



# ACTACC Aortic Dissection Audit

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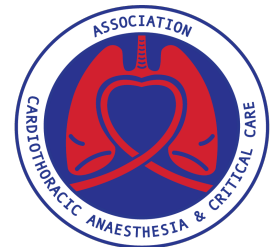
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Pan-London Academic Anaesthesia

Health Education England



# Association of CardioThoracic Anaesthesia and Critical Care (ACTACC) AUDITS

Anaesthesia 2016, 71, 627-635

doi:10.1111/anae.13423

## Original Article

The incidence and importance of anaemia in patients undergoing cardiac surgery in the UK – **the first Association of Cardiothoracic Anaesthetists national audit**\*

A. A. Klein,<sup>1</sup> T. J. Collier,<sup>2</sup> M. S. Brar,<sup>3</sup> C. Evans,<sup>4</sup> G. Hallward,<sup>5</sup> S. N. Fletcher<sup>6</sup> and T. Richards,<sup>7</sup> on behalf of the Association of Cardiothoracic Anaesthetists (ACTA)\*

Anaesthesia 2021, 76, 19-26

doi:10.1111/anae.15070

## Original Article

**The incidence and effect of re-sternotomy following cardiac surgery on morbidity and mortality: a 1-year national audit on behalf of the Association of Cardiothoracic Anaesthesia and Critical Care**

S. Agarwal,<sup>1</sup> S. W. Choi,<sup>2</sup> S. N. Fletcher,<sup>3</sup> A. A. Klein,<sup>4</sup> R. Gill<sup>5</sup> and Contributors<sup>#</sup>

Open Access

Research

**BMJ Open** Effect of individual patient risk, centre, surgeon and anaesthetist on length of stay in hospital after cardiac surgery: **Association of Cardiothoracic Anaesthesia and Critical Care (ACTACC) consecutive cases series study of 10 UK specialist centres**

Olympia Papachristofi,<sup>1</sup> Andrew A Klein,<sup>2</sup> John Mackay,<sup>2</sup> Samer Nashef,<sup>3</sup> Nick Fletcher,<sup>4</sup> Linda D Sharples,<sup>1</sup> on behalf of the Association of Cardiothoracic Anaesthesia and Critical Care (ACTACC)

Anaesthesia 2020, 75, 21-26

Anaesthesia 2019, 74, 1121-1129

doi:10.1111/anae.14649

## Original Article

**Association between anaesthetic technique and unplanned admission to intensive care after thoracic lung resection surgery: the second Association of Cardiothoracic Anaesthesia and Critical Care (ACTACC) National Audit\***

B. G. Shelley,<sup>1</sup> P. J. McCall,<sup>2</sup> A. Glass,<sup>3</sup> I. Orzechowska,<sup>4</sup> and A. A. Klein,<sup>5</sup> on behalf of the Association of Cardiothoracic Anaesthesia and collaborators<sup>#</sup>

doi:10.1111/anae.14734

## Original Article

**Complications related to peri-operative transoesophageal echocardiography – a one-year prospective national audit by the Association of Cardiothoracic Anaesthesia and Critical Care**

G. Ramalingam,<sup>1</sup> S.-W. Choi,<sup>2</sup> S. Agarwal,<sup>3</sup> G. Kunst,<sup>4</sup> R. Gill,<sup>5</sup> S. N. Fletcher<sup>6</sup> and A. A. Klein,<sup>1</sup> on behalf of the Association of Cardiothoracic Anaesthesia and Critical Care\*



# Association of CardioThoracic Anaesthesia and Critical Care (ACTACC) AUDITS

	Publication Year	Journal	Citations	Centres
Klein et al.	2016	Anaesthesia	153	12
Shelley et al.	2019	Anaesthesia	25	16
Papachristofi et al.	2016	Anaesthesia	65	10
Ramalingam et al.	2019	Anaesthesia	45	28
Argawal et al.	2021	Anaesthesia	25	23

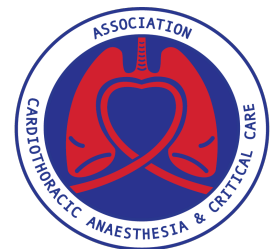


# Why an ACTACC Acute Type A Dissection Audit ?



## Why an ACTACC Acute Type A Dissection Audit ?

1. Does the inter-hospital transfer of patients with acute type A aortic dissection meet current guidelines on the transfer of critically ill patients?
2. Can the care to patients with acute type A aortic dissection until arrival in theatre be improved?
3. What are the barriers to delivering appropriate care to patients with acute type A aortic dissection during transfer to specialist centres?



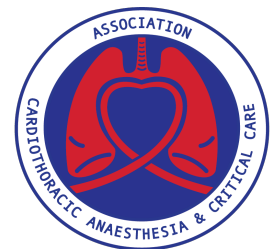
# Why an ACTACC Acute Type A Dissection Audit ?

## Primary Objective

Assessment of the timelines from the onset of symptoms, attendance to the first hospital A&E department and time of arrival in cardiac surgical theatres

## Secondary Objectives

- Qualitative assessments of diagnosis and transfer
- Surgical and anaesthetic management
- Outcomes: mortality and length of stay



## NEWS



### Half of patients with acute aortic dissection in England die before reaching a specialist centre

Elisabeth Mahase

The BMJ

Mahase BMJ 2020  
Chiappini et al. Eur Heart J 2005  
Trimarchi et al. J Thorac Cardiovasc Surg 2005

### INCIDENCE

4.5 per 100 000 of the population per year  
about 2500 cases in England per year -  
about 500 acute aortic dissection operations

### MORTALITY

20% of patients with acute aortic dissection die  
before reaching any hospital

50% die before reaching a specialist centre

### Surgery is treatment of choice

if left untreated:

