Liverpool Heart and Chest Hospital NHS
NHS Foundation Trust

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Chairman Neil Large MBE
Chief Executive Jane Tomkinson OBE

19th November 2018

PRIVATE & CONFIDENTIAL

[redacted]

Dear [redacted]

RE: [redacted]

Thank you for making the NHS Trusts involved in [redacted] care aware of your concerns arising from the inquest touching on and concerning her death.

Please accept this letter as Liverpool Heart and Chest Hospital NHS Foundation Trust's, Lancashire Teaching Hospitals NHS Foundation Trust's and Manchester University NHS Foundation Trust's response to your Prevention of Future Death Report sent on [redacted] It is hoped that a joint response will give assurance as to the collaborative approach adopted by the Trusts involved in [redacted] care in implementing measures to improve public safety and to assuage your concerns.

Your concerns were set out in the Regulation 28 Report as follows:

2. *I request the Trusts governing the Preston hospital, the Wythenshawe hospital and the Liverpool hospital to review the referral systems and to consider clear and unequivocal pathways for the treatment of patients with aortic aneurysms and the distribution of such pathways to district hospitals and all healthcare professionals within the areas serviced by their hospitals.*

Response of Liverpool Heart and Chest Hospital NHS Foundation Trust (LHCH)

The national organisation of thoracic aortic services is currently the subject of a review by NHS England. This is in recognition of the fragmented nature of current services in the UK and the variability shown in diagnosis, access to treatment and outcomes (refer to Bottle et al 2017 – Variation in the Quality of Care for patients with diseases of the Thoracic Aorta). Joint Cardiac and Vascular Commissioning discussions have begun, with formation of a committee, to examine services for managing disease from "root to visceral segment". The

resulting service arrangements will likely result in a national hub and spoke system, channelling patients through pathways, depending on complexity. This joint commissioning service reflects the necessary collaborative working between Vascular Surgery and Cardiac Surgery, to provide the best care for these patients who have rare and complex disease requiring extremely specialized treatments. The service specification will cover elective and urgent/emergency services and include all forms of treatment including open and endovascular strategies.

The North West of England has been in a better position than most regions within the UK to provide care for patients with elective and emergency thoracoabdominal aortic disease with three cardiac centres providing specialist thoracic aortic services including Blackpool, Manchester and Liverpool.

Liverpool in particular is a nationally and internationally recognised centre offering patients the entire range of treatments, open and endovascular, from aortic root to the aortic bifurcation. Patients are referred in from the entire UK including Scotland, North of England, Midlands and occasionally South of England. This is particularly the case for surgery on the thoracoabdominal aorta and complex redo surgery. Up until 2017 referrals from the region into the trust were largely based on reputation however the Trusts CEO (Jane Tomkinson), who is also the Senior Responsible Officer for the Cardiovascular Disease Programme of the Cheshire and Merseyside Health and Care Partnership, recognised the lack of a formal pathway in the locality and commissioned a review. A pathway was agreed between LiVES and LHCH and published known as Liverpool Acute Network for Thoracic Aortic Services (LANTAS), (Appendix 1). This was distributed around the region and placed on the LHCH Website.

Blackpool and Manchester typically manage elective and emergency proximal thoracic aortic disease, referring on to LHCH, most patients requiring open surgery on the thoracoabdominal disease. No formal pathways have existed in Lancashire and Cheshire to channel patients into pathways depending on complexity. Pathways were largely ad hoc and susceptible to the random nature of individuals' on-call and their knowledge, experiences and ability to navigate the natural barriers to transferring patients around the country.

[redacted] case has highlighted the need to formally organise services beyond just Cheshire and Merseyside Health and Care Partnership, to the entire North West, and ahead of formal national service specification, with agreed sign posting and pathways for patients, with their destination dependent on complexity.

National Aortic Service Specification will eventually provide statutory requirements to organise service within the North West of England.

The North West Aortic Syndrome/Emergency Pathway

Coordination of a response has taken two approaches. The first was a discussion between key clinicians to review current barriers to best patient care and suggest models of what good care should look like. From these discussions has come pragmatic solutions to improve care for patients with urgent/emergency thoracoabdominal aortic disease.

The second is a discussion between managers within each relevant trust to understand the problem and the solutions from a served provision perspective.

Three referral pathways have been produced between Cheshire and Merseyside Health and Care Partnership (LHCH) (Appendix 1), Wythenshawe Hospital and MRI (Appendix 3) and Lancashire including Blackpool (Appendix 4). Liverpool Heart and Chest have published their pathway on the Trusts website and Manchester and Lancashire will publish their documents in due course. The pathways will also be distributed to A&E departments and Liverpool will put this proposal forward to the CCG at their next meeting in December. This essentially provides sign posting for referring hospitals describing how to navigate the pathways and ensure the patient ends up expeditiously at the correct destination. Key Quality Markers are published in terms of time to make the diagnosis, early medical management and referral and transfer arrangements.

In addition to the referral pathways is a Memorandum of Understanding published by the Critical Care Networks of England, Wales and Northern Ireland, (2018) which offers guidance on transferring emergency patients in Intensive care for specialist care (Appendix 5). This is crucial and feeds into facilitating transfer of patients described in our pathways (Appendix 1, 3 and 4).

The essence of this is encapsulated in the points below:

1) Lack of an ITU bed should not stop admission for patients needing rapid life-saving intervention. Patients should be admitted straight to theatre for assessment, consenting and treatment providing of course there is theatre and staffing capacity.
2) If the team is already operating and this cannot be supported it is the trusts responsibility to find an alternative specialist destination, not the referring A&E.
3) Neighbouring specialist centres likewise should not pass on emergencies on the basis they have no bed, nor should they ask their local A&Es to refer to us but should do so themselves.

Response of Lancashire Teaching Hospitals NHS Foundation Trust

The Trust accepts the concerns raised by the Coroner and understands the need for clear pathways for the management of aortic aneurysms across the region.

Prior to the inquest of [redacted] work had already begun within our organisation on producing a pathway for the Lancashire and South Cumbria Vascular Network. It is clear that this work needed to be extended to include the whole of the North West region incorporating all the specialist cardiothoracic centres and referring hospitals.

Following the Inquest of [redacted] the above pathway (which was developed in conjunction with the Cardiothoracic Centre at Blackpool Victoria Hospital) was finalised and approved by the Clinical Reference Group for Lancashire and South Cumbria and an Action Plan was produced in response to the specific concerns raised by the Coroner. This is attached for your information at Appendix 6.

In summary, the actions include:

- The development of a locally and regionally approved pathway for the management of aortic aneurysms across Lancashire and South Cumbria.
- The development of a clinical algorithm to support effective implementation of the pathway.
- Sharing both the pathway and clinical algorithm with all Medical Directors and Emergency Departments across the Lancashire and South Cumbria Vascular Network.
- Confirming awareness of the pathway and algorithm in doctors working within our vascular service at Lancashire Teaching Hospitals both through presentation at clinical meetings and individual discussions.
- The implementation of an electronic referral and tracking system for vascular patients which can be accessed across the Lancashire and South Cumbria Network and will allow for real time documentation and tracking of the patient's care through the pathway visible to all doctors involved in both referral and treatment.

The above actions will be monitored and independently validated. We would be pleased to provide you with updates on the progress of the actions and evidence of completion, if required.

To assist with wider awareness of the issues raised, the Medical Director for Lancashire Teaching Hospitals will share the concerns raised at inquest and subsequent actions taken at the North West Medical Directors' Forum.

We have attached the following documents for the Coroner's consideration:

- Pathway for the management of aortic aneurysms (Lancashire and South Cumbria Network) (Appendix 4)
- Clinical Algorithm (Appendix 7)
- Action Plan (Appendix 6)

Response of Manchester University NHS Foundation Trust

The concerns have been discussed Trust-wide at Executive level and with cardiac and vascular surgical leads at Manchester Royal Infirmary's Manchester Heart Centre, part of the Trust's Oxford Road Campus site, and at Wythenshawe Hospital, part of the Trust's Wythenshawe, Trafford, Withington and Altrincham site,

The Trust has liaised directly with Liverpool Heart and Chest Hospital NHS Foundation Trust (LHCH) and Lancashire Teaching Hospitals NHS Foundation Trust, and a joint meeting was held between our three Trusts on 26th October 2018.

