



# Major Trauma

CHANGING PATTERNS AND CHANGING ATTITUDES



G-EHMS

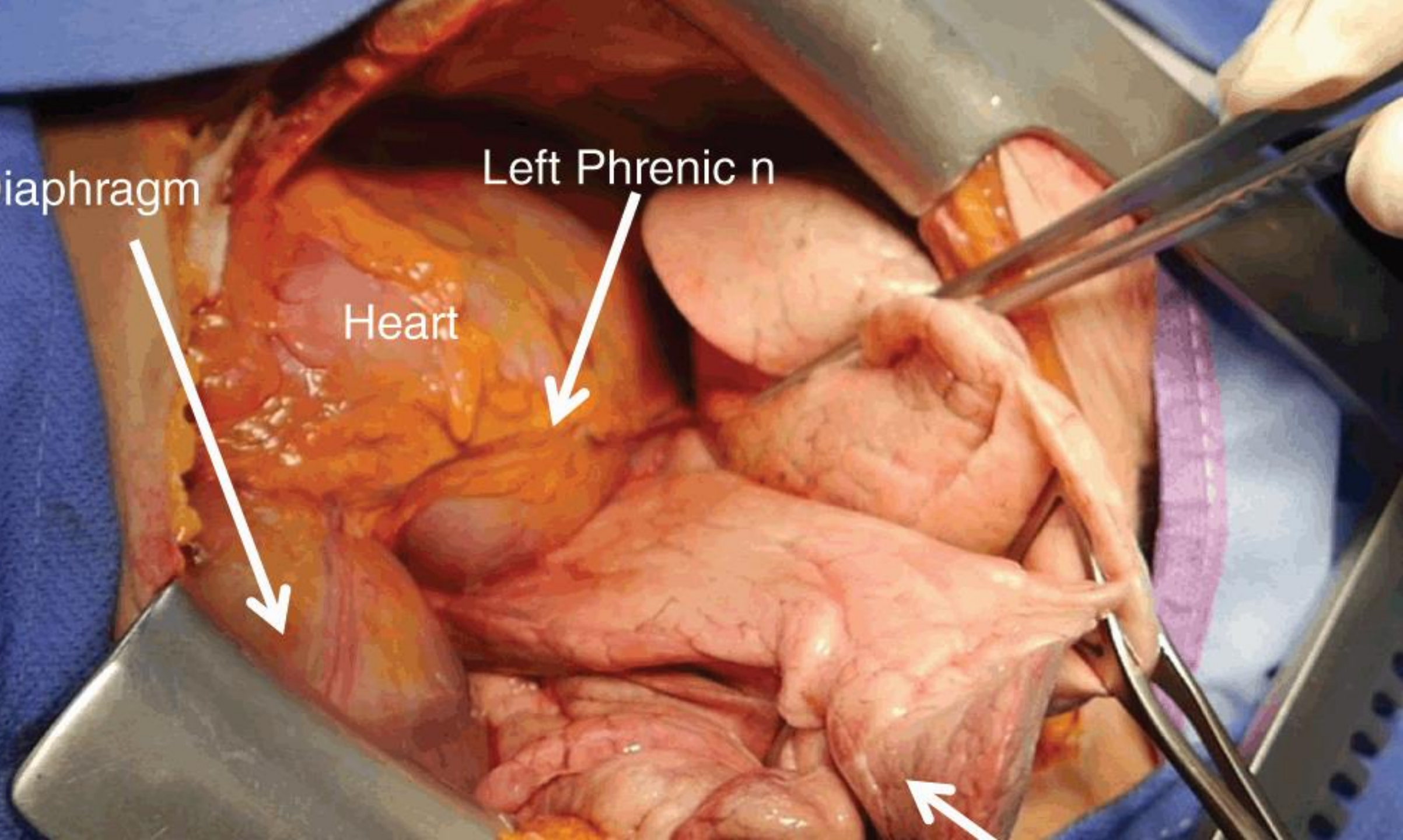
Support  
London's  
Air Ambulance  
The Helicopter



Diaphragm

Left Phrenic n

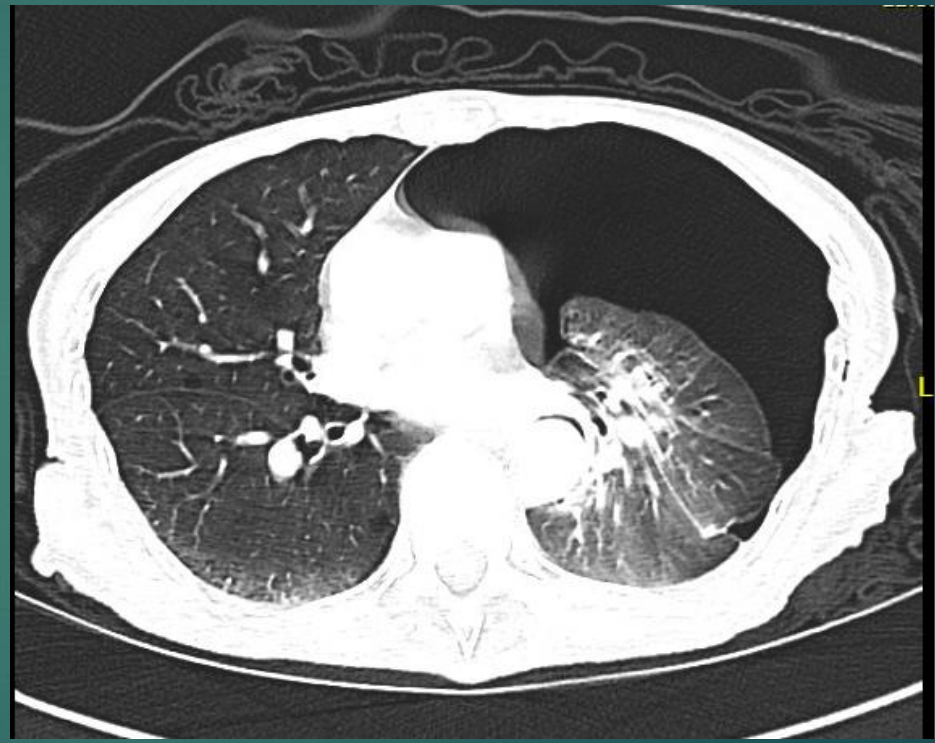
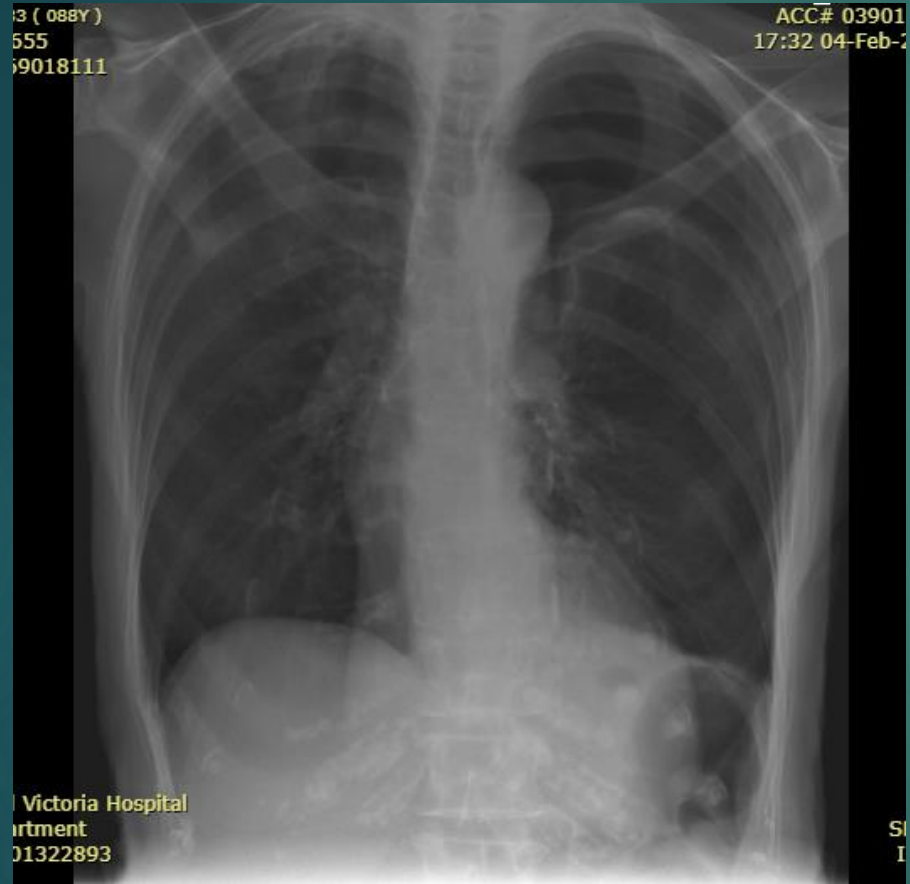
Heart





# Case history

- ▶ 88 female, frailty, dementia
- ▶ Fall from standing, pain left side chest
- ▶ ISS 25, Ps 77%
  