1-2%/h mortality after symptom onset

50% mortality within first 48h

up to 90% at 30 days

### DELAY in diagnosis: 16-40%



# NEWS



## Half of patients with acute aortic dissection in England die before reaching a specialist centre

Elisabeth Mahase

The BMJ

**Global Campaign**  
**Aortic Dissection Awareness UK & Ireland** in collaboration with  
 The Royal College of Emergency Medicine  
 The Royal College of Radiologists  
 Heart Research UK  
 The Society of Cardiothoracic Surgery in Great Britain & Ireland  
 The Vascular Society of Great Britain & Ireland

# Unexplained Severe Pain?

# THINK AORTA

Aortic Dissection is an emergency that is often fatal when missed

## CT Scan for a definitive diagnosis

<p><b>Symptoms</b></p> <ul style="list-style-type: none"> <li>• Pain is the #1 symptom</li> <li>• Neck, back, chest or abdomen</li> <li>• Numbness or weakness in any limbs</li> <li>• History of collapse</li> </ul> <p><b>Pain characteristics can be:</b></p> <ul style="list-style-type: none"> <li>• Maximal in seconds</li> <li>• Migratory &amp; transient</li> <li>• Pain can be sharp, tearing, ripping</li> </ul>	<p><b>Patient Risk Factors</b></p> <ul style="list-style-type: none"> <li>• Hypertension</li> <li>• Aortic aneurysm</li> <li>• Bicuspid aortic valve</li> <li>• Familial aortic disease</li> <li>• Marfans and other connective tissue disorders</li> </ul>	<p><b>Physical Examination</b></p> <ul style="list-style-type: none"> <li>• Pulse deficit or vascular signs</li> <li>• Neurological signs of stroke or paraplegia</li> </ul> <p><b>Diagnostic Warning</b></p> <ul style="list-style-type: none"> <li>• Chest x-ray, ECG, ultrasound &amp; blood tests can be normal</li> </ul>
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Aortic Dissection Awareness UK in collaboration with:

Heart Research UK  
 Society for Cardiothoracic Surgery in Great Britain and Ireland  
 The Royal College of Emergency Medicine

www.thinkaorta.org

# Safe Transfer of Patients with Acute Aortic Dissection: NHS England and NHS Improvement's Emergency Acute Aortic Dissection (AAD) Toolkit



**Acute Aortic Dissection Pathway Toolkit**

March 2022  
Version 1:0

- The seven key principles
- 1) Regional governance
  - 2) Coordination through a Regional Multi-Disciplinary Team (MDT) and a Multi-Disciplinary Meeting (MDM)
  - 3) Regional rota & Single point of contact
  - 4) Timely and reliable image transfer
  - 5) Safe transfer
  - 6) Specialist treatment for all acute aortic dissections
  - 7) A regional education programme

### Principle 5: Safe Transfer

Clear protocols for the safe transfer of patients need to be set out locally and adhered to. This should detail what happens and what needs to be in place (see principle 1, Regional Governance).

Type A and complicated type B dissections will require a level 2/3 critical care bed and should be transferred where possible by the regional Adult Critical Care Transfer Service for the region the patient is in: [NHS England » Adult Critical Care Transfer Service](#). Clear arrangements should be in place for patients when this is not

available including arrangements for a hospital team with appropriate training and education in critical care transfers to escort the patient.



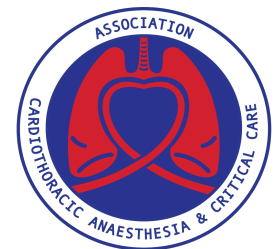


## Research paper

**Decade-long trends in surgery for acute Type A aortic dissection in England: A retrospective cohort study**

Umberto Benedetto<sup>a,1,\*</sup>, Shubhra Sinha<sup>a,1</sup>, Arnaldo Dimagli<sup>a</sup>, Graham Cooper<sup>b</sup>, Giovanni Mariscalco<sup>c</sup>, Rakesh Uppal<sup>d</sup>, Narain Moorjani<sup>e</sup>, George Krasopoulos<sup>f</sup>, Amit Kaura<sup>g</sup>, Mark Field<sup>h</sup>, Uday Trivedi<sup>i</sup>, Simon Kendall<sup>l</sup>, Gianni D Angelini<sup>a</sup>, Enoch F Akowuah<sup>l</sup>, Geoffrey Tsang<sup>k</sup>, on behalf of UK Aortic Group

- Retrospective review of 3700 patients over 10 years (2009-2018)
- Doubling in number of acute Type A Aortic Dissection (TAAD) operations:  
235 in 2009 – 510 in 2018
- Mortality 17%
- Significant variation in operative mortality between hospitals with a trend towards better survival in high volume centres
- Surgery is the only treatment for acute TAAD but is associated with high mortality



## Patient Characteristics – Intraoperative Factors – Cardiac Centre – High Volume Surgeons

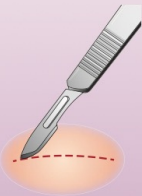
### Determinants of outcomes following surgery for type A acute aortic dissection: the UK National Adult Cardiac Surgical Audit



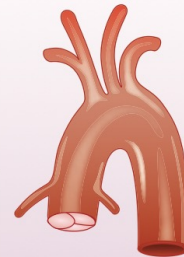
4203 patients operated in 35 hospitals by 509 surgeons (2009-2018)



Individual centres and surgeons contributed significantly to variation in observed mortality



Minimum number of operations per year required to minimize the risk of mortality was 5



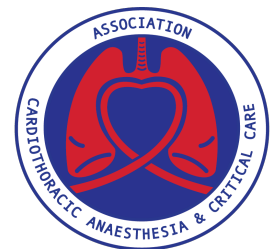
#### UK aortic score

Outcome: **operative mortality**

AUC **0.69**

Calibration slope **0.93**

- Age
- Malperfusion
- Impaired left ventricular ejection fraction
- Previous cardiac surgery
- Preoperative mechanical ventilation
- Preoperative resuscitation
- Concomitant coronary artery bypass grafting