The concerns are acknowledged in their entirety by Manchester University NHS Foundation Trust. Steps have been taken in order to create and work towards implementing formalised *written* guidance on the referral system to the Trust for treatment of patients with aortic aneurysms and other conditions. The pathway has now been formally agreed at the Trust

and distributed to those Hospitals and healthcare professionals who the Trust's service covers for specialist tertiary advice for this and other conditions.

The Trust's work on development of the necessary written guidance has been led by Mr Haris Bilal, Consultant Cardiac and Aortovascular Surgeon, Lead for Aortovascular Surgery and Director of Manchester Aortovascular Institute. Historically, Greater Manchester has been served by three hospitals for all acute aortic syndrome (AAS) patients. Manchester Royal Infirmary (MRI) and Wythenshawe Hospital in Manchester and LHCH, which are nationally, recognised tertiary aortic referral centres. There has however been variation in service delivery for this complex pathology. The discussions with LHCH and development of written guidance seeks to address this issue.

This work has included drafting of guidance for the referral of patients with all acute aortic pathologies, which has been drafted and now formally agreed at the Trust, as above in consultation with LHCH. A copy of this agreed guidance is enclosed at Appendix 3, *"Referral Pathway for Acute Aortic Syndrome for Greater Manchester"*. This guidance covers: -

- Definition of the acute aortic pathologies the guidance refers to, which includes aortic aneurysms amongst the list of other types of such pathology, which the guidance acknowledges require urgent cardio-vascular intervention;
- Clear guidance on the interventions provided at the Trust and those for which referral to LHCH is required;
- Guidance on diagnosis of the listed conditions and the nature of services provided by the Trust;
- Contact details and the specific referral pathway to be followed when referring patients with these conditions to the Trust for specialist cardiothoracic input – for the on-call Cardiothoracic Registrar at Manchester Royal Infirmary (MRI) to be contacted directly or via the MRI Switchboard as an alternative point of contact;
- Details of the steps that will be taken by the team at the Trust on receipt of such a specialist referral;
- Guidance on pre-operative management of such patients and arrangements for safe transfer;
- Reference to LHCH's own Guidelines and complex pathologies to be referred to LHCH rather than Manchester University NHS Foundation Trust.

The guidance has taken into account NHS Resolution's *"Getting it Right the First Time"* (GIRFT) report to incorporate learning from clinical negligence claims in order to improve patient safety. In particular this report noted variations in the delivery of complex acute aortovascular service nationwide. The GIRFT report also made specific recommendations in respect of acute aortic syndrome patients including establishment of formal agreements between referring hospitals, receiving specialist units and others for transfer of patients with these conditions. The guidance seeks to address these recommendations.

Mr Bilal has consulted directly with colleagues at LHCH in respect of this written guidance; Mr Manoj Kuduvalli, Consultant Surgeon and Associate Medical Director for Surgery and Mr Mark Field, Aortic Lead, specifically considering alignment with the pathway provided by Mr Field on behalf of LHCH. Our Trust's guidance is agreed in principle by LHCH and is subject to ongoing consultation, discussions and modifications in line with wider cardiothoracic strategy and service specifications.

We are grateful to the Coroner for his comments.

Further comments

Whilst each Trust has taken steps to address this issue within its locality, and in close liaison with each other, as identified within your report, this is a national issue and consequently each Trust will be greatly assisted by any guidance forthcoming from the Secretary of State for Health.

However, as alluded to above, the current National Aortic Service Specification commissioned by NHSE will in due course address formal organisation of services and pathways for patients with thoracoabdominal aortic disease including in the North West of England.

I hope that this response provides assurance to you and [redacted] that Liverpool Heart and Chest Hospital NHS Foundation Trust, Lancashire Teaching Hospitals NHS Trust and Manchester University NHS Foundation Trust have worked hard and continue to focus on ensuring that lessons have been learned and improvements have been made to the expediency and efficiency of referrals into its services.

Please do not hesitate to contact the Trusts if you require any further information in relation to the response.

Yours sincerely

Jane Tomkinson OBE
Chief Executive Officer
Liverpool Heart and Chest Hospital NHS Foundation Trust

Karen Partington
Chief Executive
Lancashire Teaching Hospitals NHS Foundation Trust

NHS
Lancashire Teaching Hospitals
NHS Foundation Trust

Miss Toli Onon
Joint Medical Director
Manchester University NHS Foundation Trust

Appendix 1: LANTAS Acute Aortic Syndrome Pathway
Appendix 2: LHCH Action Plan
Appendix 3: Acute Aortic Syndrome Pathway for Greater Manchester
Appendix 4: Acute Aortic Syndrome Pathway for Lancashire
Appendix 5: National Critical Care Network Memorandum of Understanding
Appendix 6: Lancashire Action Plan
Appendix 7: Lancashire Aortic Emergency Pathway Algorithm

Appendix 1

Acute Aortic Syndrome Pathway: *recommendations for diagnosis, early management, referral and transfer within the Merseyside & Cheshire STP, North Wales and Isle of Man.*

Short title: Acute Aortic Pathway

Authored by: Mark Field on behalf of *Liverpool Acute Network for Thoracic Aortic Services* (LANTAS)

Commissioned by: Jane Tomkinson CEO LHCH and Chair CVD Merseyside and Cheshire STP

Local referral patterns:

-Cheshire and Merseyside (STP)

-Isle of Man

-North Wales

National Referral patterns:

Nationwide

Approved by Aortic Dissection Awareness UK

Liverpool Acute Network for Thoracic Aortic Disease

(LANTAS)

The Team

Surgeons and Interventional Radiologists

Liverpool Heart and Chest Hospital

Mark Field (Clinical Lead for Aortic Surgery), Cardiac and Aortovascular Surgeon

Manoj Kuduvalli (Associate Medical Director), Cardiac and Aortovascular Surgeon

Deborah Harrington, Cardiac and Aortovascular Surgeon

Omar Nawaytou, Cardiac and Aortovascular Surgeon

Royal Liverpool University Hospital (LiVES)

John Brennan, Vascular Surgeon

Rob Fisher, Vascular Surgeon

Francesco Torella, Vascular Surgeon

Rao Vallebhaneni, Vascular Surgeon

Jonathan Smout, Vascular Surgeon

Richard McWilliams, Interventional Radiologist

Usman Shaikh, Interventional Radiologist

Medical Team

Janice Harper, RLUH, Vascular Physician

Sajid Aslam, LHCH, ACHD Cardiologist

Victoria McKay, LHCH, Clinical Geneticist

Caroline McCann, LHCH, Radiologist

Aortic Network Coordinator: Jamie Doolan LHCH

Second Wednesday Monthly MDT: 0815 Radiology Seminar Room, LHCH

Background

Acute Aortic Syndrome (AAS) is a collection of acute aortic pathologies that includes acute Type A aortic dissection, acute Type B aortic dissection, intramural haematoma, penetrating atherosclerotic ulcers and blunt trauma related injury. All have different risks and require different management pathways. Acute Type A pathologies involve the ascending aorta and typically require immediate surgery. Type B pathologies involve a variable extent of the thoracoabdominal aorta with uncomplicated presentations managed medically and complicated presentations with leaks or malperfusions managed urgently. Often acute on chronic pathologies represent more complex scenarios requiring bespoke patient specific approaches.

Within the Merseyside and Cheshire STP lays the Liverpool Heart and Chest Hospital with a specialised Thoracic Aortic Aneurysm Service and “LiVES” (Liverpool Vascular and Endovascular Services) comprising a network of vascular surgeons and interventional radiologists localised between Royal Liverpool University Hospital, Aintree University Hospital, Southport Hospital and Ormskirk and St Helens and Knowsley Trust.