- ▶ 16:22 triage
- ▶ 16:47 ACP
- ▶ 17:05 ST1
- ▶ 17:48 CXR shows large PTX
- ▶ 21:08 Covid +ve
- ▶ 22:34 CT scan
- ▶ 22:56 Cardiothoracics bleeped
- ▶ 00:30 ICD inserted



# Content

- ▶ Major trauma systems
- ▶ TARN data
- ▶ Changing patterns of MT
- ▶ Outcome measures
- ▶ BVH as a TU

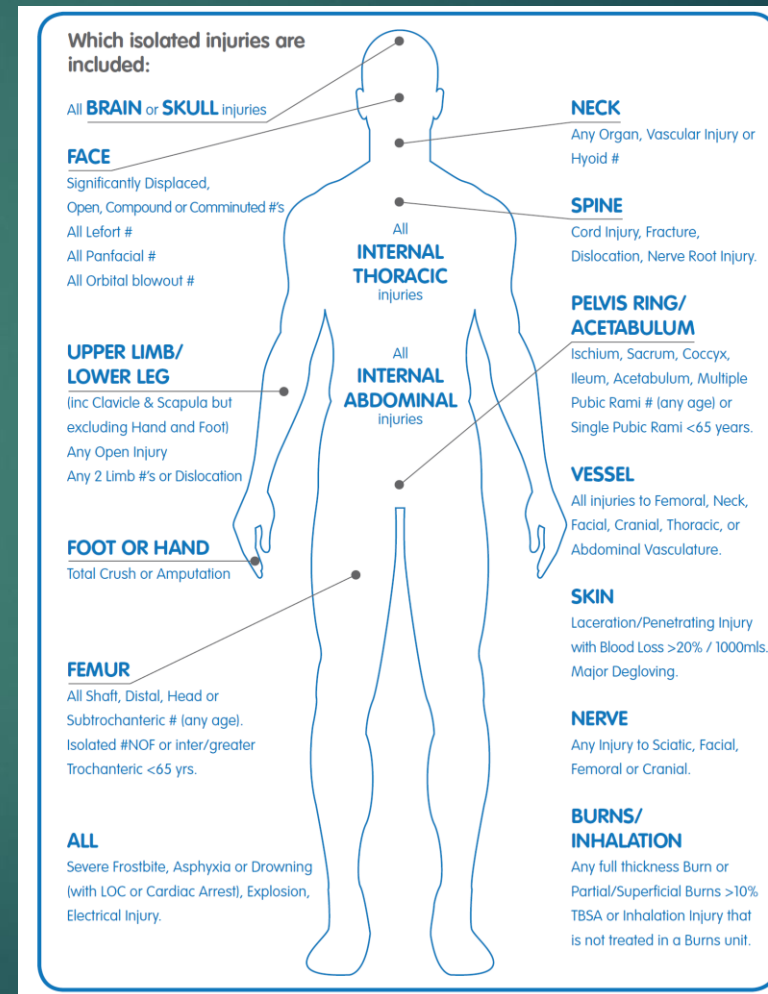


# What is Major Trauma?

- ▶ Major Trauma refers to serious injury or multiple injuries sustained by patients which could result in disability or death
- ▶ Injuries may include severe head, chest, abdominal and skeletal injuries sustained as a result of accidents, sport or violence

# What is major trauma according to TARN?

- ▶ All trauma/injury irrespective of age
- ▶ LoS > 3 days
- ▶ Isolated injuries meeting certain criteria



# Background

- ▶ 1980's – US research
- ▶ 1988 – “The management of patients with major trauma” - Prof Miles Irving obo RCSE
- ▶ 1989 – Royal London Hospital Trauma Centre and HEMS
- ▶ 1990 – foundation of TARN
- ▶ 1992 – TRISS methodology
- ▶ 2000 – “Better Care for the Severely Injured” - RCS/BOA
- ▶ 2007 – “Trauma, who cares?” NCEPOD
- ▶ 2012 – national network of trauma systems

# Prof Miles Irving's findings:

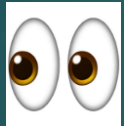
- ▶ Enhancing pre-hospital care, ensuring appropriate medical intervention
- ▶ Rapid transfer to the best local facility
- ▶ Assessing the use of helicopters
- ▶ Adopting ATLS principles
- ▶ Integrating trauma services within and between hospitals
- ▶ Investing in rehabilitation services
- ▶ Auditing and Researching injury and systems of care

# Background

- ▶ 1980's – US research
- ▶ 1988 – “The management of patients with major trauma” - Prof Miles Irving obo RCSE
- ▶ 1989 – Royal London Hospital Trauma Centre and HEMS
- ▶ 1990 – foundation of TARN
- ▶ 1992 – BMJ report
- ▶ 2000 – “Better Care for the Severely Injured” - RCS/BOA
- ▶ 2007 – “Trauma, who cares?” NCEPOD
- ▶ 2012 – national network of trauma systems

# BMJ findings:

- ▶ UK mortality rate higher than in USA
- ▶ Large interhospital variations in performance
- ▶ Unacceptable delay before treatment
- ▶ Most initial care by junior doctors



- ▶ TARN funding ↑↑↑

# Background

- ▶ 1980's – US research
- ▶ 1988 – “The management of patients with major trauma” - Prof Miles Irving obo RCSE
- ▶ 1989 – Royal London Hospital Trauma Centre and HEMS
- ▶ 1990 – foundation of TARN
- ▶ 1992 – TRISS methodology
- ▶ 2000 – “Better Care for the Severely Injured” - RCS/BOA
- ▶ 2007 – “Trauma, who cares?” NCEPOD
- ▶ 2012 – national network of trauma systems

# RCS report (July 2000):

- ▶ . . . . standards of care for the severely injured should be nationally coordinated and systematically audited
- ▶ . . . . develop realistic outcome indicators against which Trusts can audit severe injury
- ▶ Trauma Audit Research Network (TARN) should collect data from all hospital Trusts that receive severely injured patients
- ▶ . . . . National Trauma Service based upon geographical trauma systems for England, Wales and Northern Ireland
- ▶ Improved care for the severely injured will create an opportunity for reducing the cost of avoidable death and unnecessary morbidity

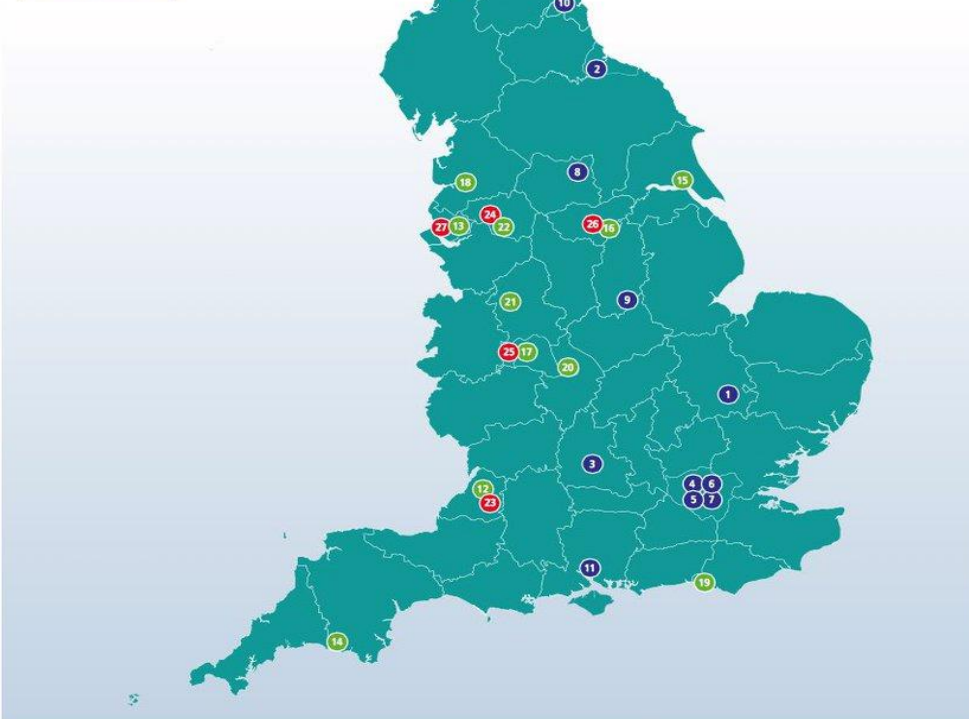


# Major Trauma Centres in England



# Major Trauma Centres in England

October 2016



## Adult & Children's MTCs

- 1: Addenbrooke's Hospital Cambridge [↗](#)
- 2: James Cook University Hospital Middlesbrough [↗](#)
- 3: John Radcliffe Hospital Oxford [↗](#)
- 4: St Mary's Hospital London [↗](#)
- 5: St George's Hospital London [↗](#)
- 6: Royal London Hospital [↗](#)
- 7: King's College Hospital London [↗](#)
- 8: Leeds General Infirmary [↗](#)
- 9: Queen's Medical Centre Nottingham [↗](#)
- 10: Royal Victoria Infirmary Newcastle [↗](#)
- 11: Southampton General Hospital [↗](#)

