East Midlands Neonatal
Operational Delivery Network

NETWORK GUIDELINE

Guideline:	**Management of Patent Ductus Arteriosus (PDA) and Referral Criteria for PDA Ligation**
Version:	**1**
Date:	**July 2020**
Review Date:	**July 2023**
Approval:	**EMNODN Clinical Governance Group**
Authors:	**Dr Venkatesh Kairamkonda**
Consultation:	**EMNODN Clinical Governance Group**
Distribution:	**Neonatal units within EMNODN**
Risk Managed:	**Appropriate management of PDA**

This document is a guideline. Its interpretation and application remains the responsibility of the individual clinician, particularly in view of its applicability across the different Trusts in the East Midlands Neonatal Operational Delivery Network. Please also consult any local policy/guideline document where appropriate and if in doubt contact a senior colleague.

Caution is advised when using guidelines after a review date.

REVIEW AND AMENDMENT LOG

Version	Type of Change	Date	Description of Change
1	-	Jul 20	-

This document should be read in conjunction with

Document	ID Number (if applicable) or Appendix No.
Standard Operating Procedure: Patient Pathway PDA Ligation in Preterm Babies	Appendix 2

Evidence according to RCPCH

Grade A	At least 1 randomized controlled trial addressing specific recommendation
Grade B	Well conducted clinical trials but no randomized trial on specific topic
Grade C	Expert committee report or opinions

Summary of Evidence

Management of PDA	Level of Evidence
Clinical signs of a PDA are not good indicators of a clinically significant PDA	C
Babies born less than 29 weeks gestation may benefit from early (< 72 hours) echocardiogram to predict the likelihood of significant PDA	C
Echocardiography criteria of PDA unlikely to close spontaneously include: • A ductal diameter of >2.0mm • Evidence of absent or reversed diastolic flow in the descending aorta • Evidence of volume loading with an increased LA:Ao ratio of >1.5:1 (least useful predictor)	C
The use of diuretics should be restricted to individual babies where there is thought to be heart failure and fluid overload	B
PDA ligation may be considered in symptomatic babies where a PDA has failed to respond to medical treatment or in cases where medical treatment is contra-indicated	B
Aggressive fluid restriction in management of clinically significant PDA is not recommended - Calorie intake should be maintained and milk intake should not be restricted.	C
Non-steroidal Anti-Inflammatory drugs reduce the glomerular filtration rate (GFR) and therefore close monitoring of fluid status is recommended	C

Monitoring whilst receiving treatment by NSAID should include daily weight, close monitoring of urine output and frequent measurement of serum electrolytes (at least daily)	C

Clinically Significant PDA

Absence of the following does not rule out a significant PDA as they do not necessarily correlate well with the clinically important effects and significance of a PDA as this is also dependent on the baby's ability to compensate. However, these signs are useful to highlight the presence of a PDA whose significance can then be assessed.

- Heart murmur, active precordium, bounding peripheral pulses, wide pulse pressure, Hepatomegaly
- A baby remaining ventilator dependent beyond 1 week of age
- Increasing ventilator or oxygen requirements without another obvious cause (for example airway problems, infection or pneumothorax)
- Significant hypotension with no other obvious cause
- Significant pulmonary haemorrhage (blood from ETT with deterioration in respiratory status)
- Abdominal distension or suspected NEC
- A baby remaining ventilator dependent and post-natal steroids being considered to try to achieve extubation.

Echocardiographically Significant PDA

It is good practice to assess significance of PDA by personnel/professional trained in neonatal Echocardiography where possible.

The presence of 2 or more of the following is a reasonable guide to identifying an 'echocardiographically significant' PDA:

- Diameter of >2.0 mm
- Pulsatile ductal flow pattern
- Left heart dilatation (LA/Ao >1.5:1)
- Retrograde post-ductal aortic diastolic flow
- Abnormal diastolic flow in mesenteric or renal or cerebral vascular beds

Combined Clinical and Echocardiographic Criteria

The following detailed staging system based on clinical and echocardiographic criteria (1) may also be useful

Table 1 Proposed staging system (adapted from McNamara and Hellman, unpublished clinical triaging system for ligation of a patent ductus arteriosus (PDA)) for determining the magnitude of the haemodynamically significant ductus arteriosus (HSDA), which is based on clinical and echocardiographic criteria