In addition to the Merseyside and Cheshire STP area our catchment area includes North Wales and Isle of Man, however patients are referred from neighbouring catchment areas in Lancashire (Blackpool), Manchester (MRI and Wythenshaw) and Staffordshire (Stoke on Trent) and also more distant regions and in particular Scotland, North East and Midlands. This document sets out our recommendations for diagnosis, early management, referral and transfer of acute aortic pathologies into LANTAS.

http://www.lhch.nhs.uk/our-services/aortic-aneurysm-surgery/information-for-referring-doctors/

Acute Aortic Pathologies

1) ***Type A Acute Aortic Syndrome (AAS)***
    a. Acute Type A aortic dissection
    b. Acute Type A Intramural Haematoma (IMH)
2) ***Type B Acute Aortic Syndrome***
    a. Uncomplicated dissection
    b. Complicated dissection
    c. Intramural Haematoma
    d. Penetrating Aortic Ulcer (PAU)
3) ***Acute on chronic thoracoabdominal aortic disease***
4) ***Other***
    a. Mycotic aetiologies
    b. Trauma

Acute Type A aortic dissection or IMH

Pathology

Acute Type A aortic dissection is a splitting of the tunica media resulting in a true lumen and a false lumen.

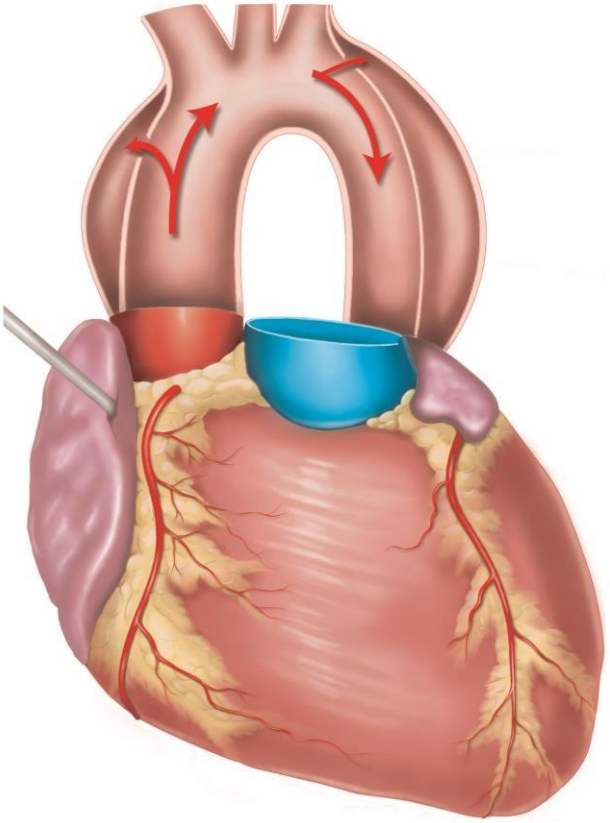


Figure: *Acute Type A involves the ascending aorta while acute Type B does not.*

The natural history following the index event is poor with a 1% per hour mortality over the first 48 hours. Patients die of rupture and tamponade, aortic insufficiency and heart failure as well as malperfusion syndromes of the coronaries, cerebral circulation, viscera and limbs. Crucial to a successful outcome is early diagnosis, immediate medical management and transfer to the nearest specialist centre for surgery. Intra-mural haematoma is a bruising of the aorta due to rupture of the vasa vasorum and has been shown to carry the same risk profile as formal aortic dissection and requiring surgery. While surgical and anaesthetic techniques have improved and with them outcomes, there remains a stubbornly high mortality even in specialist centres. The reasons for this are three fold:

1) Delayed diagnosis and end-stage disease on arriving in theatre

2) Sub-optimal initial medical management

3) Delays in transfer between hospital and into the operating room.

This document is intended to offer guidelines to improve these three remaining challenges.

Presentation

Patient may present with classical chest pain striking from front to back between the scapula blades. However, they may present in a variety of ways including atypical chest, stroke, heart failure, acute abdomen and limb ischaemia, depending on the extent of dissection, degree of end-organ involvement and degree of malperfusion. As aortic dissection is a rare disease and represents only a very small proportion of patients presenting with chest pain, the key to making the diagnosis is to always “think aorta”.

Diagnosis

The rarity of acute Type A is the Achilles heel of the disease. Doctors in A&E will rarely if ever see such a patient. Campaigns encourage doctors (http://www.aorticdissectionawareness.com/aortic-dissection/) to think aortic dissection however by far the biggest reasons for chest pain are myocardial infarction, pulmonary embolism and non-specific musculoskeletal aetiologies. Standard investigations for chest pain will include: bloods (incl. cardiac enzymes and D-dimers), ECG and CXR with more advanced imaging including echocardiography and CT scans. Standard investigations together with a thorough history and examination should lead the doctor to at least suspect aortic dissection and order specialist investigations particularly CT. Echo is ideal but not mandated and should not delay the management of the patient. Evidence for malperfusion should be assessed once the diagnosis is made.

Early management

Patients need immediate intravenous access, analgesia and blood pressure control. Ideally all patients should have:

1) IV access
2) Labetalol infusion
3) Catheter
4) Arterial line

This is important to reduce risks of rupture or extension of the dissection as well as allow safe transfer.

Referral

All acute Type A pathologies should be referred to LHCH. At the Liverpool Heart and Chest Hospital there are a numbers of ways to refer in however the fastest pathway is to ring switchboard (0151 2281616) and ask to be put through to the Aortic Fellow. The Aortic Fellow will take the details and request transfer of imaging CT scan. If the Aortic Fellow cannot be contacted then the Senior Surgical SpR should be contacted by switchboard. Failing that, or if there is a desire to speak directly to the consultant on-call aortic surgeon, switchboard

will put you through to one of Mr Kuduvalli, Mr Field, Miss Harrington or Mr Nawaytou.

Ideally we would prefer an ECG gated CT entire aorta. Gated CT scans may not always be possible and if there is any question about non-gated motion artefact in the images of the root which give the appearance of a “pseudo-dissection” the patient may require transfer for a gated scan. On occasions the diagnosis may be made on a CT PA or on a CT scan which doesn’t cover the entire aorta. In these circumstances it will be preferable to transfer the patient to our hospital for further specialist images rather than delaying transfer. On occasions there may be issues transferring the images on PACs via the Link. Should this be the case, transfer should be based on the report and image transfer should not delay patient transfer. We do need to see the images before taking the patient to theatre and therefore as a last resort the patient should be sent along with a CD containing the appropriate images along with the password for access. If the patient arrives with no access to images a repeat CT will be required which will delay surgery.

Transfers

Once accepted by the surgeon, there will need to be a discussion with our on-call Intensivist regarding an ITU bed. The Matron in our ITU will contact the nurses in the referring hospital to arrange a blue light transfer. The patient must not be put in an ambulance and transferred until our nurses confirm a bed is available, or a plan to admit to theatre.

Ideally the patient should be transferred with a medical escort with monitoring (IV access, arterial line and catheter) as well as strict BP control with Labetalol. There is no room for a so-called “scoop and run” approach. A safe and stable transfer is essential.

Destination within LHCH

Patient will normally be transferred into the Critical Care Area which may be:1) Intensive Care, 2) Post Operative Care Unit (POCCU) , or 3) Coronary care Unit. For some selected patients the destination will be directly through the Critical Care Area into the Theatre Suit. These patients will be those identified at very high risk:

1) Peri-arrest
2) Obvious tamponade
3) Evidence of myocardial infarction
4) Evidence of general low cardiac output and/or malperfusion (lactate >4)
5) Evidence of limb ischaemia

These features should be identified to the surgeon taking the referral. More stable pain free patients with no compromise will be assessed on ITU first. This is particularly the case for stable patients with a delayed (over days) diagnosis or patients who have sustained a stroke whom in which a more measured, timely intervention may be considered.