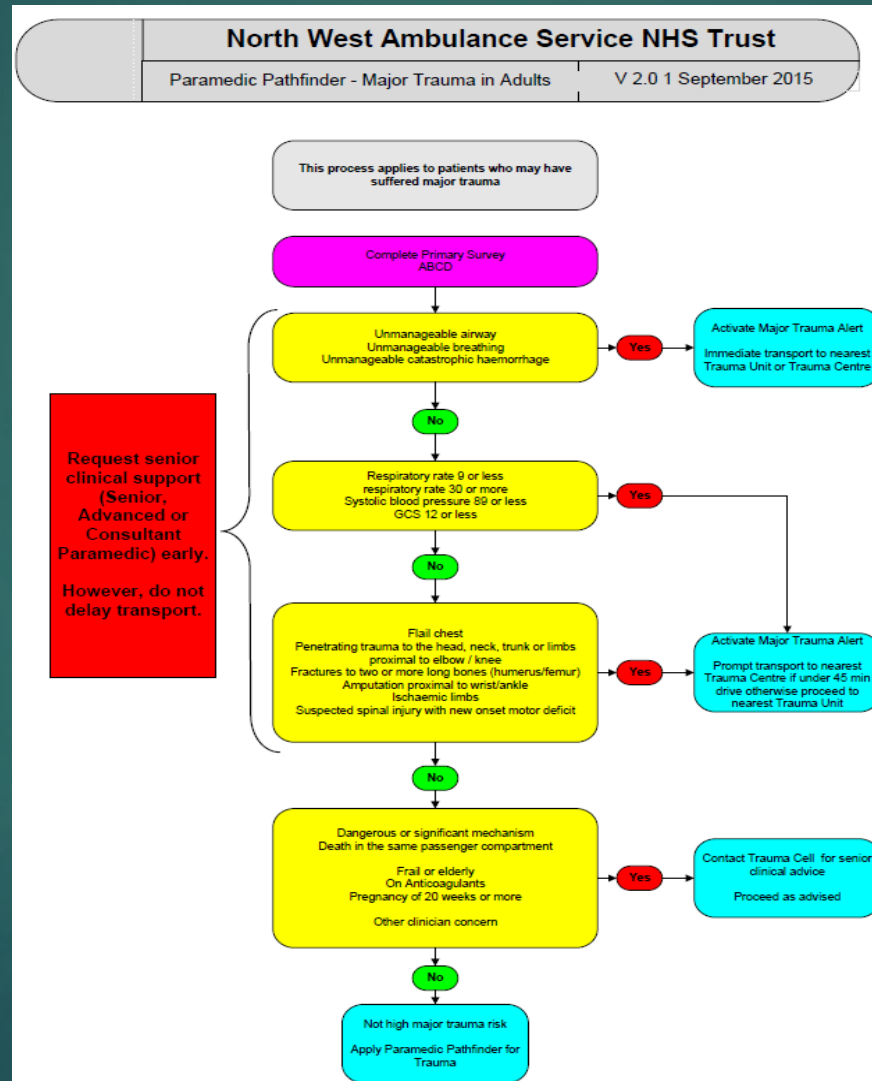
## Adult MTCs

- 12: Southmead Hospital Bristol [↗](#)
- 13: Aintree University Hospital Liverpool [↗](#)
- 14: Derriford Hospital Plymouth [↗](#)
- 15: Hull Royal Infirmary [↗](#)
- 16: Northern General Hospital Sheffield [↗](#)
- 17: Queen Elizabeth Hospital Birmingham [↗](#)
- 18: Royal Preston Hospital Lancashire [↗](#)
- 19: Royal Sussex County Hospital Brighton [↗](#)
- 20: University Hospital Coventry [↗](#)
- 21: University Hospital of North Staffordshire Stoke on Trent [↗](#)
- 22: Salford Royal Hospital and Manchester Royal Infirmary (Collaborative) [↗](#)

## Children's MTCs

- 23: Bristol Royal Hospital for Children [↗](#)
- 24: Royal Manchester Children's Hospital [↗](#)
- 25: Birmingham Children's Hospital [↗](#)
- 26: Sheffield Children's Hospital [↗](#)
- 27: Alder Hey Children's Hospital Liverpool [↗](#)

# MT paramedic pathfinder



# Abbreviated Injury Scale (AIS)

- ▶ AIS is an anatomical scoring system
- ▶ Injuries are ranked on a scale of 1 to 6
- ▶ This represents the 'threat to life' associated with an injury and is not a comprehensive measure of severity

<b>AIS score</b>	<b>Injury</b>
<b>1</b>	Minor
<b>2</b>	Moderate
<b>3</b>	Serious
<b>4</b>	Severe
<b>5</b>	Critical
<b>6</b>	Unsurvivable

# Injury Severity Score (ISS)

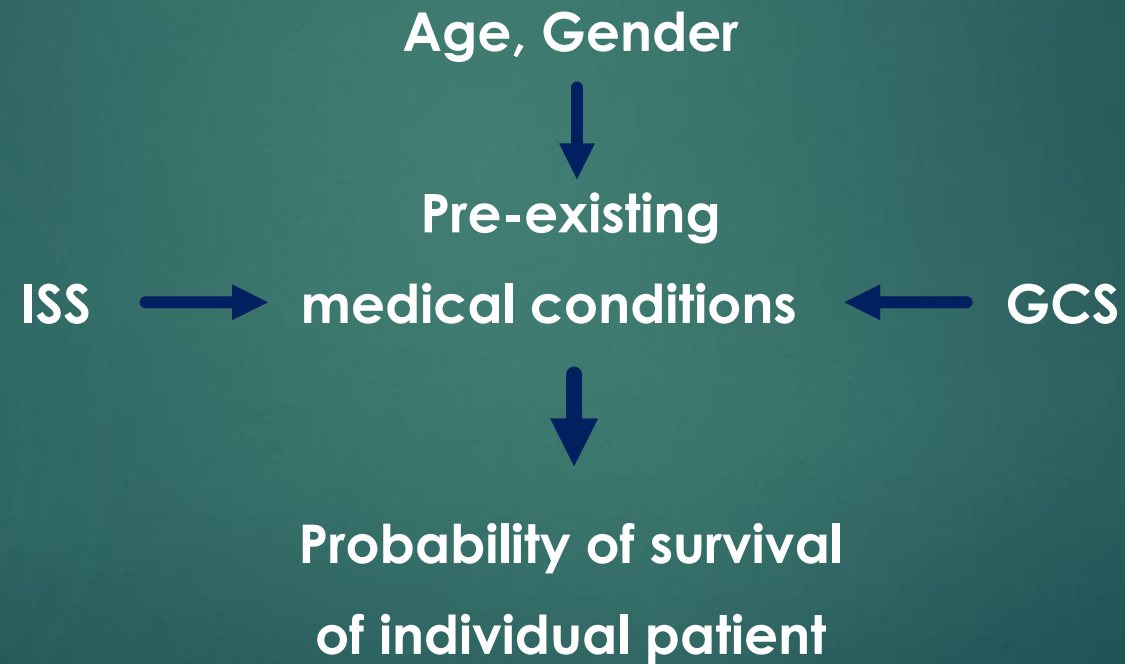
- ▶ Provides an overall score for patients with multiple injuries
- ▶ Each injury is assigned an AIS score and is allocated to one of six body regions
- ▶ Only the highest AIS score in each region is used
- ▶ The 3 most severely injured body regions have their score squared and added together
- ▶ The ISS score correlates linearly with mortality, morbidity, hospital stay and other measures of severity

# ISS - example

Region	Injury Description	AIS	Square top 3
Head & Neck	Cerebral contusion	3	9
Face	No injury	0	
Chest	Flail chest	4	16
Abdomen	Minor contusion of liver	2	
	Complex rupture of spleen	5	25
Extremity	Fractured femur	3	
External	No injury	0	
<b>Injury Severity Score:</b>			<b>50</b>