Clinical	Echocardiography
C1 Asymptomatic	E1 No evidence of ductal flow on two-dimensional or Doppler interrogation
C2 Mild Oxygenation difficulty (OI <6) Occasional (<6) episodes of oxygen desaturation, bradycardia or apnoea Need for respiratory support (nCPAP) or mechanical ventilation (MAP <8) Feeding intolerance (>20% gastric aspirates) Radiologic evidence of increased pulmonary vascularity	E2 Small non-significant ductus arteriosus Transductal diameter <1.5 mm Restrictive continuous transductal flow (DA V_{max} >2.0 m/s) No signs of left heart volume loading (eg, mitral regurgitant jet >2.0 m/s or LA:Ao ratio >1.5:1) No signs of left heart pressure loading (eg, E/A ratio >1.0 or IVRT >50) Normal end-organ (eg, superior mesenteric, middle cerebral) arterial diastolic flow
C3 Moderate Oxygenation difficulty (OI 7–14) Frequent (hourly) episodes of oxygen desaturation, bradycardia or apnoea Increasing ventilation requirements (MAP 9–12) Inability to feed due to marked abdominal distension or emesis Oliguria with mild elevation in plasma creatinine Systemic hypotension (low mean or diastolic BP) requiring a single cardiotropic agent Radiological evidence of cardiomegaly or pulmonary oedema Mild metabolic acidosis (pH 7.1–7.25 and/or base deficit −7 to −12.0)	E3 Moderate HSDA Transductal diameter 1.5–3.0 mm Unrestrictive pulsatile transductal flow (DA V_{max}<2.0 m/s) Mild-moderate left heart volume loading (eg, LA:Ao ratio 1.5 to 2:1) Mild-moderate left heart pressure loading (eg, E/A ratio >1.0 or IVRT 50–60) Decreased or absent diastolic flow in superior mesenteric artery, Middle cerebral artery or renal artery
C4 Severe Oxygenation difficulty (OI >15) High ventilation requirements (MAP >12) or need for high-frequency modes of ventilation Profound or recurrent pulmonary haemorrhage "NEC-like" abdominal distension with tenderness or erythema Acute renal failure Haemodynamic instability requiring >1 cardiotropic agent Moderate-severe metabolic acidosis (pH<7.1) or base deficit >−12.0	E4 Large HSDA Transductal diameter >3.0 mm Unrestrictive pulsatile transductal flow Severe left heart volume loading (eg, LA:Ao ratio >2:1, mitral regurgitant jet >2.0 m/s) Severe left heart pressure loading (eg, E/A ratio >1.5 or IVRT >60) Reversal of end-diastolic flow in superior mesenteric artery, middle cerebral artery or renal artery

BP, blood pressure; DA V_{max}, ductus arteriosus peak velocity; E/A, early passive to late atrial contractile phase of transmitral filling ratio; IVRT, isovolumic relaxation time; LA: Ao ratio, left atrium to aortic ratio; MAP, mean airway pressure; nCPAP, nasal continuous positive airway pressure; NEC, necrotising enterocolitis; OI, oxygenation index.
Patients should be assigned both a clinical and echocardiography stage (eg, neonate with severe oxygenation failure, pulmonary haemorrhage and a 3.2 mm unrestrictive left-to-right shunt will be C4-E4 class HSDA).
Detailed discussion of the echocardiography parameters is beyond the scope of this perspective.