Standard Setting

Key Quality Markers

1) **Door to skin within 6 hours**
2) **Diagnosis**
    a. Diagnosis within 4 hours of arrival
3) **Early management**
    a. All the following:
        i. Labetalol infusion
        ii. Arterial line
        iii. Catheter
        iv. IV access
4) **Transfers**
    a. Transfer to centre and theatre within 2 hours

Feedback to referring centres in the network

Feedback to referring A&E will be on an annual basis to the head of Department and benchmarked against our KQI.

MDT

All patients with be discussed at the next Aortic MDT for consideration of distal intervention in the sub-acute phase.

Follow-up

All patients will be offered life long follow-up and as appropriate, referral to clinical genetics.

2) ***Type B Aortic dissection or IMH***

a. Uncomplicated dissection

b. Complicated dissection

Pathology

Acute Type B aortic dissection, like acute Type A, is a splitting of the tunica media however not involving the ascending aorta. The risk profile is different to acute Type A aortic dissection without the risk of cardiac tamponade, aortic valve insufficiency or myocardial infarction. The default management is medical and associated mortality is around 10-15% for uncomplicated disease. If there is malperfusion of spinal cord, viscera vessels, renal vessels or limbs or evidence of contained rupture then intervention may be required.

The challenge with acute Type B aortic dissection is not just diagnosis, early management and transfer as with acute Type A, but managing the heterogeneity of specialities involved and stewarding the patient into a regional single point of contact (SPOC) and MDT discussion. Those specialties involved in diagnosis and care often

include: Accident and Emergency, General Medicine, General Surgery, Cardiology, Intensive Care, Vascular Surgery and Cardiac Surgery. The pathway to specialist care is equally diverse in the region with most hospitals caring for uncomplicated acute Type B aortic syndromes under the advice of LANTAS and complicated presentations transferred into RLUH or LHCH.

Presentation and Diagnosis

Patients present is a vast variety of ways but principly chest pain and as such the difficulty like for acute Type A aortic dissection is in diagnosis and identifying them from myocardial infarction, pulmonary embolism and non-specific chest pain. Patients may present in other complex ways relating to visceral malperfusion and limb ischaemia. History and examination and a differential diagnosis of aortic dissection are key. Standard investigations will include: ECG, cardiac enzymes, D-dimers, CXR however the diagnosis is made on CT scan. A contrast CT of the entire aorta is required.

Early Management

The pathway for patients is dependent on the extent of the dissection and the presence or not of malperfusion.

1) Uncomplicated

Patients diagnosed with uncomplicated acute Type B aortic dissection or IMH will be managed medically and with serial imaging typically in their presenting hospital under the advice of LANTAS. Patients should be admitted to a Critical Care Area and require:

1) IV access and analgesia
2) Arterial BP monitoring and Labetalol infusion
3) Urinary catheter

The aim of management is to steward the disease into a chronic state to enable monitoring and follow-up on an out patient bases and possible elective aneurysmal surgery or TEVAR. Patients should be monitored for signs of progression of the AAS whether that be malperfusion or leak.

Serial CT scanning is the only way to accurately monitor the disease in the acute phase and we recommend that after the initial diagnostic CT scan further scans are performed at 48 hours and 5 days. This may be modified of course if there is on-going pain or a suspicion of disease progression.

During this period the patient should be established on oral antihypertensive therapy and will typically include B-blockers, calcium channel blockers, ACE inhibitors and alpha blockers. Providing the patients BP is well controlled, pain has settled and CT scans are satisfactory, they may be discharged home to be seen in clinic at LHCH at 4 weeks with a CT on arrival. A formal letter of referral should be sent on discharge. The patient will be discussed at the next Aortic MDT at LHCH and considered for TEVAR in the sub-acute phase (2-12 weeks).

Contact: Initial contact should be either LHCH or RLUH. At LHCH ask Switchboard for the Aortic Fellow on-call. If this fails other points of contact are the Cardiac Surgical SpR on-call, Hospital Coordinators or Aortic ANP Coordinator (Jammie Doolan).

Alternatively the consultant aortic surgeon on-call may be contacted directly. At RLUH there is a Vascular SpR on-call or the Vascular Surgeon may be contacted directly.

2) Complicated

Whether the initial diagnosis is of a complicated acute Type B aortic syndrome or the disease progresses under follow-up, transfer is warranted to LHCH or RLUH.

Complicated acute Type B will include:

a) Paraplegia
b) Visceral malperfusion
c) Renal malperfusion
d) Ischaemic limbs
e) Contained leak
f) Enlarging pleural effusions

Other issues:

a) Retrograde dissection evolving into an acute Type A
b) Persistent pain
c) Rapid expansion
d) Uncontrolled hypertension

Under these circumstances intervention may include TEVAR, Arch and Frozen Elephant Trunk or as a last resort open thoracoabdominal aortic surgery.

Referral

Once the patient has been accepted into RLUH or LHCH through pathways described above, coordination is required with the Matron in-charge of the relevant Critical Care Area. Transfers should not occur until a bed is confirmed.

Transfer

Transfers should be with a medical escort and include:

a) IV access and strict BP control with Labetalol
b) Arterial line
c) Urinary catheter

Virtual MDT Management

Management of these patients will typically involve a virtual MDT of relevant specialists to agree and ensure appropriate management.

Aortic MDT

All cases are mandated to undergo a formal MDT discussion at monthly meetings at LHCH on second Wednesday of every month at 0815 in Radiology Seminar Room. Any interested Physician is welcome to attend.

Outpatient Reviews

Weekly clinics in LHCH or RLUH are available to review patients in follow-up phase. Follow-up will likely be for life and relevant referrals are made including genetic service.

Standard Setting

Key Quality Markers

1) **Door to treatment decision (CCA or Theatre) within 6 hours**
2) **Door to Diagnosis within 4 hours of arrival**
3) **Diagnosis to treatment decision within 2 hours**
4) **Early management complicated and uncomplicated dissections**
    a. All the following:
        i. Critical care bed
        ii. Labetalol infusion
        iii. Arterial line
        iv. Catheter
        v. IV access
5) **Audit trail and review of time lines from treatment decision (medical versus intervention) to destination**

Feedback

Data on the pathway will be fed back on an annual basis.

3) Acute on chronic thoracoabdominal disease

Acute on chronic thoracoabdominal disease is a common referral and represents the far end of complexity in terms of management. Depending on the age, co-morbidities and general fitness the patient may be transferred into LHCH or RLUH. Diagnosis, early management and referral should follow the same guidelines above for acute Type B aortic syndromes. Aortic MDT discussion is central to bespoke patient specific management.

4) Other (Mycotic aneurysms, Vasculitis, Trauma)

1) Mycotic aneurysm

    a. Mycotic or infected aneurysms are complex pathologies and difficult to manage. Referrals should be via LHCH or RLUH depending on proximity and pathology. Transfer is often warranted.

