
Timeline	Post-op Day # _____ (transfer from CICU) to Discharge
Unit/Dept.	A6C
Date Transfer	
Assessment/Monitoring	Vital signs with BP every 4 hrs, 4-limb BP every Monday
Cardiac	Telemetry
Resp/Pulm.	Assess breath sounds, O_2 sat
Fluid status	Measure I & O
Diagnostics	CBC, renal panel twice weekly and PRN CXR weekly and PRN Cardiac echo pre-discharge.
Medications/ IV therapy	Furosemide, captopril/enalopril, Baby ASA +/- spironolactone +/- digoxin erythromycin (if greater than 14 days old)or metoclopramide
Treatments/ Procedures	Incision check Routine PICC line and IV site care +/- circumcision
Nutrition/GI	NG/PO per feeding guideline to achieve target calories Daily weight
Activity	Ad lib
Consults/referrals	Home health care Early intervention Audiology (BAERS)
Psychosocial	Patient comfort measures Family/Patient support
Education	Per Health Topic "Going Home after Cardiac Surgery" +/- per Health Topic "Nasogastric Feeding Tube Insertion" and "Nasogastric Feeding" Norwood Home Surveillance Offer CPR teaching
Discharge planning	Assess discharge readiness. Scale and oxygen saturation monitor for Norwood Home Surveillance Order discharge prescriptions Follow-up appointments made. Fax discharge communication form to referring physician.

***order set** [ ] Indicates strongest strength of evidence (see guideline for evidence scale)

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Clinical Pathway: Norwood Operation

Page _____

EXPECTED OUTCOMES

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Signatures/ Credentials																
Timeline	Post op Day # _____ to discharge	Post-op Day ___			Post-op Day ___			Post-op Day ___			Post-op Day ___			Post-op Day ___		
Unit/Dept.	A6 Central															
Date		**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**	**D**	**E**	**N**
Physiologic	Hemodynamic stability.															
	Stable respiratory status.															
	O_2 sat greater than 65% and less than 85%															
	No fevers, evidence of infection.															
	Tolerating NG/PO feedings →adequate caloric intake.															
	(Target calories _____)															
Psychosocial/ Comfort	Family/patient informed regarding discharge needs.															
	Adequate pain control.															
Educational	Family/patient demonstrates comprehension of discharge instructions.															
	Medications _____ (date)															
	Feeding/Nutrition _____ (date)															
	NG tube placement _____ (date)															
	Weight and oxygen saturation measurement _____(date)															
	Signs of cardiac distress _____(date)															
	Prescriptions filled **_____(date)															
	Follow-up appointments made **_____(date)															
Other	Patient is discharged to home ☐ Ronald McDonald House ☐															
	Other _____															
	Date of discharge** _____															
Outcome not met due to:	Unstable vital signs.															
	Respiratory distress.															
	Hypoxemia (oxygen saturation less than 70%)															
	Fever, signs of infection _____															
	Feeding problems_____															
	Family unable to assume home care due to _____															
	Delay in discharge due to:															
	Other: _____															

For each met outcome, initial = met *= not met (see progress notes) ** APN will document

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Clinical Pathway: Norwood Operation

Outpatient 1

Expected length of stay: 21 days

Attending physician _____

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Eligibility Criteria: - Hypoplastic Left Heart or functional single ventricle variants treated with Stage I Norwood palliation. Age less than 1 mo. ***No significant comorbidities.***		
Timeline	Post-discharge	
Unit/Dept.	Clinic	
Date		
Assessment/Monitoring	H & P	
Monitoring		
Cardiac	4-limb BP	
Resp/Pulm.	O_2 sat	
Fluid status		
Diagnostics	CXR	
Medications/IV Therapy		
Treatments/Procedures	Incision check	
Nutrition	weight	
Activity		
Consults/Referrals		
Psychosocial/Comfort	Assess parenting stress, infant behavior	
Education		
Discharge Planing		

[ ] Indicates strongest strength of evidence (see guideline for evidence scale).

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CLINICAL PATH: Norwood Operation

Outpatient 2

EXPECTED OUTCOMES

This pathway is a general guideline and does not represent a professional care standard governing provider's obligations to patients. Care is revised to meet the individual patient needs.

Signatures/ Credentials				
Timeline	Post discharge			
Unit/Dept.	Outpatient			
Date				
Physiologic	Incision healing. Weight gain.			
Psychosocial	Family/patient have resumed preoperative level of functioning.			
Educational	Family informed.			
Other				
Outcome not met due to:	Feeding problems Wound infection Disruption of family routines. Parenting stress Since discharge: Readmission _____ E.D. visit _____			

For each met outcome, initial = met
*** = not met (see progress notes)**

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