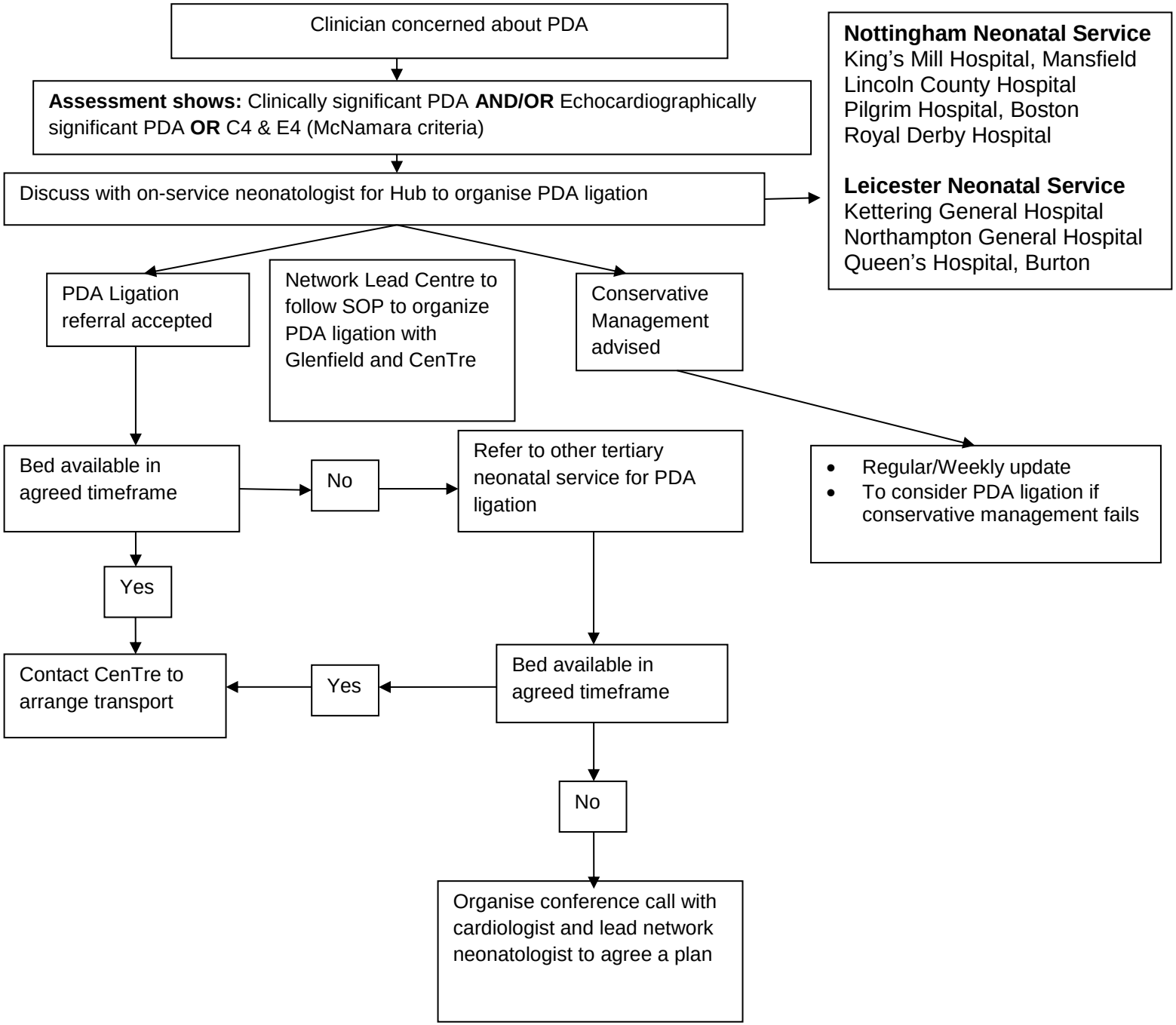
Surgical Closure of PDA

Surgical closure of PDA should only be considered in babies with

- A clinically significant PDA (as defined above) AND/OR
- Echocardiographic signs of a significant duct (as defined above) OR
- C4 and E4 (McNamara criteria) OR
- Hemodynamically significant PDA which has failed to close despite two courses of Ibuprofen and diuretic treatment and / or baby is beyond 4 weeks of age when NSAID may be less effective

This should trigger discussion with the on-service neonatologist at the Network/Hub Lead Centre. (refer to Appendix 1). If PDA ligation is agreed, Network/Hub Lead Centre should follow Standard Operating Procedure: Patient Pathway PDA Ligation in preterm babies (see Appendix 2)

Appendix 1: EMNODN Pathway for PDA Ligation



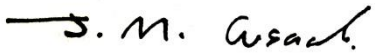
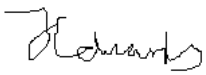
Appendix 2: Standard Operating Procedure: Patient Pathway PDA Ligation in Preterm Babies

Standard operating procedure: Patient Pathway PDA Ligation in preterm babies

University Hospitals of Leicester NHS Trust	
Version	V* January 2020
Directorate	Women's and Children
Department	EMCHC and CenTre
Clinical Medical Lead	Katie Linter
Document Reference:	PDA: V8 January 2020
Document Name:	Standard operating procedure: Patient Pathway PDA Ligation in preterm babies
Authors	Dr Linter, Mr Saeed, Andrew Leslie, Dr.B Schoonaker
Publication date	August 2020
Target Audience:	Referring Neonatal Units, CenTre, EMCHC, Blood Bank
Additional Circulation:	CMG Women and Children, regional NNU
Description.	This document will provide the overview for the patient pathway from the point of recognition that a premature infant has a PDA which is haemodynamically significant and requires surgical ligation to permit reduction of ventilator support to successful recovery to surgery and stabilising infant at receiving unit post-surgery. It aims to ensure that within the East Midlands Neonatal Operational Delivery Network (EMNODN) the NICUs, surgical NICU,Transport team and EMCHC will provide surgical ligation of PDA when indicated, whilst minimising time of referral to time of surgery and time infant is outside of Neonatal Intensive Care Unit environment.
Actions required.	Circulate to appropriate stakeholders for review and comment