# ACTACC Aortic Dissection Audit – 12 months 2021 - 2022

## Type-A dissection - quality and timeline of transfer and outcome

- 1 Patient age
- 2 Sex
- 3 GCS on arrival in theatre?
- 4 BP on arrival in theatre?
- 5 HR on arrival in theatre?
- 6 monitoring on arrival at cardiac centre
  - ECG
  - Sats
  - Non-invasive BP
  - invasive blood pressure
  - central line
  - intubated
  - other \_\_\_\_\_
- 7 any of the following medications on arrival – please tick if yes
  - on oxygen mask
  - labetalol
  - gtn
  - propofol
  - other \_\_\_\_\_
- 8 transferral team at arrival at cardiac centre
  - health care worker / nurse
  - medically trained doctor
  - anaesthetist
  - if doctor what grade \_\_\_\_\_
- 9 onset of initial symptoms time: (\_\_:\_\_) and date (day/month/year)
- 10 admission to first hospital (A&E): approximate time (\_\_:\_\_) and date (day/month/year)**
- 11 investigations for diagnosis at first centre
  - CT
  - Echo
  - Other \_\_\_\_\_
- 12 arrival at cardiac centre hospital: time (\_\_:\_\_) and date (day/month/year)
- 13 start of surgery: time (\_\_:\_\_) and date (day/month/year)**



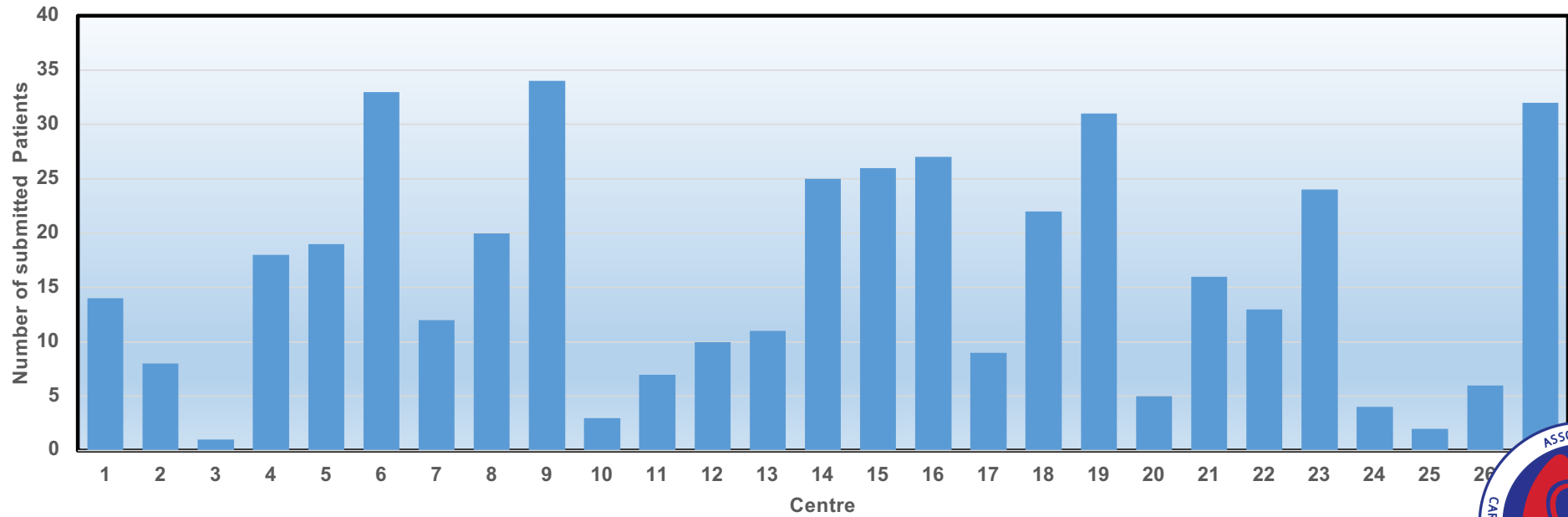
Centre	Hospital	Audit Lead
Aberdeen	Aberdeen Royal Infirmary	P. Sasidharan
Basildon	Essex Cardiothoracic Centre	G. Namjoshi
Belfast	Royal Victoria Hospital	F. Flynn
Birmingham	Queen Elizabeth Hospital	H. Singh
Blackpool	Lancashire Cardiac Centre	M. Hartley
Brighton	Royal Sussex County Hospital	A. Hill
Bristol	Bristol Royal Infirmary	M. Lewis
Cambridge	Royal Papworth Hospital	G. Ramalingam
Cardiff	University Hospital of Wales	R. Abel
Coventry	University Hospitals Coventry & Warwickshire	M. Patteril
Edinburgh	Royal Infirmary	C. Moore
Glasgow	Golden Jubilee National Hospital	M. Steven
Hull	Castle Hill Hospital	C. Rigg
Leeds	Yorkshire Heart Centre	M. Cross
Leicester	Glenfield Hospital	A. Darbar
Liverpool	Liverpool Heart & Chest Hospital	J. Kendall
London	Barts Heart Centre	C. Corredor
London	Harefield Hospital	C. Walker
London	King's College Hospital	T. Gilbey
London	Royal Brompton Hospital	T. Pickworth
London	St Thomas' Hospital	A. Chawla
Manchester Royal Infirmary	Manchester Royal Infirmary	H. Elmahdi
Manchester South	University Hospital of South Manchester (Wythenshaw)	L. Szentgyorgyi
Middlesborough (S Tees)	James Cook University Hospital	K. Khan
Newcastle	Freeman Hospital	M. Prabhu
Oxford	John Radcliffe Hospital	A. Keiralla
Sheffield	Northern General Hospital	D. Woodward
Southampton	University Hospital Southampton	S. Sandys
Stoke on Trent	University Hospital North Midlands	R. Jeeji
Swansea	Morrison Hospital	F. Husain
Wolverhampton	New Cross Hospital, Heart & Lung Centre	D. Morrice