2) Active vasculitis

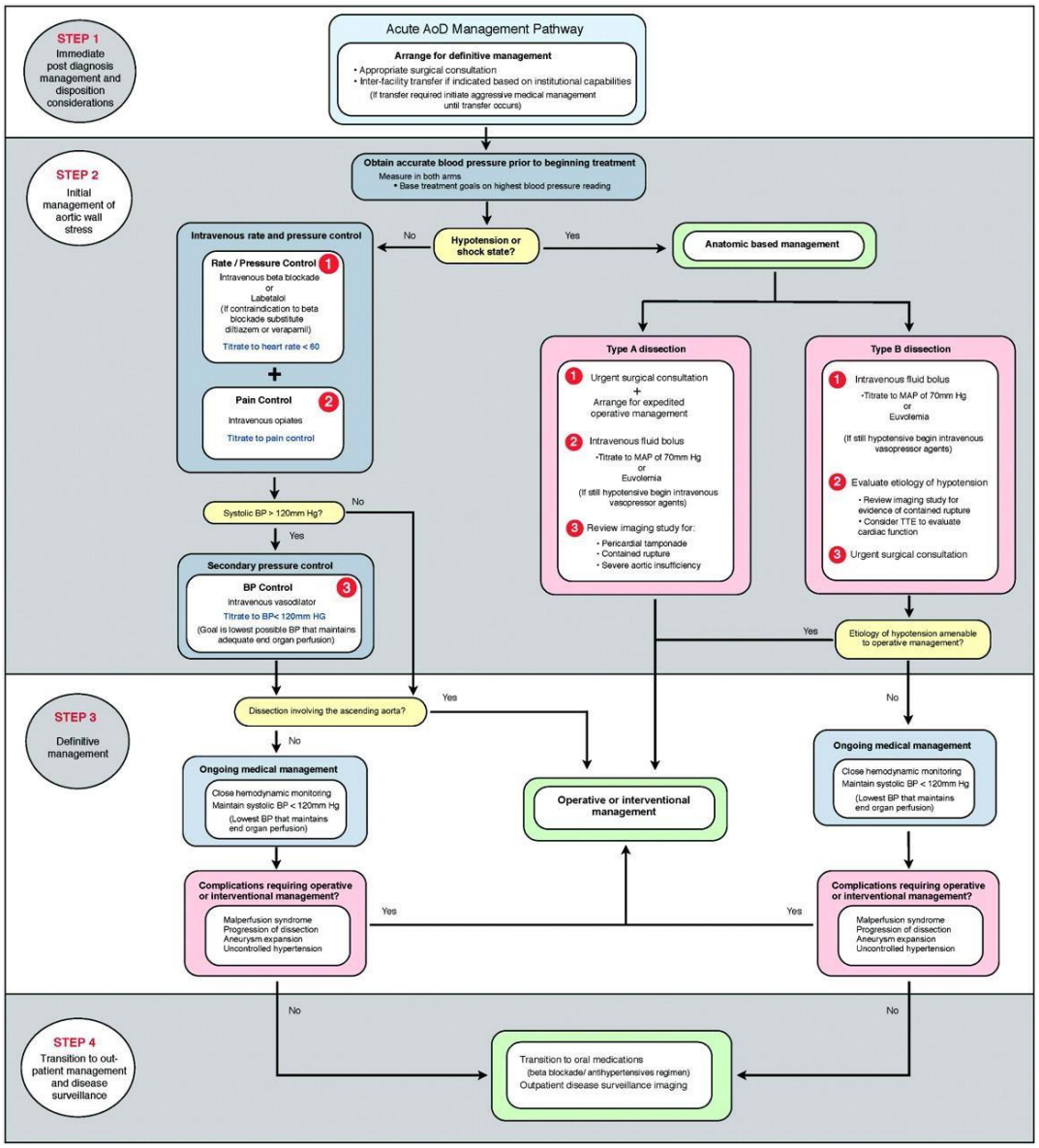
    a. Active vasculitis of large vessels is complex to manage and often multi-disciplinary with our physicians. Referrals should be via LHCH or RLUH depending on proximity and pathology. Transfer is often warranted.

3) Blunt Traumatic Aortic Rupture

    a. BTAR requires immediate referral to the on-call consultant at LHCH or RLUH.

Additional Information

1) American Heart Association Guidelines
2) European Guidelines


STEP 1
Immediate post diagnosis management and disposition considerations
Acute AoD Management Pathway
Arrange for definitive management
• Appropriate surgical consultation
• Inter-facility transfer if indicated based on institutional capabilities
(If transfer required initiate aggressive medical management until transfer occurs)
STEP 2
Initial management of aortic wall stress
Obtain accurate blood pressure prior to beginning treatment
Measure in both arms
• Base treatment goals on highest blood pressure reading
Intravenous rate and pressure control
Rate / Pressure Control
1
Intravenous beta blockade
or
Labetalol
(If contraindication to beta blockade substitute diltiazem or verapamil)
Titrate to heart rate < 60
+
Pain Control
2
Intravenous opiates
Titrate to pain control
No
Hypotension or shock state?
Yes
Anatomic based management
Type A dissection
1
Urgent surgical consultation
+
Arrange for expedited operative management
2
Intravenous fluid bolus
•Titrate to MAP of 70mm Hg
or
Euvolemia
(If still hypotensive begin intravenous vasopressor agents)
3
Review imaging study for:
• Pericardial tamponade
• Contained rupture
• Severe aortic insufficiency
Type B dissection
1
Intravenous fluid bolus
•Titrate to MAP of 70mm Hg
or
Euvolemia
(If still hypotensive begin intravenous vasopressor agents)
2
Evaluate etiology of hypotension
• Review imaging study for evidence of contained rupture
• Consider TTE to evaluate cardiac function
3
Urgent surgical consultation
Systolic BP > 120mm Hg?
No
Yes
Secondary pressure control
BP Control
3
Intravenous vasodilator
Titrate to BP< 120mm HG
(Goal is lowest possible BP that maintains adequate end organ perfusion)
Yes
Etiology of hypotension amenable to operative management?
STEP 3
Definitive management
Dissection involving the ascending aorta?
Yes
No
Ongoing medical management
Close hemodynamic monitoring
Maintain systolic BP < 120mm Hg
(Lowest BP that maintains end organ perfusion)
Operative or interventional management
Ongoing medical management
Close hemodynamic monitoring
Maintain systolic BP < 120mm Hg
(Lowest BP that maintains end organ perfusion)
Complications requiring operative or interventional management?
Malperfusion syndrome
Progression of dissection
Aneurysm expansion
Uncontrolled hypertension
Yes
Yes
Complications requiring operative or interventional management?
Malperfusion syndrome
Progression of dissection
Aneurysm expansion
Uncontrolled hypertension
No
No
STEP 4
Transition to out-patient management and disease surveillance
Transition to oral medications
(beta blockade/ antihypertensives regimen)
Outpatient disease surveillance imaging

ACTION PLAN: Regulation 28 Report: [redacted]

Regulation 28 concern 1	Action	Responsible person/s	Timescale	Evidence of completion
Lack of internal awareness of Aortic Pathway across all divisions and lack of awareness of Memorandum of Understanding for bed management in patients requiring emergency intervention	Strengthen internal process of how pathway should work and is communicated to relevant staff: 1) Distribution to Aortic Team 2) Distribution to Intensive Care Team 3) Distribution to Middle Grade Doctors taking referrals 4) Distribution to Senior Nursing in ITU 5) Distribution to Cardiology Ensure that Staff are aware that lack of ITU beds should not prevent admission to theatre for emergency lifesaving intervention: 1) Distribution to Aortic Team 2) Distribution to Senior Nursing Staff 3) Distribution to Senior Theatre Staff 4) Distribution to Intensive Care/Anaesthetic Team	Mr Field Dr Ratnasingham Admin SR Fiona Altintas Dr Morris Mr Field Fiona Altintas Yvonne Heslop Ian Curle Dr Ratnasingham Dr Kendall	31/12/2018 15/01/2019	**Direct communication requesting cascade of information** **Presentation on Audit Day**

Regulation 28 concern 2	Action	Responsible person/s	Timescale	Evidence of completion
Pathway dissemination outside of Trust	Clinical Lead for Aortic Surgery and Associate Medical Director for Surgery to attend December Clinical Quality Performance Group Meeting to present Regulation 28 response to ensure a wider communication trail of pathway awareness. Publication on hospital web site Dissemination of Pathway to referring hospitals within region	Mark Field/ Manoj Kuduvalli Matthew Back Marga Perez-Casal	31/01/2019	Relevant section of meeting minutes Web site Postal evidence

Manchester University
NHS Foundation Trust

Referral Pathway for Acute Aortic Syndrome for Greater Manchester

Author: Mr Haris Bilal, Consultant Cardiac and Aortovascular Surgeon on Behalf of Medical Directors, Manchester University NHS Foundation Trust – Manchester Royal Infirmary (MRI) and Wythenshawe Hospital

All patients diagnosed with Acute Aortic Syndrome (AAS) will be referred to Manchester Royal Infirmary (MRI) for any emergency surgical or endovascular treatment.

All DGH emergency departments (A&Es), cardiology, surgical and medical teams are advised to contact MRI Switchboard at 0161 276 1234 or 0300 330 9444 to speak to the on-call cardiothoracic Registrar.