Version Control	
PDA V1 120918 – Draft for review	Katie Linter , Alison Poole
PDA V2 150918 – Draft for review	Frances Bu'Lock ,Katie Linter, Alison Poole
PDA V3 190918 – Draft for review	Katie Linter , Alison Poole
PDA v4 200918 – Draft for circulation	Andy Leslie, Katie Linter, Alison Poole
PDA v5 121118 PDA v5 121118 12.00	Katie Linter (post PDA 71118)
PDA v6 271118	Katie Linter, Andrew Leslie (post PDA 271118)
PDA v7 211218	PDA ligation Patient Pathway v7 211218 further comments KL/JB after review of LL email and EMNODN governance minutes.doc
PDA v8	EMNODN reviewed and agreed January 2020

APPROVALS REQUIRED

Approvals Required:	Signature	Date
HoS for EMCHC		17.11.2020
Clinical Lead for Congenital Cardiac Surgery		
Clinical Lead for UHL Paediatric Intensive Care	Claire Westrope	18.11.20
Clinical Lead for Congenital Cardiac Anaesthesia		
HOS CenTre		18.11.20
Lead Clinician for EMNODN (S),	Jo Behrsin	17.11.20
Lead Clinician EMNDON (N),	Anneli Wynn Davies	12.10.20
HOS Neonates, UHL		17.11.20
HOS Neonates NUH		24/11/20
HOS Neonates, UHCW	Puneet Nath	17/12/20
Clinical Director W&C CMG UHL		

1. Purpose

1.1. To work as a coordinated team for the best interest of the pre term neonate
1.2. To undertake surgery within 48 hrs of referral, 7 days a week
1.3. To provide case by case debrief for quality assurance purposes
1.4. Meet national recommendations and standards

2. Scope

2.1. This Standard Operating Procedure (SOP) includes a description of the premature neonate pathway from referral for Patent Ductus Arteriosus (PDA) ligation by the referring Neonatal Intensive Care Unit (NICU), to admission for surgery at the East Midlands Congenital Heart Centre (EMCHC) and return to accepting NICU post-surgery
2.2. This SOP covers roles, responsibilities and routine tasks of the pathway within the normal working practice of the referring NICU, accepting NICU, EMCHC and CenTre transport team
2.3. This SOP does not cover
- Indication for referral
- Transport arrangements between referring NICU and accepting NICU

3. Definitions

3.1 NICU is the Tertiary Neonatal Intensive Care Unit at NUH or UHL referring the neonate

Level 3 Neonatal intensive care units (NICUs) are sited alongside specialist obstetric and fetomaternal medicine services, and provide the whole range of medical neonatal care for their local population, along with additional care for babies and their families referred from the neonatal network. Many NICUs are co-located with neonatal surgery services and other specialised services. Medical staff in a NICU should have no clinical responsibilities outside the neonatal and maternity services.

3.2.1 **EMCHC** is the organisation which will accept the patient referral and undertake surgery

3.21 **CenTre** is the specialist neonatal transport team which will manage transfer of neonate from the accepting NICU to Glenfield Hospital, management of stay at Glenfield hospital and transfer back to Base Hospital

3.22 **PICU** is the Paediatric Intensive Care Unit; Glenfield Hospital who will provide the space for observation and monitoring in preparation for to surgery and postoperative recovery prior to discharge from unit

3.23.1 **Heart Suite** is the data management system that is used to record details of all NICOR related surgeries and is accessible to external clinical teams on prior arrangement

3.23.2 **East Midlands Neonatal Operational Delivery Network (EMNODN)** is the support network for Stakeholders within Acute Trusts and lease with Specialist Commissioners