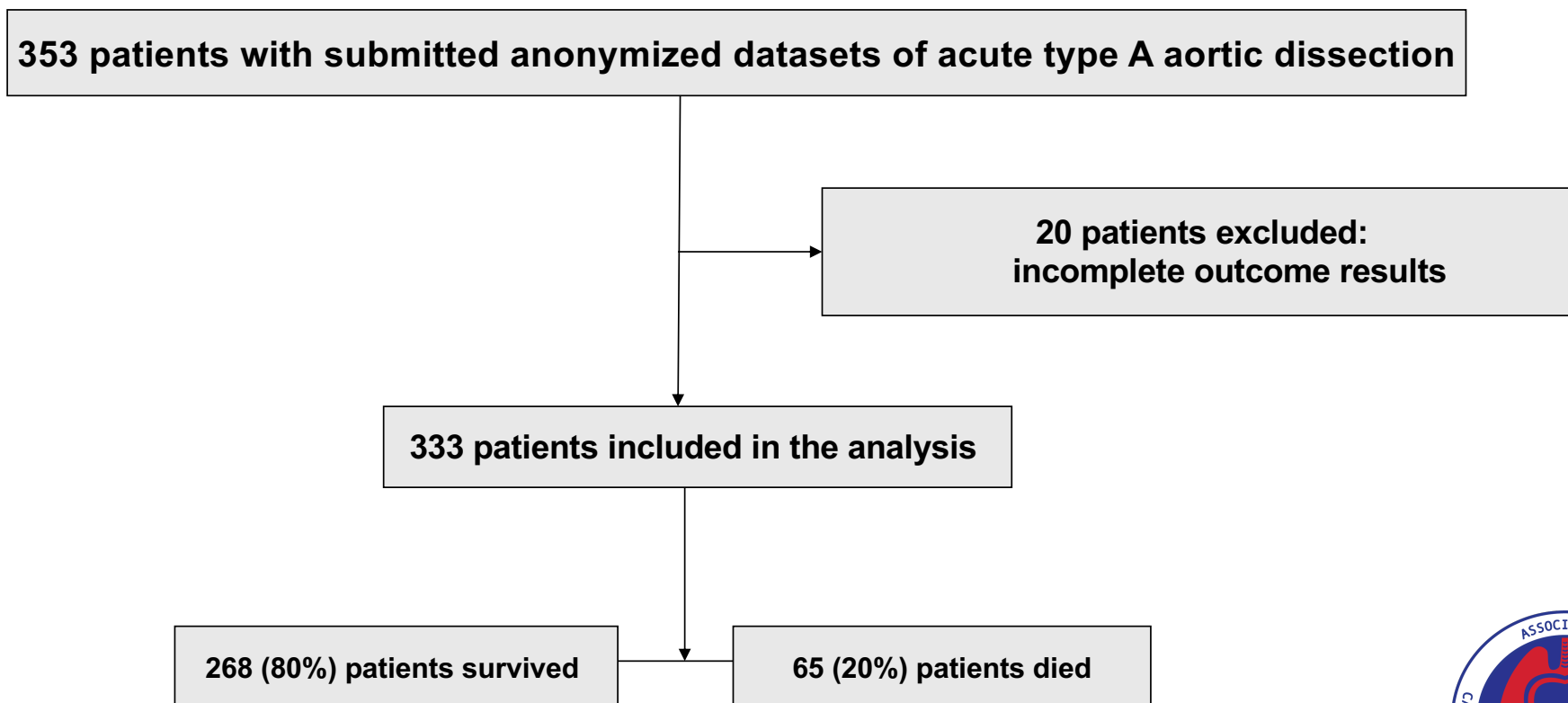
Out of 32 centres – 27 participated

Centres received random numbers



# Centres and Numbers of Cases in 12 months



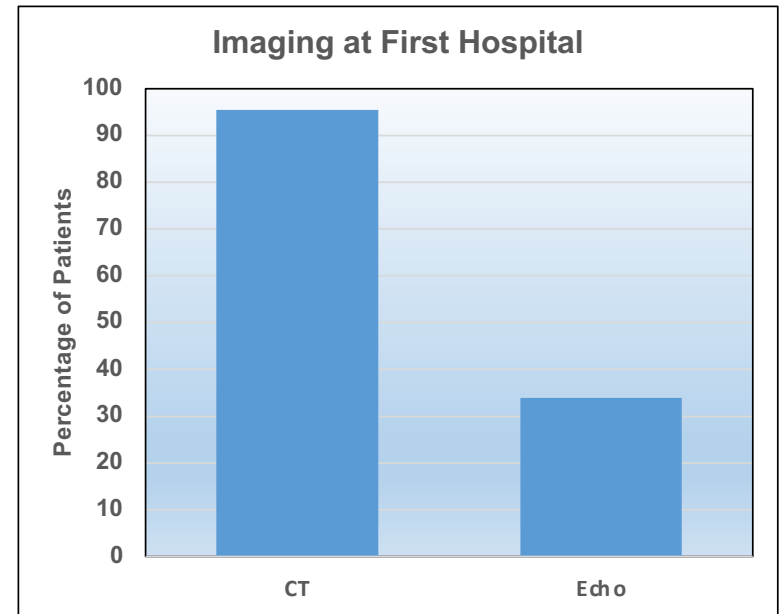


## Demographics and Pre-Op Results

<b>Age, years (mean, SD)</b>		62 (14)
<b>Gender (%)</b>	<b>male</b>	62%
	<b>female</b>	38%
<b>History of Covid-19 infection</b>		4.5%