Once accepted, there would be guaranteed patient transfer to MRI, i.e. not dependent on bed availability.

Failing to contact on-call cardiothoracic Registrar please ask the switchboard to direct the call to a cardiothoracic consultant on call.

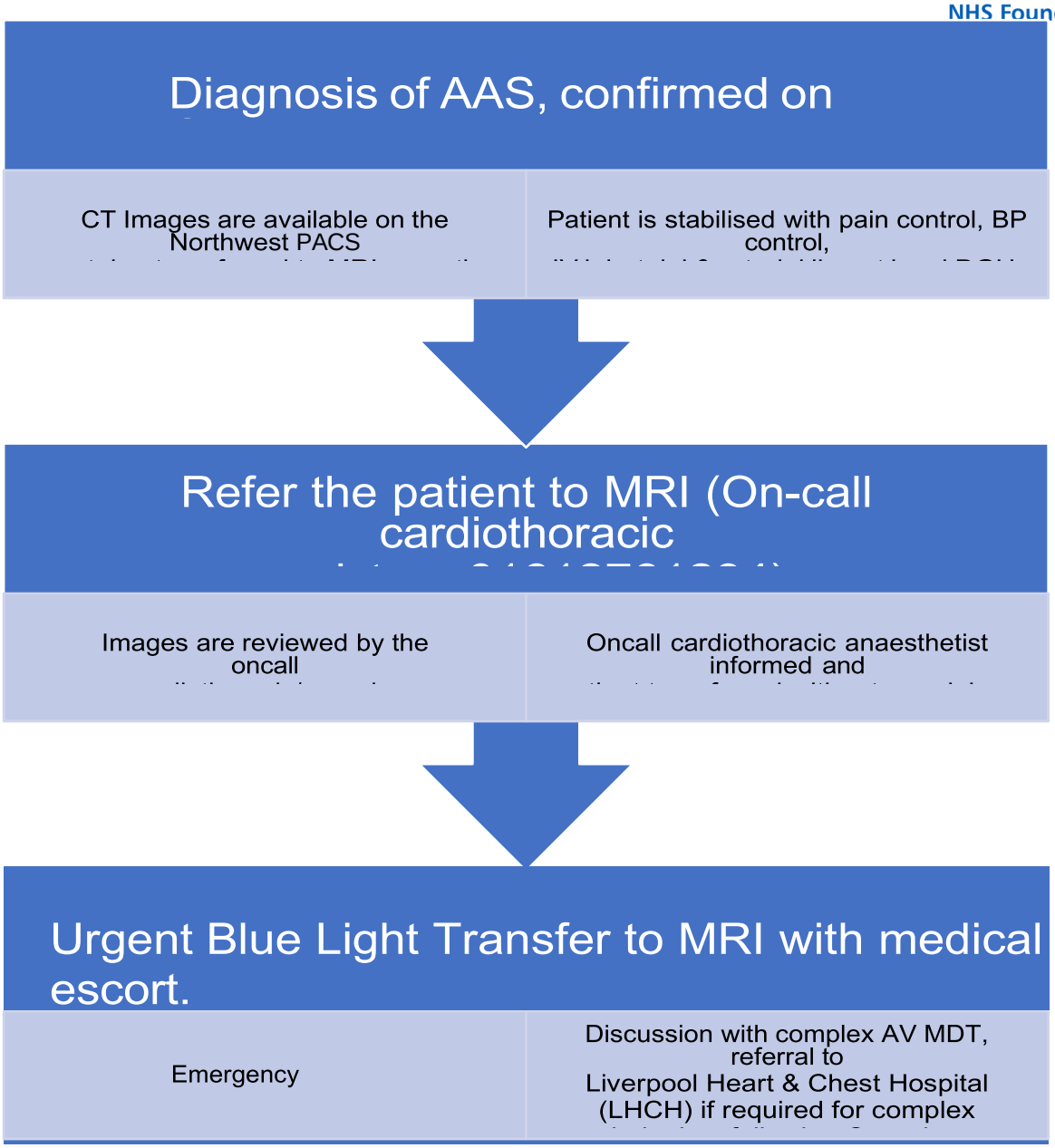
MRI provides a single phone call service for all AAS patients.

This document outlines a pathway for the referral for all acute aortic pathologies. It considers the pathway provided by Liverpool Heart & Chest Hospital (LHCH) authored by Mr Field.

Acute aortic pathologies for the purpose of this Pathway are defined as follows: -

- Acute Type A Dissection
- Intramural Haematoma
- Penetration Aortic Ulcer
- Iatrogenic Aortic Dissection
- Traumatic Aortic Dissection
- Acute Type B Dissection
- Complicated Type B Dissection (Malperfusion)
- Acute and Acute on Chronic Thoraco-abdominal Aneurysms
- Contained Rupture of Thoracic and Thoracoabdominal Aneurysms
- Traumatic Aortic Transection
- Traumatic Aortic Injuries

All the above pathologies need urgent cardio-vascular intervention and typically require urgent surgery or endovascular intervention. Manchester University NHS Foundation Trust does not provide open thoracoabdominal interventions; these patients are transferred to Liverpool Heart and Chest Hospital or other tertiary referral centres whose own local guidelines should be referred to.



Summary of the pathway for AAS Treatment for Greater Manchester

Key to Successful Outcome: Diagnose Early, Communicate Clearly, Safely Transfer, Expedite Transfer to MRI.

Detailed Pathway for AAS Treatment

Preoperative Management and Safe Transfer

The referring hospitals are advised to optimally manage these patients, stabilise and arrange a safe transfer to MRI or other destinations. All patients would be expected to have: -

- IV access
- Labetalol infusion
- Catheter
- Arterial line
- Transferred to MRI as soon as possible without any delays
- The patient should have a medical escort during transfer
- Accompanied by all relevant paperwork and handover from the referring hospital.
- A detailed medical handover to the medical team locally via telephone and written if possible.
- A nursing handover.

Referral to Liverpool Heart and Chest Hospital for Complex Pathologies

For a selected group of complex thoracoabdominal emergencies, contained ruptures, complicated type B dissections where no endovascular strategy is available, these patient could be transferred to Liverpool Heart and Chest Hospital LHCH) following an MDT review. It would be a consultant-consultant referral from MRI to Liverpool to avoid any delays. LHCH's own guidelines should be referred to for guidance on the transfer of patients to LHCH.

Lancashire Teaching Hospitals NHS
NHS Foundation Trust

Acute Aortic Syndrome Pathway

Key agreements

There has been increasing number of referral to vascular centre for patient with acute intrathoracic aortic pathology (Acute Aortic syndrome). These patients attend the local A&E/surgical department with different presentations. This document intends to provide a clear pathway and way of referral to cardiothoracic/ vascular centre.

This pathway has been designed following detailed discussion of all involved parties regarding the best treatment of acute aortic syndrome.

The pathway is only to be followed for acute and emergency presentation and does not intend to cover the incidental findings (asymptomatic ascending or descending aneurysm, dissection, penetrating ulcer, intramural thrombus), for asymptomatic incidental findings the referral pathway to Lancashire Teaching Hospital Major vascular centre should be followed.

Definition:

Acute aortic syndrome (AAS) describes a range of severe, painful, potentially life-threatening abnormalities of the aorta, which includes:

- **Acute Aortic dissection (Type A, Type B)**
- **Acute intra mural thrombus**
- **Ascending or descending ruptured aneurysm**
- **Symptomatic penetrating atherosclerotic aortic ulcer**

Presentation:

The patient's presentation could be different depending on the background pathophysiology and could be:

Severe chest and back pain, aortic insufficiency, collapse, pulse differential, myocardial ischemia, neurological signs, hypotension, hypertension mesenteric or lower limb acute ischemia

- Seen by middle grade/consultant at A&E or Ward
- History (co-morbidities, confirm diagnosis)
- Bloods (FBC, U/E, LFTs, amylase, CRP, clotting, cross-match, D-Dimer) and ECG
- Good venous access (CVP not always necessary), urinary catheter and arterial line
- CT angiogram whole aorta
- Diagnosis is confirmed
- Contact the on call **cardiothoracic** team at Blackpool Victoria Hospital (middle grade/Consultant

  Based on patient's Presentation and possible treatments available, appropriate advice will be given by cardiothoracic team regarding admission.