4. The Principles for the PDA patient pathway

4.1 Provision of surgical care must follow the principles directed by UHL NHS Trust to include

- High quality care of the neonate at all points in patient pathway
- High quality care and communication between and within working teams
- Well informed, timely, multidisciplinary team working
- Accurate documentation and communication of decision making process
- Minimal delays in process
- Clear information to Referring NICU/ Accepting NICU of what is required for referral, necessary investigations to complete before transfer
- The provision of 1 unit cross matched, irradiated CMV negative blood to be available at time of surgery- in theatre fridge at time of surgery.
- Accurate information provided to parents with regard to procedure, timescale and what to expect at EMCHC
- Effective delivery of service to minimise time neonate spends in transport and outside NICU
- Minimal steps in hand over
- Best use of CenTre service
- Paediatric Intensive Care Medical and Nursing staff should not be expected to provide care unless in exceptional circumstances
- Identification of key staff and contacts
- Flexibility to optimise use of theatre space
- Explicit instructions for postoperative care after discharge

5. The expected model of care

5.1. Referral is treated with highest priority to provide high quality care of the neonate identified to require surgical PDA

5.2. Time points are optimised to

- Minimise time between referral and acceptance of patient for surgical ligation (within 48 hours)
- Minimise time waiting for surgery / procedure
- Minimise time patient out of neonatal intensive care unit (NICU)–during transfer and operating process

Safety is embedded throughout the process

5.3 Decision to refer is made according to referring hospital clinical guidelines for management of patients with a clinically significant PDA

5.4 Referrals for PDA ligations will only be accepted from the tertiary neonatologist in Nottingham or Leicester

5.4.1 **Patients in Other EMNODN units requiring duct ligation**

5.4.2 When there is consideration that a duct ligation will be required for a baby receiving care in a local neonatal unit or SCBU a discussion is required with the lead tertiary centre for the appropriate hub (NCH or QMC– for Lincoln, Boston, Kingsmill, & Derby, Leicester Neonatal Service for Northampton, Kettering and Burton). All

babies will be reviewed as inpatients in one of the tertiary NICUs prior to definitive decisions being made regarding the need for duct ligation. Referral for duct ligation will then follow the processes as outlined in this pathway.

The referring neonatologist at the tertiary centre and local neonatal unit must be identified and contact details made available

5.3 The referral should be made in writing using PDA ligation referral proforma to the On-call Cardiology SpR. This can be e mailed to the SpR on call (who will inform the Cardiology Consultant) or the On-call Cardiology Consultant

5.3.1 When the referral is made by email this should always be copied and filed in patients notes

5.4 The Referral should include patient's details including parents' names and contact number, clinical status, MRSA status, echocardiogram and CXR

5.5 IT systems should be in place for transfer of images between NHS Trusts.

5.6 The Cardiology SpR will confirm data has been received, identify and request missing data and set up MDT.

5.7 The patient pathway manager (PPM) will register the patient and enter details on to Heart Suite and generate notes.(In exceptional circumstances out of hours/during leave this will be provided by the duty manager/medical secretary). The patient notes will transfer with the patient. The quorum for an appropriate MDT is EMCHC Surgeon and Cardiologist. The MDT will review the data and accept the referral for closure. Should the referral not be accepted, the referring Neonatologist will be informed by the Cardiologist or Surgeon, with the rationale for declining at this moment in time. This will be followed up in writing. The Cardiology SpR will inform the PPM immediately and complete outcome for HeartSuite.

6. Once the referral is accepted:

6.1. Decision will be sent to Patient Pathway Manager to list for surgery. The decision is relayed to Local NNU and Tertiary NICU (It is expected that this will be during/immediately after MDT. This is the responsibility of Cardiology SpR)

6.2. Tertiary NICU will refer to CenTre team, and coordinate transfer if required

6.3. CenTre will advise on availability of transport for the proposed surgical slot. Same-day referrals will not usually be possible unless clinically indicated. CenTre will be unable to undertake more than one PDA transfer at a time. CenTre will advise on any unusual contingencies which might limit transport availability for the proposed surgical slot

6.4. The responsible Neonatology Consultant, Cardiology Consultant, responsible Cardiothoracic Surgeon, and Patient Pathway Manager will be identified and be available to communicate effectively

6.5. Prior to transfer, full blood count, biochemistry and clotting parameters must have been checked and be in normal range appropriate to gestational age of neonate according to local neonatal guidelines. These should be reviewed by CenTre before transfer and will also be reviewed at Glenfield.