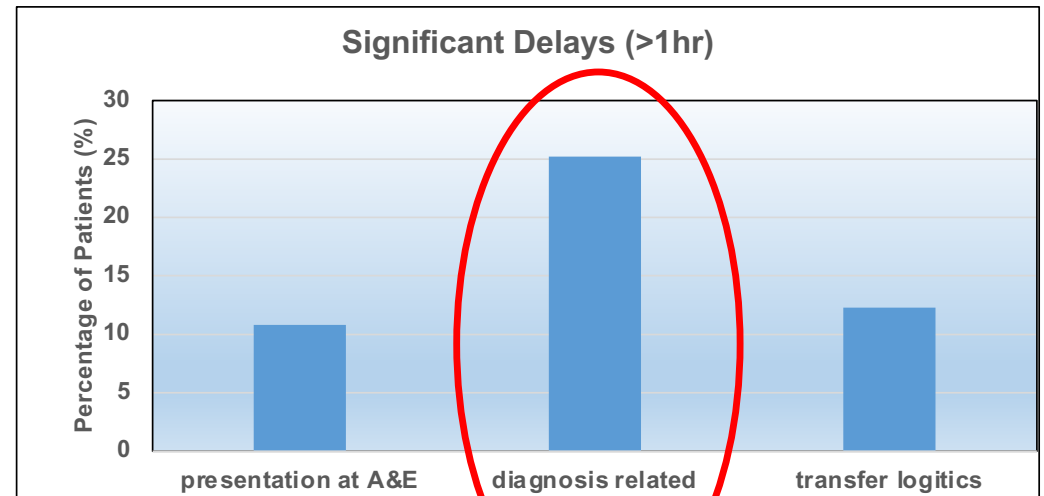
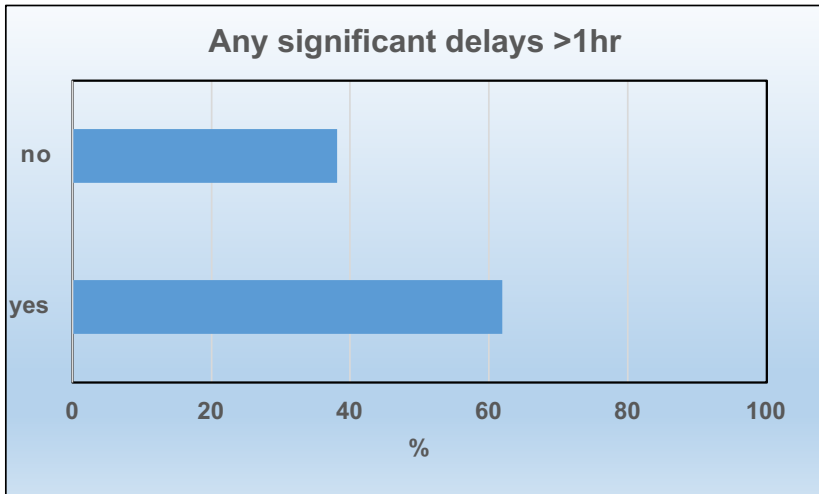
### Median Timelines hours

<b>Chest pain – A&amp;E</b>	<b>2</b>	
Median (range)	(0.1 – 492)	(492hrs = 20 days)
<b>A&amp;E - theatre</b>	<b>10</b>	
Median (range)	(0.8 – 364)	(364hrs = 15 days)



# Delays before Surgery

Were there any significant delays (>1hr) during the patient's journey between onset of symptoms and admission to theatres?



## Examples of delays before Surgery

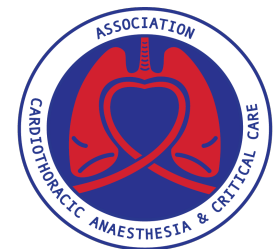
**Were there any significant delays (>1hr) during the patient's journey between onset of symptoms and admission to theatres?**

### Diagnosis related delays - examples

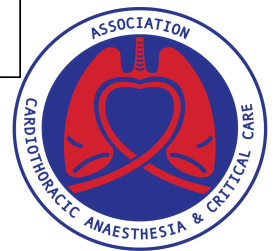
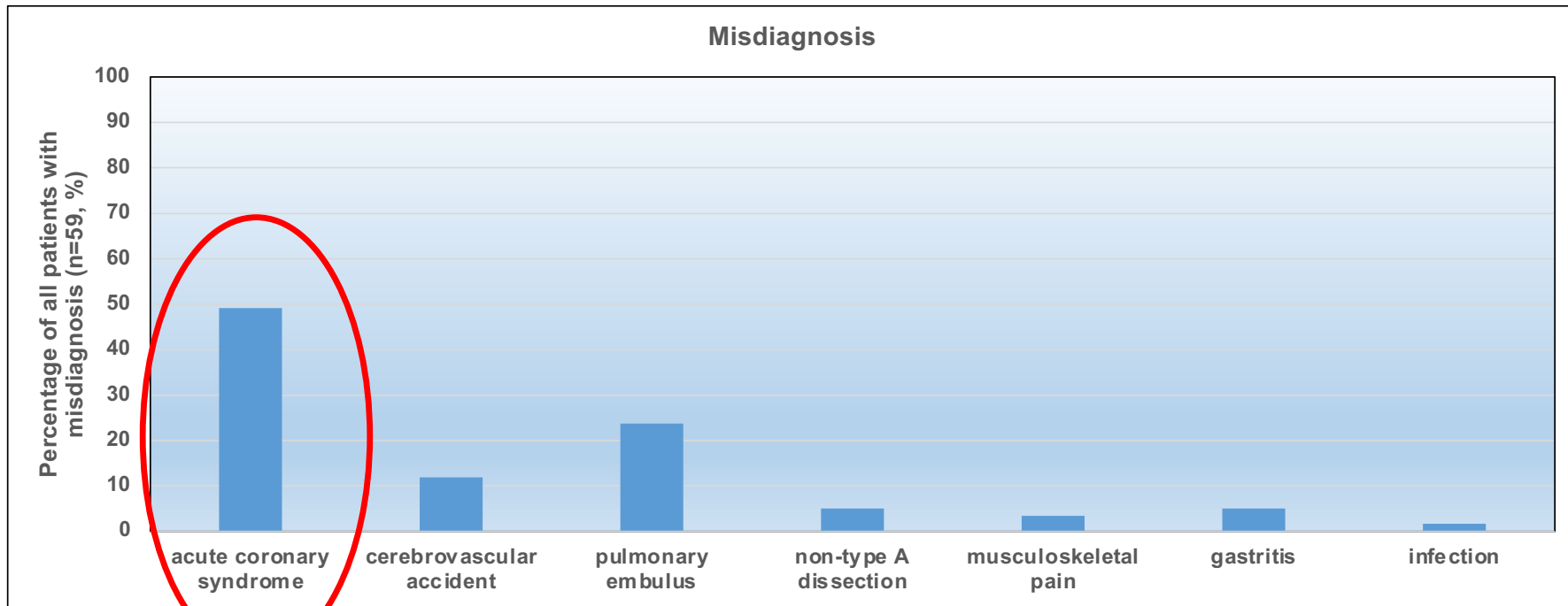
- 'Presented to ED on 27th with chest pain, **Discharged home**. Returned again on 30th with Hypotension'
- 'Needed CT head + carotids. Presented with **stroke like symptoms**.'
- '15 days!! **Delayed diagnosis**, eventually via **privately requested elective CT scan**.'