# Probability of Survival (Ps19)

- ▶ The Ps model weights those parameters that best predict survival

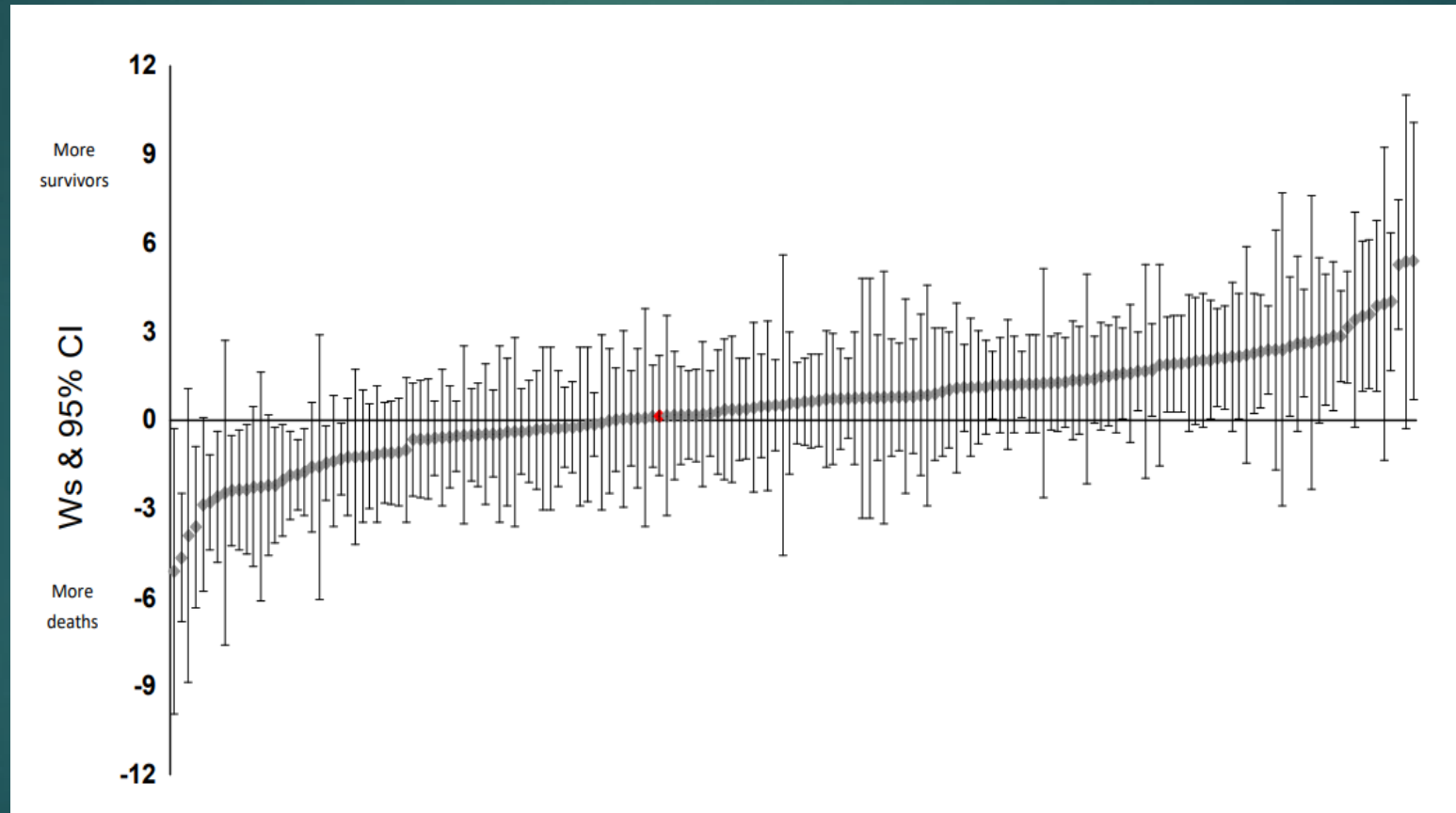


# Data presentation

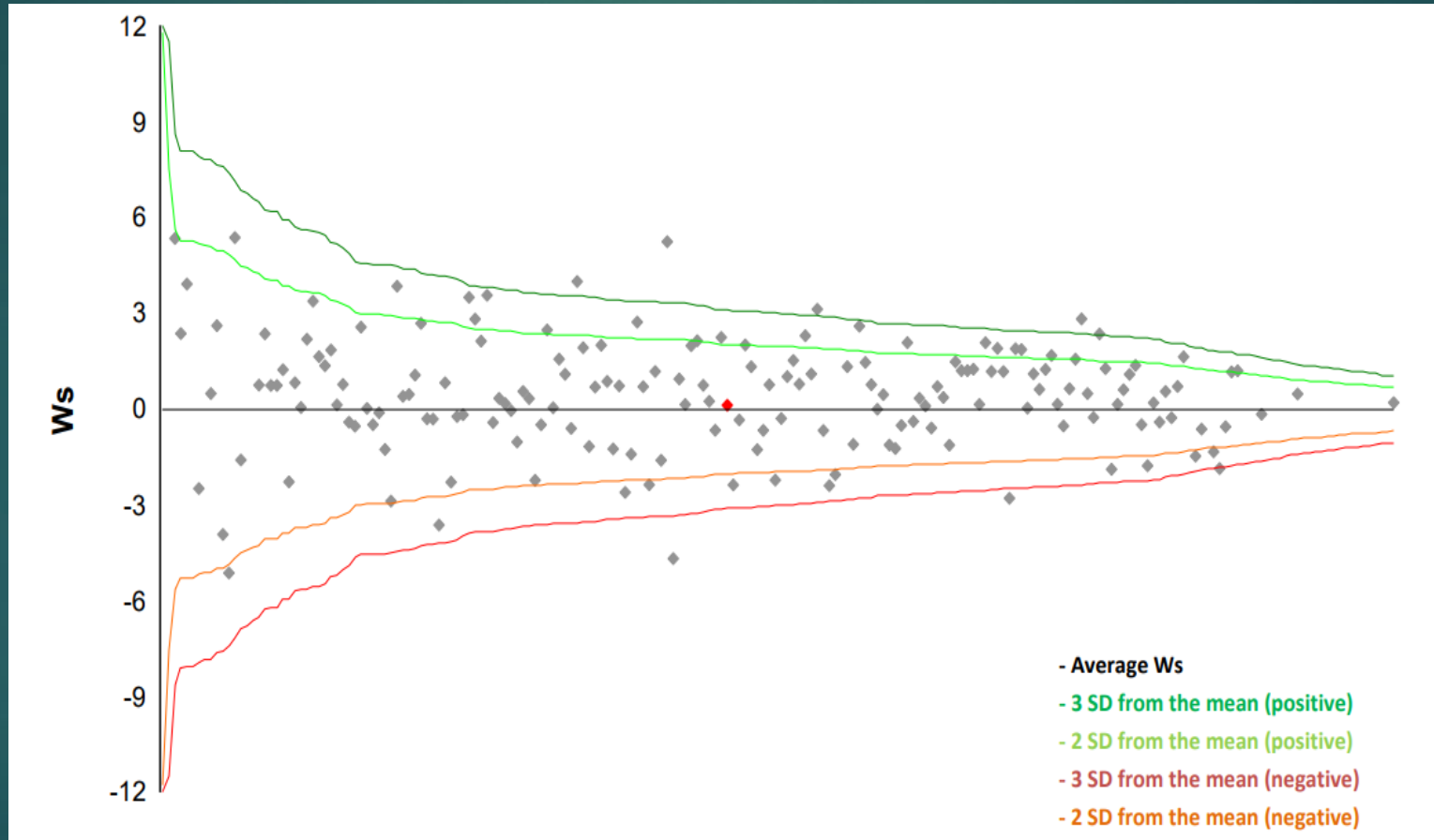
- ▶ Ws caterpillar plots
- ▶ Ws funnel plots
- ▶ VLAD charts