6.6. Blood transfusion provision

For surgery to proceed on time and minimise waiting communication with Blood transfusion is vital

1 unit cross matched (XM), CMV negative, irradiated blood must be available in theatre blood fridge or in a sealed blood bank box from NUH when patient goes to theatre

For Inpatients on the NICU, Leicester Royal Infirmary

- Patient and maternal samples should be sent to LRI laboratory immediately. Request form should state 'Neonate for PDA ligation at the Glenfield Hospital. Please test sample at LRI immediately'
    - <4mths age: LRI Blood Transfusion laboratory require neonatal sample for grouping and a maternal sample for Anti body testing
    - >4mths age: group and antibody testing on same neonatal sample
- The LRI lab will perform testing and identify any potential issues that may arise with testing
- When date of PDA ligation is confirmed the Glenfield Hospital team should send a separate request form to Glenfield Hospital Blood Bank stating date of procedure and requesting 1 unit to be cross matched, CMV negative and irradiated. Stating samples tested at LRI, Blood required at Glenfield

For Nottingham patients

- A maternal sample (This should include the mothers first name, surname, date of birth and NHS number) and neonatal sample must be made available for UHL to test before blood can be cross matched for procedure. Samples can be sent to Glenfield Blood Bank)

1 unit cross matched (XM), CMV negative, irradiated blood to be taken when baby is transferred to Glenfield in blood bank sealed box. (Blood can remain in sealed box for up to 8 hours)

The PDA Ligation Proforma (Appendix 1) should be used to communicate

effectively what actions are expected by the team at NUH or LRI prior to transfer for

duct ligation by the CenTre transport team as follows:

- Up to date summary letter/Badger summary
- Photocopy of relevant medical notes or agreement for CenTre to take the medical notes
- 2 correct name bands on infant
- 2 working cannulas
- All blood, and blood gas results from previous 12 hours to be available
- PDA ligation leaflet to be given to patients (Appendix 2)
- The PDA Ligation Proforma must be retained with patient notes and passed to the CenTre transport team as part of the handover during their arrival at the referring unit.

6.7. On day of surgery the patient will be discussed at 08.30 PICU huddle. Patient should not be included as a patient bed-space,

6.8. CenTre to contact PICU, when patient leaves Tertiary NICU
Should a referral be terminated PPM/CenTre will be informed immediately

7. On arrival at EMCHC PICU

7.1. Expected time of surgery to be confirmed by Congenital Cardiothoracic Team when referral accepted and listed: Confirmation between PPM, PICU, CenTre and NICU.
7.2. Patient should only leave NICU when theatre time is confirmed on day.
7.3. The expectation is that the baby goes to theatre without avoidable delay from admission to unit
7.4. On arrival, receiving staff (PICU nurse in charge) will inform Identified Surgeon, On Call Cardiology SpR/Consultant and Anaesthetist. CenTre team will continue to monitor neonate and provide medical and nursing care to neonate – CenTre to confirm checklist
7.5. Echocardiogram to be performed to exclude duct dependent circulation, check ductal size, patency and significance, cardiac function and estimated right heart pressures
7.6. Standard pre -op procedures, consent to be performed by the surgical SpR or Cardiothoracic Surgeon either face to face or via telephone if parents don't accompany patient to Glenfield Hospital. CenTre team to confirm prior to transport if parents are consenting face to face or telephone. CenTre to confirm contact details.
7.7. Theatre team to be kept informed and it is expected that an emergency team is made available to prevent any booked second case from being cancelled in line with Chief Executive's escalation procedure for CHD surgical cases

8. Patient returns to PICU

8.1. The following actions will be performed:

- Echo
- CXR
- CenTre assessment
- Cardiothoracic Notes and anaesthetic notes photocopied for referring unit.
- Provide accepting NNU with update and expected time of arrival at accepting NICU.
- Speak to parents either face to face or by telephone if not accompanied patient to Glenfield Hospital.

8.2. Pre departure details will be completed according to PDA ligation Proforma
8.3. Specific Post-operative care plan provided to include drain removal and
8.4. wound care. The post-op plan should be clearly documented onto the proforma. A copy of the proforma is required for EMCHD audit purposes
8.5. Transport Unit to contact Patient Pathway manager when transfer to
8.6. Accepting Hospital is complete
8.7. Copy of PDA ligation proforma is returned to Patient Pathway Manager for
8.8. collection of data for quality Assurance and Audit process
8.9. PICU to provide a copy of anaesthetic notes and surgical notes to go into babies notes prior to transfer to referring unit

9. Roles and responsibilities

Cardiology SpR Receives referral, informs Cardiology Consultant on-call, checks all data is available for MDT, completes entry of cardiac MDT conference summary onto Heart Suite , informs referring team of outcome of MDT, performs pre and post-operative ECHO providing timely assessment pre and post theatre