### Transfer related delays - examples

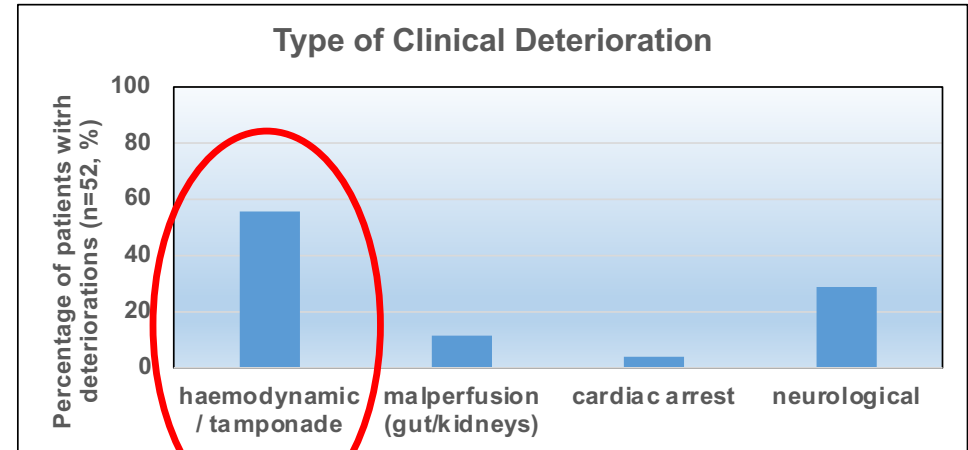
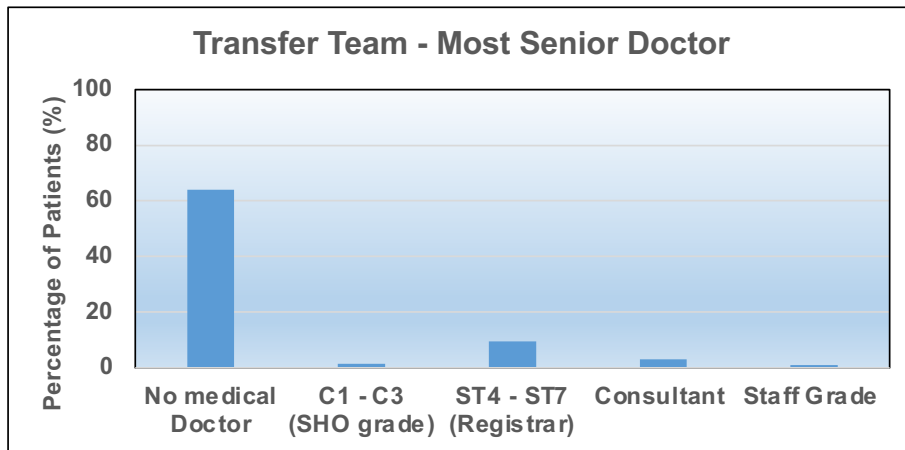
- 'The first hospital was itself a cardiac centre, able to perform aortic surgery, but aortic surgeons were already operating and there was **no theatre/staff capacity available**.'
- '**Ambulance available with delay (2.5h)** for transfer at 22:00 despite referral at 19:30'
- 'Decision to operate made at 14:30. **Transfer initiated with delay (5h)** (until 19:30). Lack of communication between teams.'



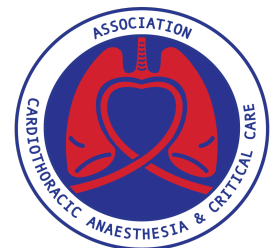
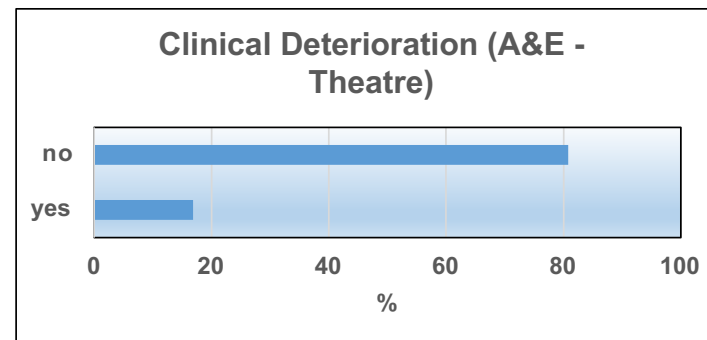
# Delays before Surgery



# Transfer Team



**Was there a significant clinical deterioration between presentation to A&E in the first hospital and arrival in the operating theatre?**