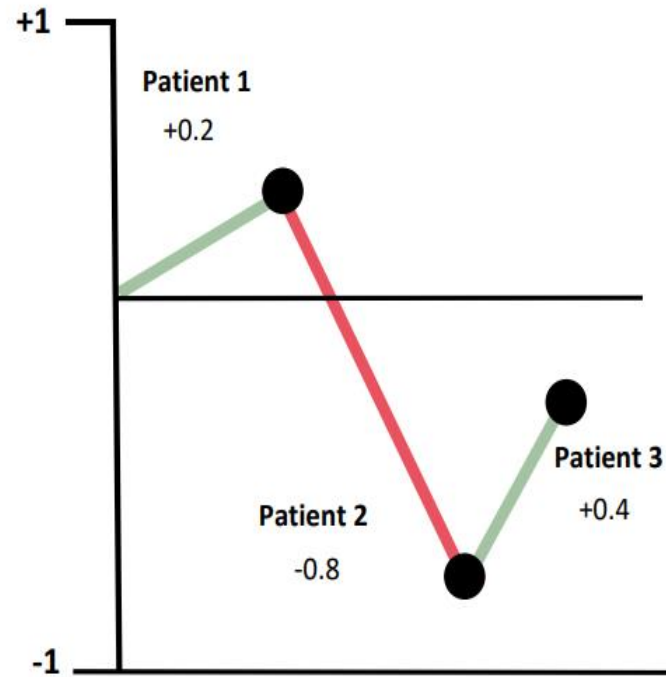
# Caterpillar plot



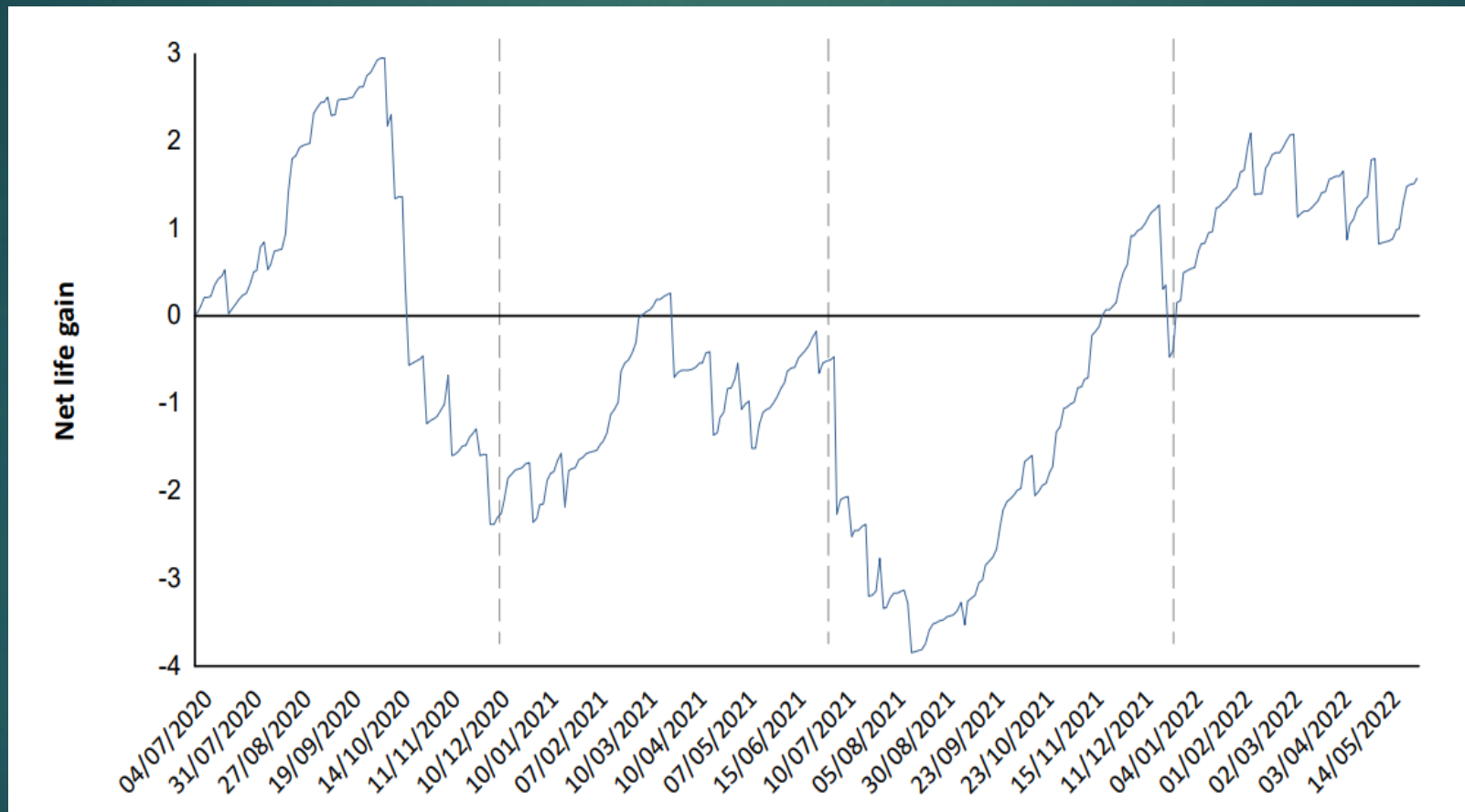
# Funnel plot



# VLAD



# VLAD



# Impact of MTNs?



Contents lists available at ScienceDirect

EClinicalMedicine

journal homepage: <https://www.journals.elsevier.com/eclinicalmedicine>

**E**Clinical**M**edicine

Published by THE LANCET

Research Paper

## Changing the System - Major Trauma Patients and Their Outcomes in the NHS (England) 2008–17

Christopher G. Moran <sup>a</sup>, Fiona Lecky <sup>b</sup>, Omar Bouamra <sup>c</sup>, Tom Lawrence <sup>c</sup>, Antoinette Edwards <sup>c</sup>, Maralyn Woodford <sup>c</sup>, Keith Willett <sup>d</sup>, Timothy J. Coats <sup>e,\*</sup>


<sup>a</sup> University of Nottingham, Derby Rd, Nottingham NG7 2UH, UK

<sup>b</sup> Centre for Urgent and Emergency Care REsearch (CURE), Health Services Research Section, School of Health and Related Research, University of Sheffield, S1 4DA, UK

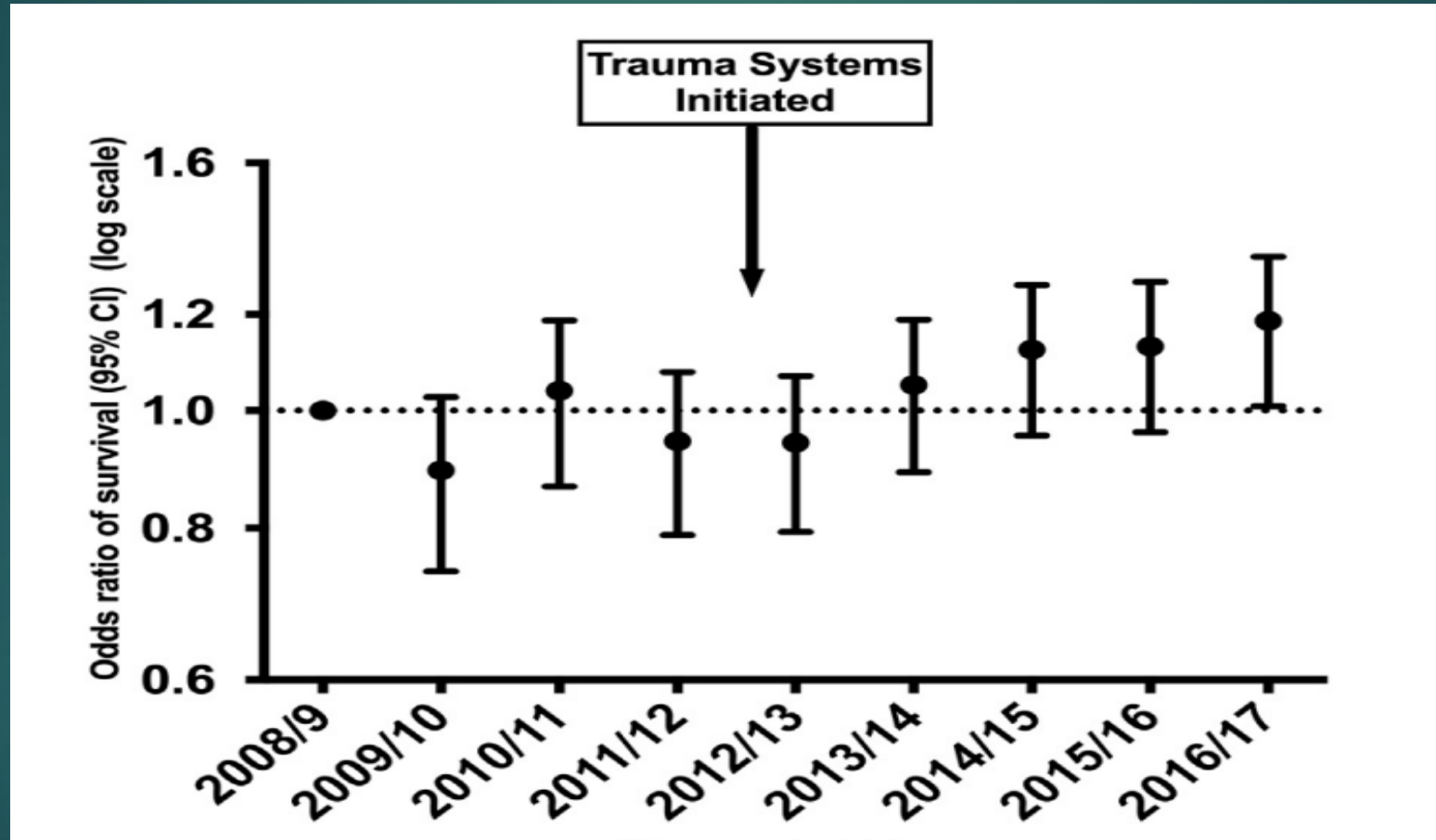
<sup>c</sup> Trauma Research and Audit Network, University of Manchester, 3rd Floor Mayo Building, Salford Royal NHS Foundation Trust, Salford M6 8HD, UK

<sup>d</sup> Kadoorie Research Centre, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Headley Way, Headington, Oxford OX3 9DU, UK