Surgical SpR Responsible for obtaining consent/completion of consent form when parents do not accompany patient, provides accepting NICU with post-surgical plan, liaises with blood bank re XM unit , may assist or perform surgical procedure
Cardiology Consultant of week/On Call Identified as the Named Consultant for patient, attends MDT, informs referring Will be responsible Named Cardiologist for patient when referral accepted Nominates Doctor to document outcome of MDT on Heart Suite. Will inform referring neonatologist of the outcome of the MDT decision
Cardiothoracic Surgeon/On Call Attends MDT, liaises directly with PPM, performs surgery or supervises SpR, provide post-operative assessment and care plan. Nominates Doctor to document outcome of MDT on Heart Suite.
Anaesthetist Pre surgical assessment, post-operative handover to CenTre team
Members of CenTre team Liaise with Surgical NICU and EMCHC, oversee and complete PDA Ligation Proforma, send copy of Proforma to PPM. Responsible and accountable for provision of safe transport. Keep parents and other members of team informed
PICU nurse in charge Liaise with CenTre, inform EMCHC team expected time of arrival of patient. Give support and advice to CenTre team post operatively if required
PICU ward clerk Copy surgical anaesthetic notes, give copy to CenTre team Ensure consent forms are on PICU.
PICU consultant Pre and post operatively the baby is residing on PICU and the consultant is responsible for providing immediate hands-on support if needed by the transport team in the event of an emergency, for example cardiac arrest
Patient Pathway Manager/ Duty Manager List patient for surgery, add to HeartSuite data base, and ensure all details are on Heart Suite, responsible and accountable for keeping Ormis updated
Blood Transfusion Laboratory - provide efficient process for sample analysis, update referring unit if further samples are required, to have available 1 unit of XM, CMV negative, irradiated blood for procedure in Glenfield Theatres for day of surgery.
EMCHC team are responsible and accountable for provision of safe and effective surgical care, and consent, keeping parents and other members of team informed of process, progress, issues and ongoing care. Responsible and accountable for publication of ligation proforma, details of referral process, and parent information to be distributed to all referring centres.
Referring and Surgical NICU Responsible and accountable for correct referral details and readiness for transfer out and for readmission of neonate post procedure. Completion of first section of PDA Ligation proforma. Keep parents and other members of team informed. Identification of factors which should defer surgery referral i.e. signs of sepsis, Necrotising Enterocolitis (NEC), or reverse decision to refer i.e. clinical improvement. Provide samples for Blood Bank as per protocol
All teams Responsible for Problem-solving and Problem-spotting, Escalate and proactively manage actual or predicted problems that might affect patient pathway and delay time to theatre, lengthen pathway.

10. Patient Information

10.1. The required Information booklet (appendix 2) will have been provided by the Referral Hospital to parents including a copy of the consent form, along with information to aid familiarisation with environment, and where food and drink is available

10.2. Information provided must include understanding of why referral and transfer decision has been made to facilitate timely consent and risks associated with surgery

10.3. Information must include the possibility that transfer does not guarantee procedure will take place as circumstances may change even during transfer and the EMCHC team must make the final decision after assessment on arrival

10.4. Parents to be kept informed of anticipated operating date and expected times by referring NICU, and any management changes necessary as they occur by the appropriate medical or nursing staff according to time point along pathway

11. Contact Numbers

UHL Main Switchboard	0300 303 1573
NNU LRI	0116 2586462 or 0116 2585437
NNU NUH (QMC)	0115 92471552
Cardiology Registrar on call - Bleep	2528
Surgical Registrar on call	07538 077590
CenTre	0300 300 0038
PICU Glenfield Hospital	0116 258 3288
Patient Pathway Manager Theatre Control	0116 256 3963 0300 303 1573 ext 72594

12. Appendix 1 – PDA Ligation Proforma

Referral form (To be completed by referring unit before contacting CenTre)

Section A to be completed by the Referring unit; Discuss with Cardiology team at Glenfield by calling LRI Switchboard 0300 303 1573 (Bleep 2528 – Cardiology registrar) and subsequently fax the form to 01162502422.

Section B to be completed by Cardiology team after discussion at MDT and return form to the referring unit.