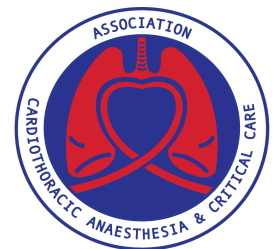


## Transfer Team

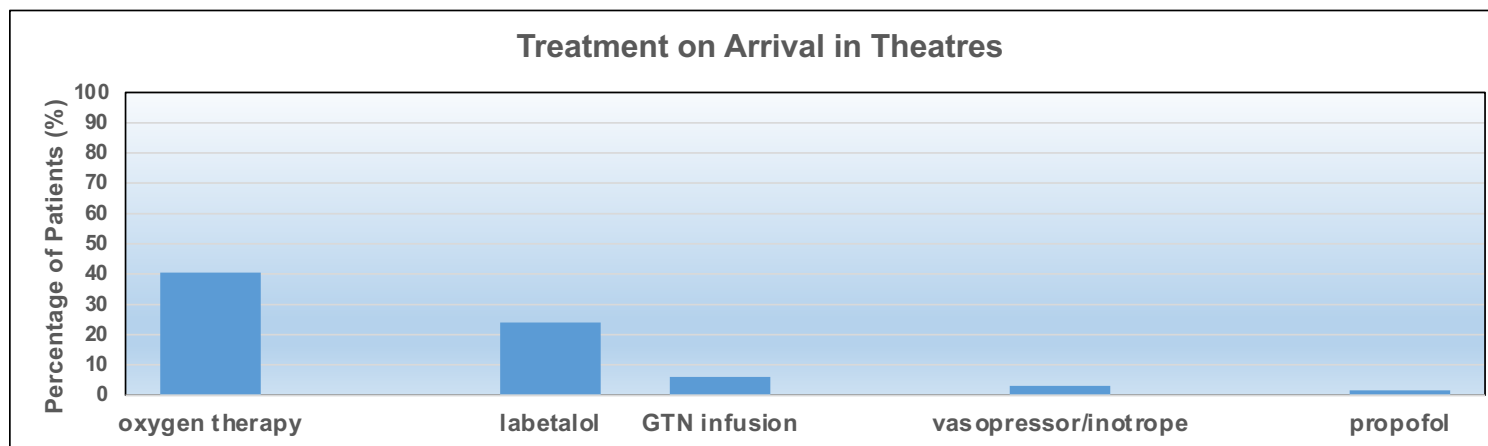
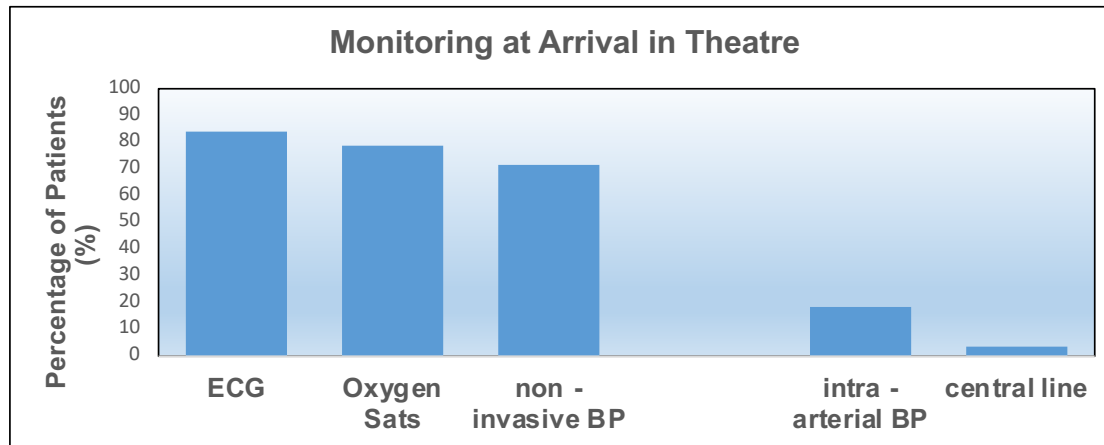
### Significant clinical deteriorations during transfer - examples

- developed **seizures** at first hospital, intubated then sent to second hospital, hemodynamically compromised during CT aorta in second hospital, then put on pressor support
- Patient was becoming **hypotensive** in the operating theatre, requiring support prior to induction of anaesthesia. This was felt to be due to a **significant pericardial collection**.
- **Lactate 9**, drowsy GCS 15 to 13
- GCS 15 on first admission to A&E, **GCS 6 on arrival to theatre**
- **Cardiac arrest** at hospital
- **Peri-arrest on arrival**

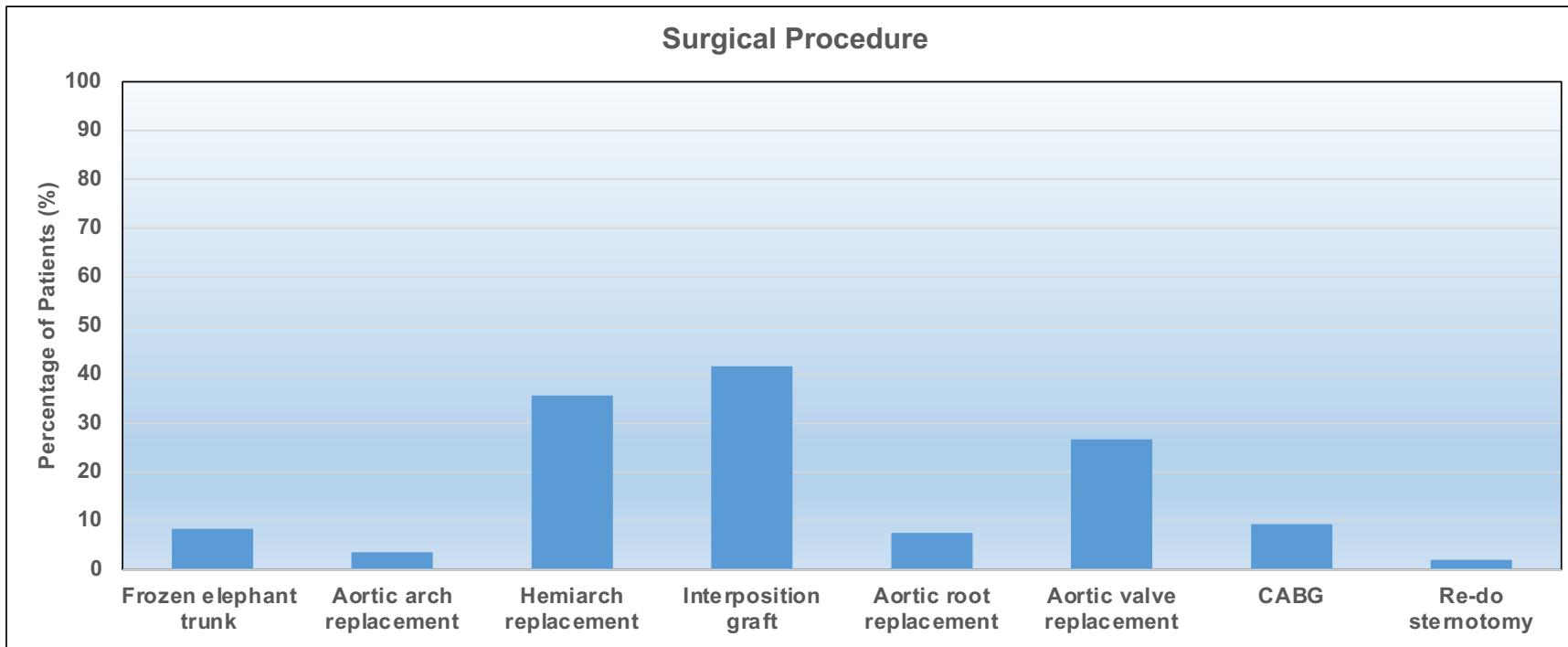
Was there a significant clinical deterioration between presentation to A&E in the first hospital and arrival in the operating theatre?