1. Admission

- Patients who are fit for open surgical intervention will be transferred to Blackpool Victoria Hospital cardiothoracic centre.
- If the best treatment of option is endovascular procedure, the case should be discussed between cardiothoracic consultant on call at BVH and vascular and interventional radiologist consultant on call at Lancashire teaching hospital. The patient will be transferred to Royal Preston Hospital for urgent IR procedure.
- Stable asymptomatic Type B dissection (with no mesenteric renal or acute lower limb ischemia)should be admitted under cardiology team at the local hospitals for blood pressure control and symptomatic management with a plan for repeat CT angiogram at Day 1, 3 and 7 post presentation. Any changes in these scans should be discussed with on call cardiothoracic team at Blackpool Victoria Hospital.
- If patient is palliative – admit and refer to palliative care team at local hospitals.

1. Surgery

If patient requires immediate surgery:

- Plan immediate surgery
- Theatre category 1 with vascular/cardiothoracic anaesthetist

2. Post-Operative

- Admit to critical care or ward as per patient's need.

3. Discharge

This cohort of patients is likely to have co-morbidities, medical complications and often social issues. The principle of daily review, prompt referral to other specialty teams as appropriate and repatriation to the local trust once the vascular condition has been resolved should be adhered to.

4. Surgical Follow Up

Post op surgical review 6 weeks following surgery at local trust. Patient then discharged from the service or referred to appropriate surveillance program.

NHS
Critical Care Networks of England, Wales and Northern Ireland.

Memorandum of Understanding

National Critical Care Networks coordinated response to recent Regulation 28 publications from UK Coroners relating to critical care capacity and immediate life preserving interventions

May 2018

The Adult Critical Care Networks of England, Wales and Northern Ireland have produced a coordinated response in acknowledgment of the findings of two Regulation 28 coroner reports published in January 2017 regarding specialist care and implications relating to immediate availability of Intensive Care level 3 provision. This response references the letter on the subject from Sir Bruce Keogh of 27 February 2017 (see below), which highlights the key features and concerns raised by the Regulation 28 reports. We would like to thank the North of England Critical Care Network for writing the original Memorandum of Understanding upon which this is based and for allowing its further development into this national memorandum by the collaborative working structure of our Networks.

In summary, there have been two cases in the UK when at coroner's inquest it was stated there were delays in transferring patients to specialist neurosurgical units for immediate lifesaving neurosurgery. These delays were judged to have adversely affected outcome. One of the contributing factors cited was a lack of available intensive care beds at the receiving specialist centre.

In the open letter from Sir Bruce Keogh he reaffirms that "professional guidance includes recommendations that, admission to a regional neurosurgical unit for life-saving, emergency surgery should never be delayed and that neurosurgical units should not refuse admission to patients requiring emergency surgery from their catchment population. The lack of critical care beds must not be a reason for refusing admission for patients requiring urgent surgery."

This comes with the caveat that this should not exclude co-operation between neighbouring units if this can expedite patient care.

Furthermore, Prof Keogh states that "There should be a designated consultant in the referring hospital with responsibility for establishing arrangements for the transfer of patients with head injuries to a neuroscience unit and another consultant at the neuroscience unit with responsibility for establishing arrangements for communication with referring hospitals and for receipt of patients transferred."

These cases and the Regulation 28 letters from the Coroner and their implications for critical care were discussed at the National Critical Care Networks Medical Leads meeting in London in March 2017. In addition to this, further cases were discussed at the meeting in October 2017

arising from documented incidents where there was lack of access to specialist centre beds for ongoing care in patients requiring a tertiary centre for services other than neurosurgery. There was general acceptance of the necessity to comply with the process outlined above whereby, even in the immediate absence of critical care capacity in the receiving specialist centre, the patient should still be admitted to that hospital to undergo the emergency intervention. Capacity would then need to be created on site if possible (following site-specific discharge policies) to admit the patient to that centre's critical care unit, or if necessary transfer out either the same patient or an alternative patient to another critical care unit.

It was subsequently agreed that the same principle should apply to any immediately life-threatening event where an emergency procedure might improve outcome. This would therefore encompass procedures such as unstable ruptured aortic aneurysm, either for open repair or emergency endovascular repair, a defined group of acute coronary events mandating immediate primary percutaneous coronary intervention (PPCI), major burns and multiple trauma, amongst others. Other areas such as recipients for implantation of time critical cadaveric donor organ transplant (i.e. heart, lung, liver), where the procedure is time critical though the recipient is not in immediate danger, may also come under the same consideration.

Furthermore, in cases where transfer to a specialist centre is clinically indicated for ongoing specialist treatment on an urgent timescale without the requirement for an immediate life preserving intervention, that transfer should occur as soon as possible in accordance with the pre-existing care pathway. If there are inadequate critical care resources to provide the required ongoing management within this specialist centre, then in accordance with the principle of care already agreed to, the consultant at the specialist centre should be responsible for ensuring an appropriate bed is found in another specialist centre to enable the patient to receive necessary care without delay.

The Medical Leads for the Adult Critical Care Networks of England, Wales and Northern Ireland agree with these principles, accept them and seek to ensure all units within our individual Networks understand their nature and ensure they work to provide them, in the best interests of the patients receiving their care:

- We, as Medical Leads of the Networks, agree to work to the principle that if a patient is identified as having an immediately life threatening clinical event, that can be effectively treated by an immediate time critical specialist intervention, limitation in critical care resources should not delay the access for the patient to the immediate intervention. This only applies in the circumstance where the intervention can be performed immediately and that any delays (i.e. of more than 2 hours) in the procedure will have a significant adverse effect on outcome.
- Where these principles are met, the patient should be transferred to the specialist centre according to the existing care pathway as soon as possible to undergo the necessary procedure. Plans to accommodate the patient, either within the critical care at the specialist site or another unit, should be made simultaneously. Responsibility for identifying appropriate critical care facilities for the patient and if necessary the arrangement of this with another specialist centre followed by coordination of the transfer of the patient to that specialist centre rests with the consultant accepting the patient. Clear communication between all medical and nursing teams is mandatory.

Furthermore, even when a lifesaving intervention is not immediately required, patients with a need for specialist intensive care unit treatment as a matter of urgency should not have their treatment delayed because of a lack of critical care capacity in specialist centres as defined by the pre-existing care pathway. The specialist consultant accepting the initial patient referral should take responsibility for guiding the care of the patient and ensuring a bed becomes available as soon as possible to accept that patient for specialist critical care. If the specialist centre on the care pathway is unable to receive transfer of the patient within the necessary time frame for ongoing treatment, it is the responsibility of the consultant at that specialist centre to arrange for the management of the patient at an alternative specialist centre (not the referring clinician seeking transfer of their patient). The urgency of this time frame will be determined by the consultant clinician in the specialist centre.