Section A

Name:	**Date of Birth:**
Hospital Number:	**NHS number:**
Referring unit:	**Fax number:**
Person referring:	**Neonatal Consultant:**
Contact number:	**Date form completed:**

Birth Gestation:	**CGA:**
Birth Weight:	**Current Weight:**

Current Diagnosis / problem list:

ECHO details: **Date, Name and Designation of person performing:** **Findings**

Systemic details:			
Respiratory	**Ventilation settings:** **Gas:**		
Cardiovascular & Fluids	**HR**	**BP**	**SpO2**
	Fluids		
Infection	**Any current concerns / Colonisation**		
MRSA status (last 7 days)	**Last swab date and result**		

Blood results (Date):					
Hb	**WCC**	**Plat**	**Na**	**K**	**CRP**
PT	**APTT**	**INR**			

Parents name and contact number:		
Are parents happy to give consent over the telephone if not present at GGH.	**Yes**	**No**

Section B (To be completed by Cardiology/Cardiothoracic team)

Date of MDT meeting discussion	
MDT meeting outcome	
Named Cardiothoracic Surgeon	
Named Cardiology Consultant	
Date and Time of surgery	

Please contact CenTre neonatal transport team on 0300 300 0038 as soon as possible to inform about the potential transfer.

All timings must be discussed with CenTre Neonatal Transport at referral to ensure appropriate team and resource availability.

Arrangement of date and time of the operation is the responsibility of the referring unit.

Readiness for transfer form (To be completed by referring unit prior to arrival of transport team)

Actions to be completed by referring team prior to arrival of CenTre team	Referrers to sign to confirm completed	Date completed
An up to date clinical summary letter printed		
– CenTre to take the infants medical notes with them		
Maternal blood sample – Adult bottle (7.5mls EDTA KE for transfusion) – Maternal details handwritten on bottle – A blood transfusion form – For NUH transfers 1 unit of blood should accompany the baby		
TWO correct name bands on infant		
At least TWO working cannulae in place		
Less than 2 hours before CenTre team arrive – Recent blood gas taken and results recorded – BP measured and recorded – Axilla temperature taken and recorded		
All results from previous 12 hours to be available – FBC, U&E, CRP, Clotting * ***Hb at acceptable level pre transfer – clarify with Glenfield***		
IV opiate infusion running before team arrive if ventilated – check prescription and syringe label		
IV maintenance and all fluids drawn up and correctly labelled in 50ml syringes Nil by mouth for last ……. hours		
Routine / regular medications given as prescribed before departure		
Drug chart or copy to go with infant		

X-rays available on disc to accompany infant if PACS not an option		
PDA Ligation information leaflet given to parents		

To be completed by CenTre transport team after arrival at referring unit

If infant not ready for transfer / not transferred (Please state reasons):

Arrival Date:	**Arrival Time:**
Departure Date:	**Departure Time:**

Pre Theatre details (To be completed by CenTre team after arrival at Glenfield)

Date and Time of Arrival	
Date and time of Surgery	

<u>On Arrival: Contact</u>

On call Cardiothoracic registrar
<u>AND</u>
On call Cardiology registrar (Bleep 2528)

	Time contacted	**Time Reviewed**	**Reason for delay**
Cardiology			
Cardiothoracic			
Anaesthetic			

<u>Pre Op ECHO details:</u> Time, Name and Designation of person performing:
Findings:

For surgery	**Yes**	**No**

Time transferred to Theatre	
Time back from Theatre	

Reasons for delays in going to Theatre (if any):

Intra-Operative problems		
Increased ventilation req	**Yes**	**No**
Additional i.v access	**Yes**	**No**
Temperature maintenance	**Yes**	**No**
	Additional measure(s) used	
Blood given	**Yes**	**No**
Fluid boluses	**Yes**	**No**

Parents updated / informed post operatively ☐

Pre Departure details (To be completed by CenTre team post Theatre)

Post Op ECHO details: Name / Findings / Time performed		
Cardiology team is happy with LV output and function	**Yes**	**No**
Appropriate assessment performed to consider additional inotrope or volume support (if required)	**Yes**	**No**

Post Op Chest X-ray: Findings / Time performed

Specific Surgical Post-Operative care plan:

Pre departure checks	Sign to confirm
Ventilation adjusted, consider reducing pressures	
Cardiovascular function assessed & stable observations	
Cardiology team happy for transfer	
Temperature stable (in normal range)	
Inform Cardiology / Cardiothoracic / PICU re departure	
Ensure copies of the operation & anaesthetic notes are included in referring unit baby notes	
Parents informed and updated	
Receiving unit informed	
Transport consultant informed	
All documents and equipment checked	

Time of Departure:
Time of Arrival at Receiving unit:
Time of Arrival at Base:

Reference

1. Mcnamara, Patrick & Sehgal, Arvind. (2007). Towards rational management of the patent ductus arteriosus: The need for disease staging. Archives of disease in childhood. Fetal and neonatal edition. 92. F424-7. 10.1136/adc.2007.118117.