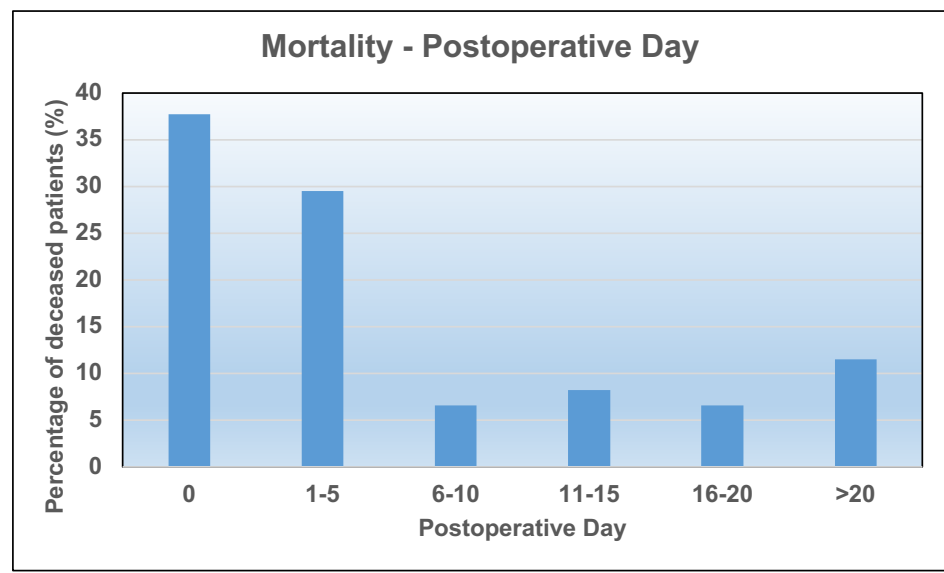
# Arrival in Cardiac Theatres



# Intra - Operative Results



# Outcomes



## Preoperative Variables

		Survived (n=268; 80.5%)	Died (n=65; 19.5%)	p-value
Age yr, Mean (SD)		61.8 (13.5)	63.7 (13.7)	0.32
Gender	Male	165 (61.6%)	42 (64.6%)	0.76
	Female	103 (38.4%)	23 (35.4%)	
First Cardiac Centre, n (%)		246 (91.8%)	56 (86.2%)	0.24
GCS, Median [IQR]	A&E	15 [15-15]	15 [15-15]	<0.01
	Theatre	15 [15-15]	15 [14-15]	<0.01
Drug Infusion, n (%)	Labetalol	65 (24.3%)	15 (23.1%)	0.97
	GTN	19 (7.1%)	1 (1.5%)	0.16



# Outcomes

## Logistic regression analysis between in hospital mortality and clinical deterioration

Categories		Odds ratio	95% C.I.	P value
Neurological compromise	No	Reference	-	-
	Yes	9.564	3.145-29.082	< 0.0001
Haemodynamic compromise	No	Reference	-	-
	Yes	2.255	1.000-5.085	0.050

**Neurological Compromise:**

GCS  $\leq$  12 at A&E presentation or at arrival in theatres, or deterioration by  $\geq$ 3

**Haemodynamic Compromise:**

Systolic BP < 90 at A&E presentation or arrival in theatres



## ACTACC Acute Type A Dissection Audit - Summary

- Median time from arrival in A&E to surgery was 10h with significant delays in the majority of patients due to delayed diagnosis and delayed transferrals.
- Whilst 17% of patients deteriorated clinically during the transfer, the transfer team did not include a medical doctor in more than half of the patients and basic monitoring was not provided for all patients.
- Mortality after emergency type A aortic dissection surgery was 20% with 2/3 patients dying within the first postoperative week.
- Preoperative neurological deterioration was associated with higher mortality.

# ACTACC Acute Type A Dissection Audit - Conclusions

- Diagnosis is challenging, and diagnostic delays should be addressed by optimising awareness for acute aortic dissection in A&E departments
- There is scope for the logistics of the transfer to be optimised
- Patients with Type A aortic dissection require an adult critical care transfer service with adequate monitoring and presence of an adequately trained medical team
- Outcome of patients with Type A aortic dissection can be improved by
  - (i) avoidance of diagnostic- and transfer-related delays until surgical intervention
  - (ii) the implementation of an adequate adult critical care transfer service