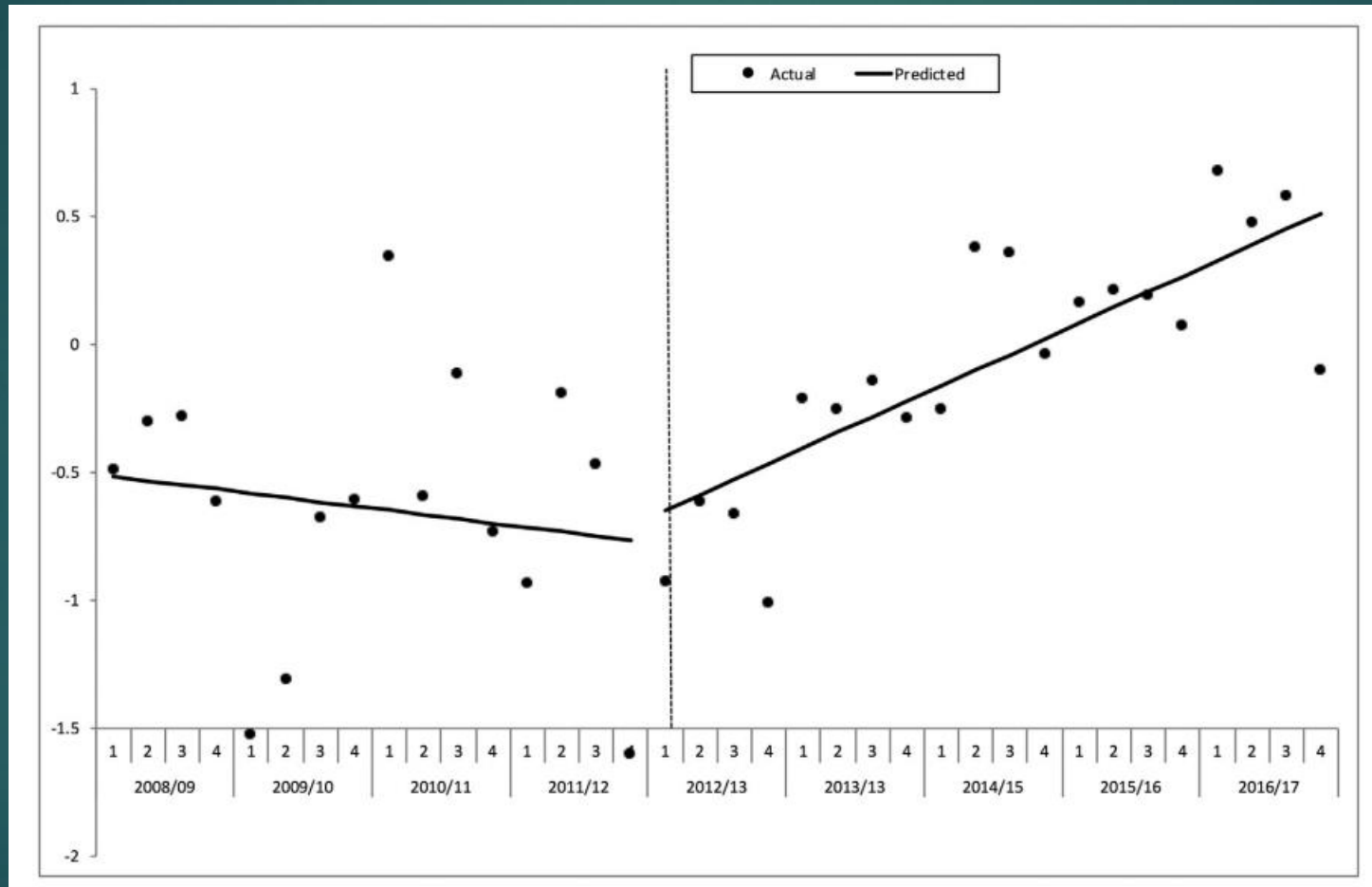
<sup>e</sup> University of Leicester, University Road, Leicester LE1 7RH, UK

- 
- ▶ Longitudinal cross-section study 2008-2017
  - ▶ TARN data, 110,863 patients
  - ▶ Findings – MTNs associated with significant changes in:
    - ▶ Patient flow
    - ▶ Treatment systems
    - ▶ Patient factors
    - ▶ Clinical care
  - ▶ **19% ↑ case-mix adjusted odds of survival from severe injury**

# Effect of trauma systems



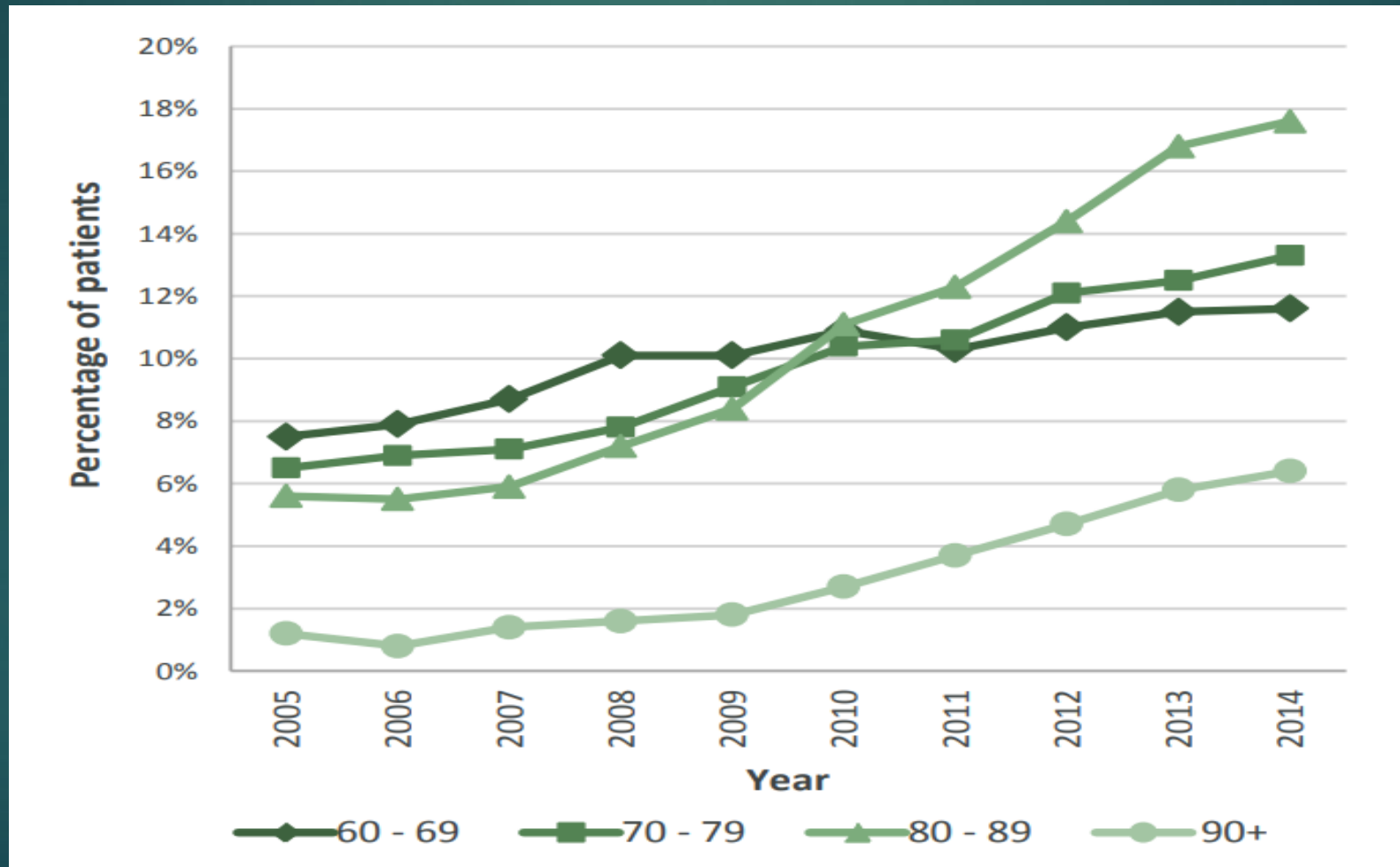
# Improved mortality





# But the disease is clearly changing . . . . .

(Older MT patients with ISS > 15)





- ▶ . . . . . medicine has been slow to confront the very changes that it has been responsible for . . .