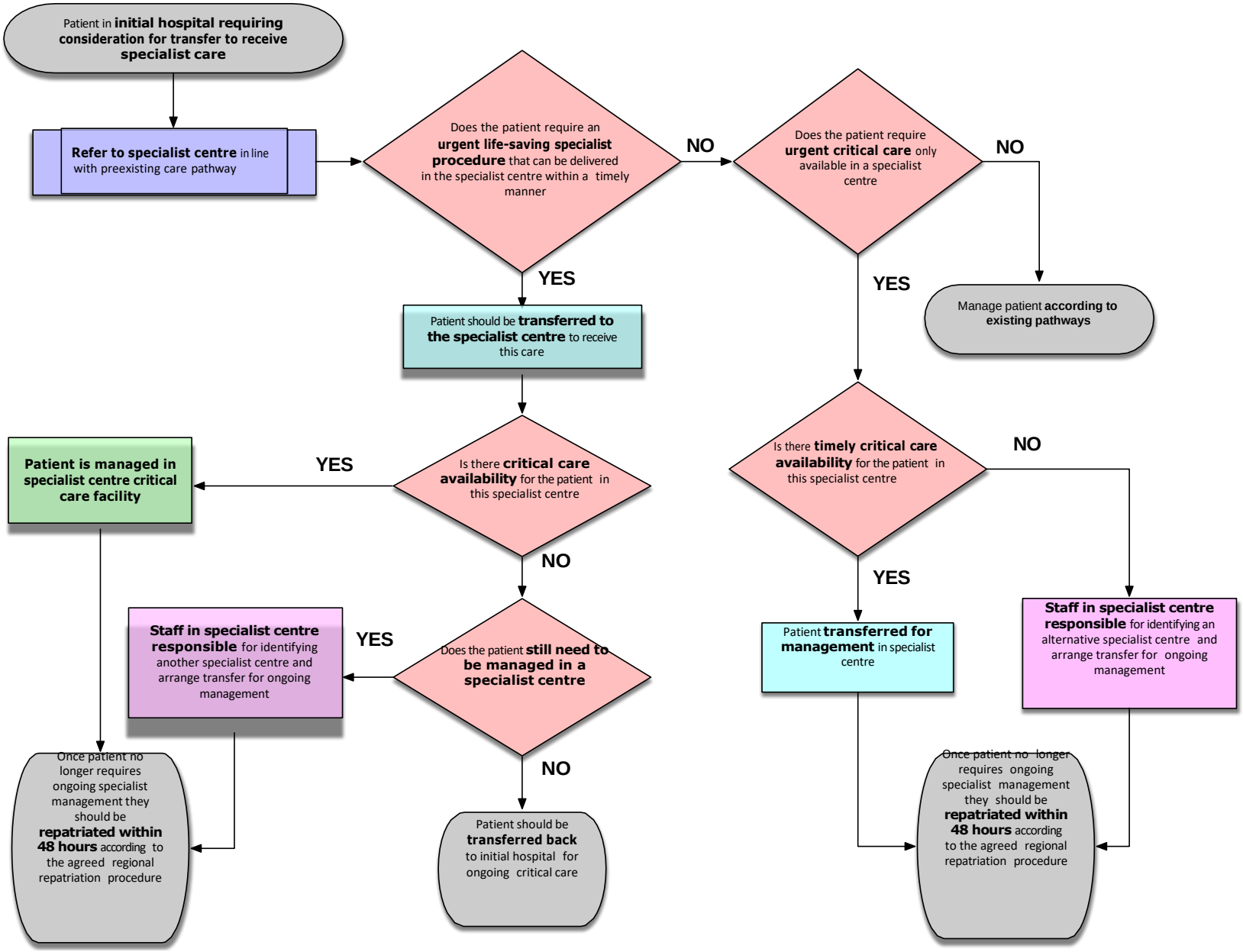
Once a patient's specialist intervention has been completed and they are stable and ready for repatriation to their original hospital then it is the responsibility of that local hospital to ensure the patient's return is completed within a timely manner (48 hours maximum from the time a transfer back is requested) in line with regional transfer policies. In some circumstances the return post-procedure may be within a very short time frame. A fundamental aspect of this process of immediate transfer is the cooperative working between the Network's Critical Care Units to ensure optimal use of regional critical care capacity. When unavoidable, acceptance of exchange transfers may have to be considered.

Signed on behalf of the Medical Leads of the National Critical Care Networks of England, Wales and Northern Ireland

Dr David Cressey
North of England Critical Care Network Medical Lead

Dr Mark Blunt
East of England Critical Care Network Medical Lead
Deputy Chair of the National Networks Medical Leads Group

Dr Mike Carraretto
South East Critical Care Network Medical Lead
Chair of the National Networks Medical Leads Group


Patient in **initial hospital requiring consideration for transfer to receive specialist care**
Refer to specialist centre in line with preexisting care pathway
Does the patient require an **urgent life-saving specialist procedure** that can be delivered in the specialist centre within a timely manner
NO
Does the patient require **urgent critical care** only available in a specialist centre
NO
YES
Manage patient **according to existing pathways**
YES
Patient should be **transferred to the specialist centre** to receive this care
Is there **critical care availability** for the patient in this specialist centre
YES
Patient is managed in specialist centre critical care facility
NO
Is there **timely critical care availability** for the patient in this specialist centre
NO
YES
Patient **transferred for management** in specialist centre
Staff in specialist centre responsible for identifying an alternative specialist centre and arrange transfer for ongoing management
Does the patient **still need to be managed in a specialist centre**
YES
Staff in specialist centre responsible for identifying another specialist centre and arrange transfer for ongoing management
NO
Once patient no longer requires ongoing specialist management they should be **repatriated within 48 hours** according to the agreed regional repatriation procedure
Patient should be **transferred back** to initial hospital for ongoing critical care
Once patient no longer requires ongoing specialist management they should be **repatriated within 48 hours** according to the agreed regional repatriation procedure

Appendix 6

Lancashire Teaching Hospitals NHS Foundation Trust

ACTION PLAN: Regulation 28 Report. [redacted]

Action Plan Executive Lead	[redacted]
Responsible Committee	**Clinical Governance Committee**

Regulation 28 concern 1	Action	Responsible person /s	Timescale	Evidence of completion
Lack of clear regional pathway for the management of aortic aneurysms	Specific pathway and clinical algorithm for the assessment and management of aortic aneurysms within the Lancashire and South Cumbria Vascular Network to be developed and approved locally and regionally.	Mr A Egun Clinical Director for Vascular Services LTHTR	31/10/2018 Completed	Pathway and clinical algorithm. (With evidence of approval process from meeting minutes).
Regulation 28 concern 2	**Action**	**Responsible person/s**	**Timescale**	**Evidence of completion**
Lack of awareness of pathway and clinical algorithm from hospitals within the Lancashire and South Cumbria Vascular Network	Specific pathway and clinical algorithm to be shared across all hospitals within the LSC network to both Medical Directors and ED leads.	Mr A Egun	31/10/2018 (Completed)	E .mail communication.

Regulation 28 concern 3	Action	Responsible person/ s	Timescale	Evidence of completion
Lack of awareness of pathway and clinical algorithm from doctors within the vascular service at LTHTR	**1)** The following documents will be shared with all relevant doctors within the vascular team at LTHTR. Signed confirmation that the documents have been read will be required. • **Pathway** • **Clinical algorithm** • **Regulation 28 report**	Kathryn Flinn Mr Egun	16/11/2018	Target audience and signature sheet.
	2) Discussion of Regulation 28, Pathway, Clinical Algorithm and wider learning from the inquest case at Vascular Clinical Network meeting	Mr Egun	31/10/18 (Completed)	Meeting minutes.
	3) Implementation of an electronic referral and tracking system for vascular patients which can be accessed across the LSC network.	Mr Egun	30/11/2018	Business case approval documentation.

Regulation 28 concern 4	Action	Responsible person/s	Timescale	Evidence of completion
Requirement for wider learning across the NW region of the matters of concern raised in the Regulation 28 report	Regulation 28 and actions taken in response will be shared at the NW Regional Medical Directors Forum to enable wider learning.	G Skailes Medical Director LTHTR	31/12/2018	Relevant section of meeting minutes from NW Medical Directors Forum

It has been agreed by all Trusts who received this Regulation 28 that a joint approach and response to the Coroner is required. Clinical discussions have been held to ensure full awareness of pathways from each organisation (LTHTR, Wythenshawe and Liverpool Heart and Chest Hospital).

A joint meeting has been held on 26/10/2018. At this meeting it was agreed that Hill Dickinson Solicitors will submit a joint response to the Coroner which will include details of all actions taken by each organisation. Individual Trust responses and associated documents are to be provided to Liverpool Heart and Chest Hospital by 9th November 2018.

A draft template for the response is attached for your information.

Appendix 7

ACUTE THORACIC AORTIC REFERRAL PATHWAY
LANCASHIRE AND SOUTH CUMBRIA NETWORK