TARN

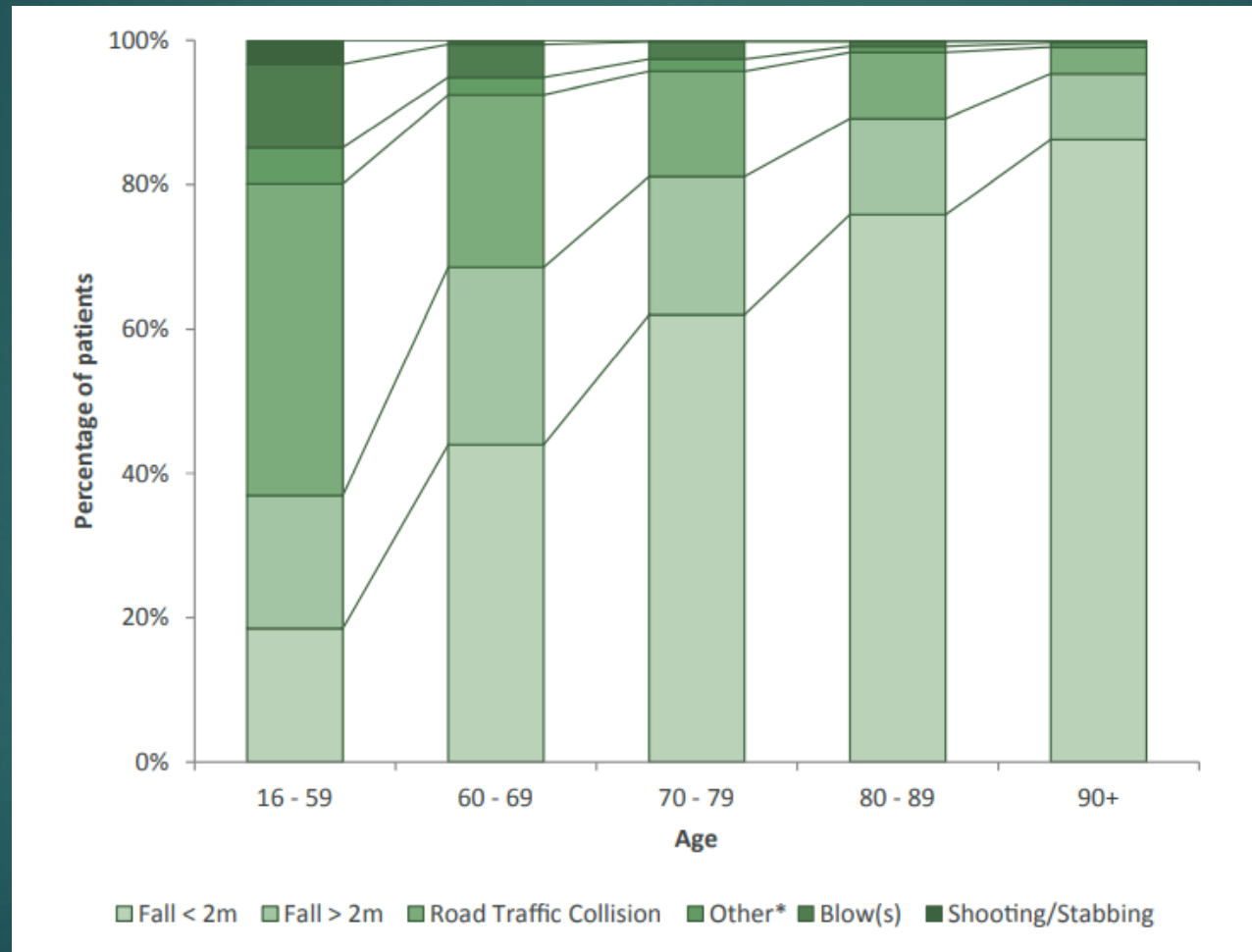
THE TRAUMA AUDIT & RESEARCH NETWORK

England & Wales

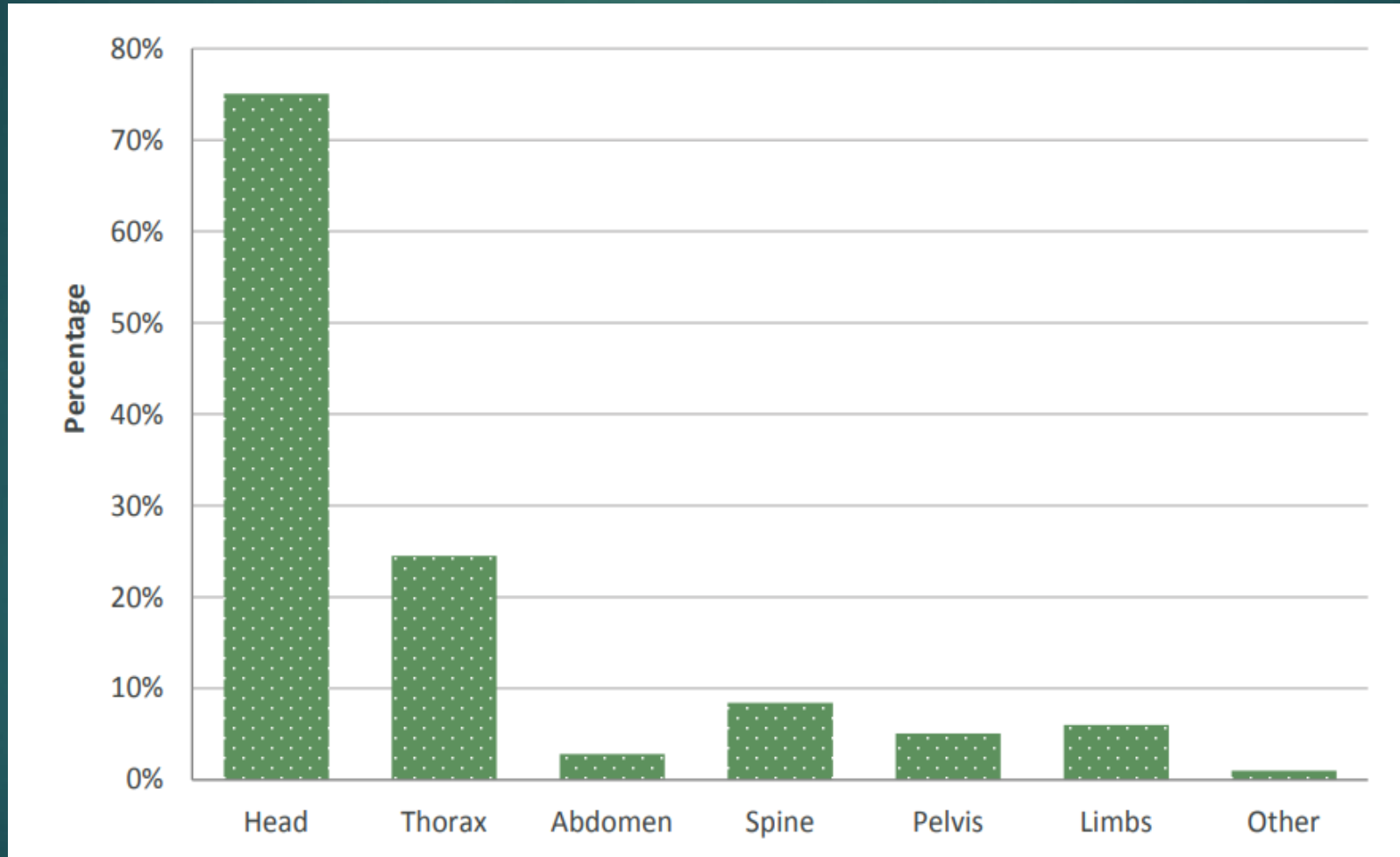
# MAJOR TRAUMA IN OLDER PEOPLE

2017

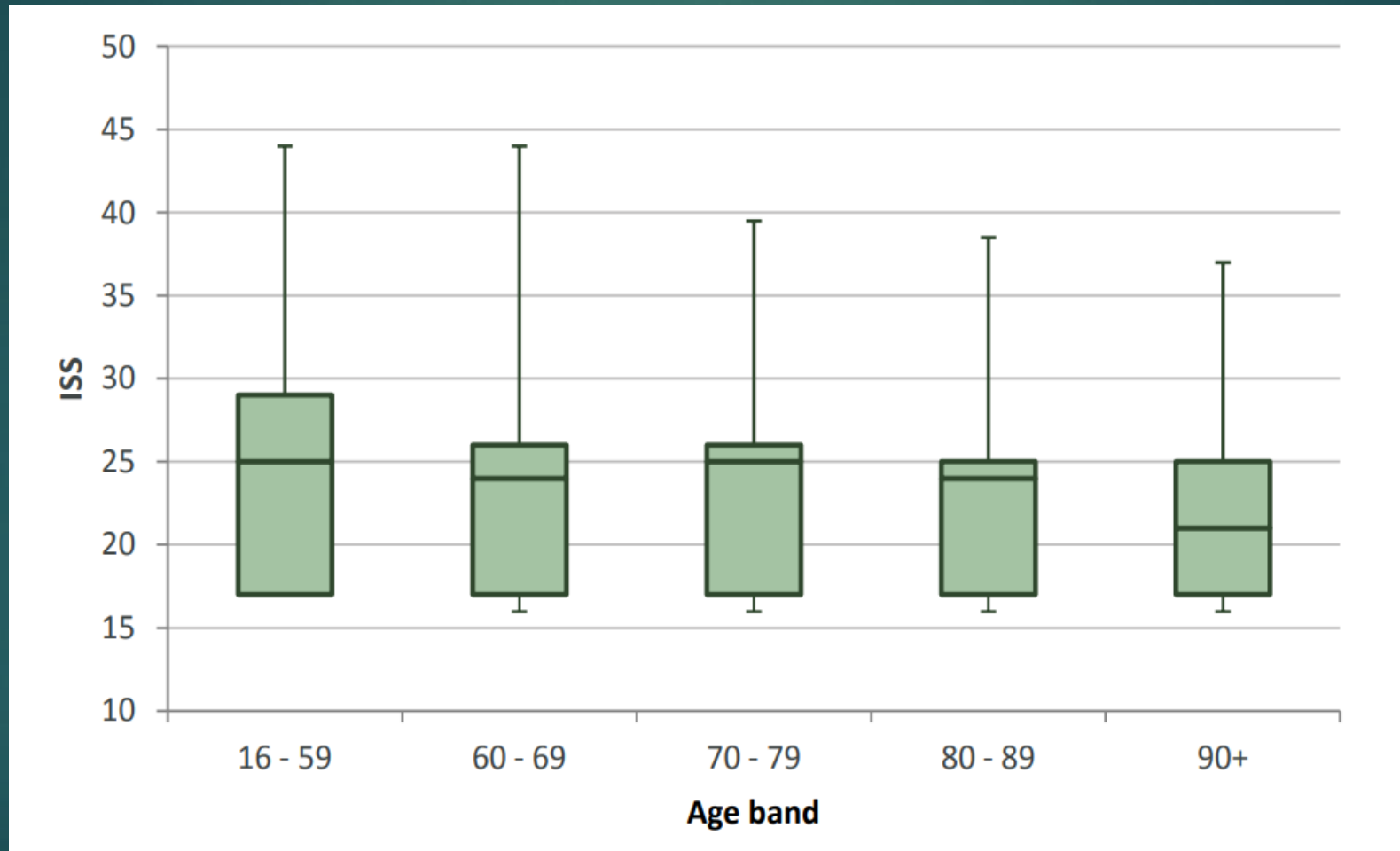
# MOI by age (ISS > 15)



# Body area injured (older people, ISS > 15)



# Severity of injury



# Findings of the report

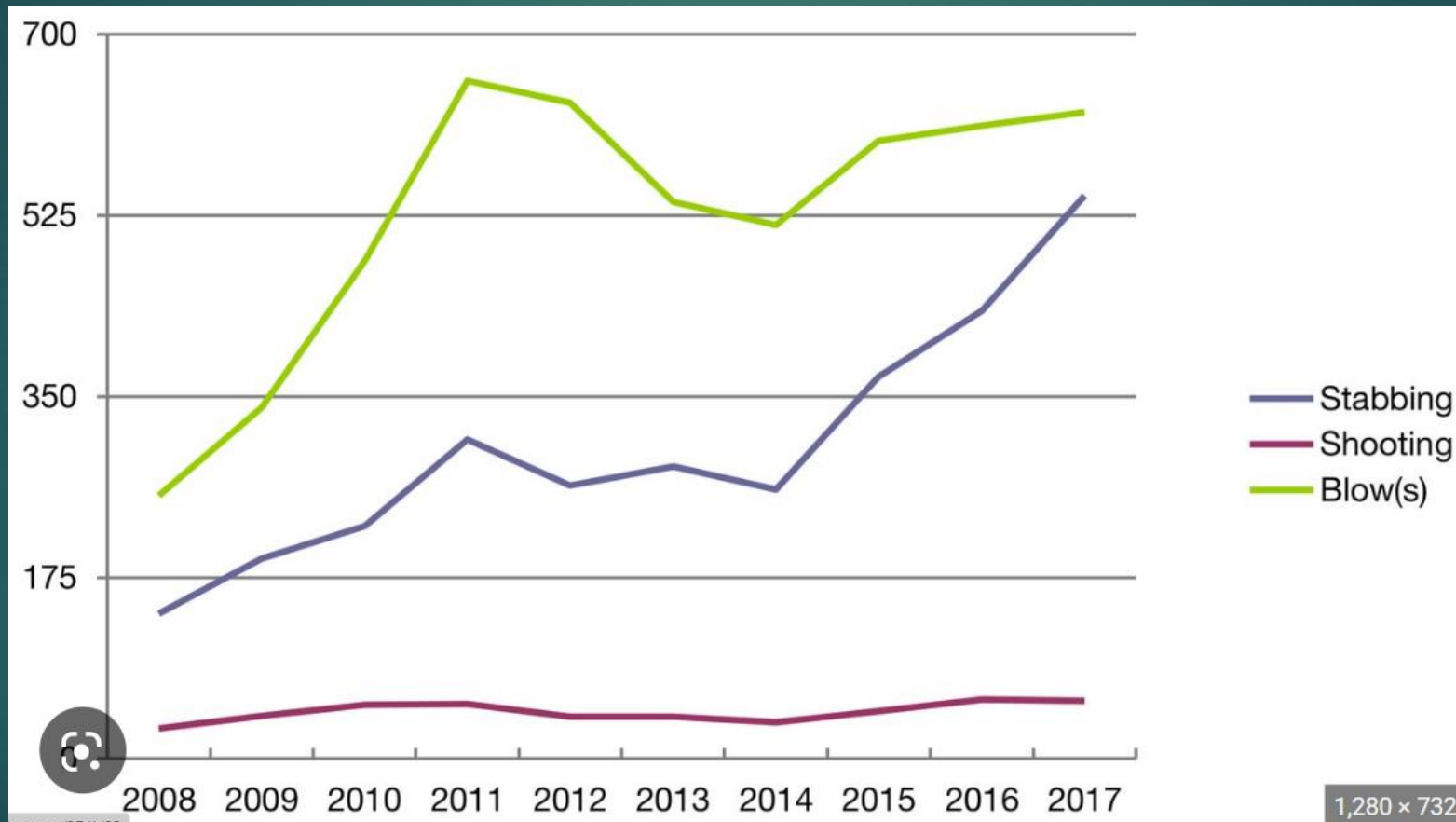
- ▶ Similar injury severity and injury distribution
- ▶ TBI commonest cause of death
- ▶ Fall < 2m commonest injury
- ▶ Current prehospital triage systems poor at identifying older MT patients
- ▶ Lack of early identification means initial treatment more likely to be in a TU and undertaken by a junior doctor
- ▶ Older patients have longer waiting times for both investigation and treatment, and are much less likely to be transferred for specialist care

# So there are now 2 types of Major Trauma

- ▶ High energy transfer Major Trauma
  - ▶ Young. Male. RTC. Triage +ve. MTC. Early detection. Early intervention.
- ▶ Low energy transfer Major Trauma
  - ▶ Older. Fall < 2m. Triage -ve. TU. Late detection. Late intervention.
- ▶ (Penetrating Major Trauma)



# Penetrating trauma



1,280 × 732

# Should high and low energy MT be judged by the same outcomes?

- ▶ 19 year old male, ISS 25 with head and chest injuries from a high speed RTC
- ▶ 90 year old female, ISS 25 with head and chest injuries from a fall at home

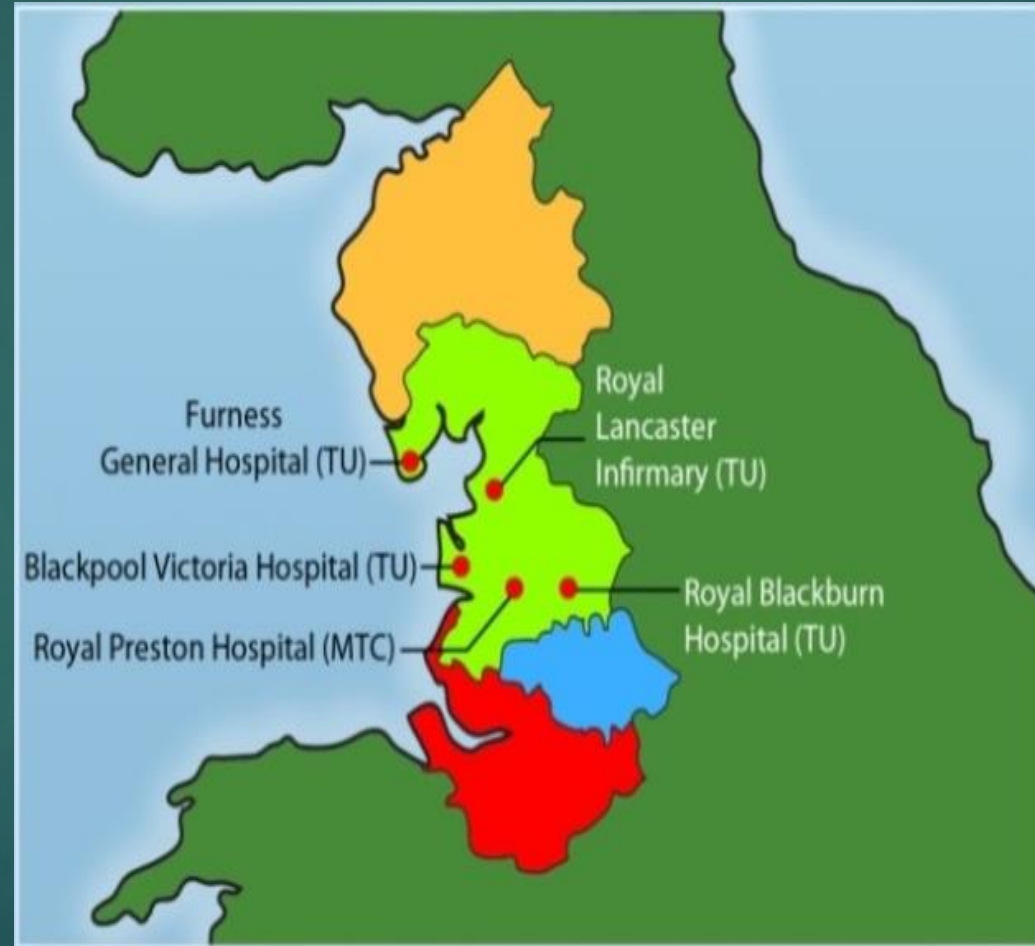
# Trauma system 2050

- ▶ Different systems for high and low energy transfer trauma
- ▶ PROMS used as outcomes
- ▶ Systems designed to optimize PROMS
  - ▶ Early psychological assessment
  - ▶ Early social assessment
  - ▶ Combined bio-psycho-social interventions
  - ▶ Tailored rehab to predicted outcomes
- ▶ Different training for trauma specialists

# Conclusion

- ▶ Major trauma networks have proven to work
- ▶ Nature of trauma has (and is) changing
- ▶ Ongoing refinement of pathways and data collection
- ▶ More focus on quality of survival
- ▶ MTCs vs TUs

# BVH within L&SC MT Network



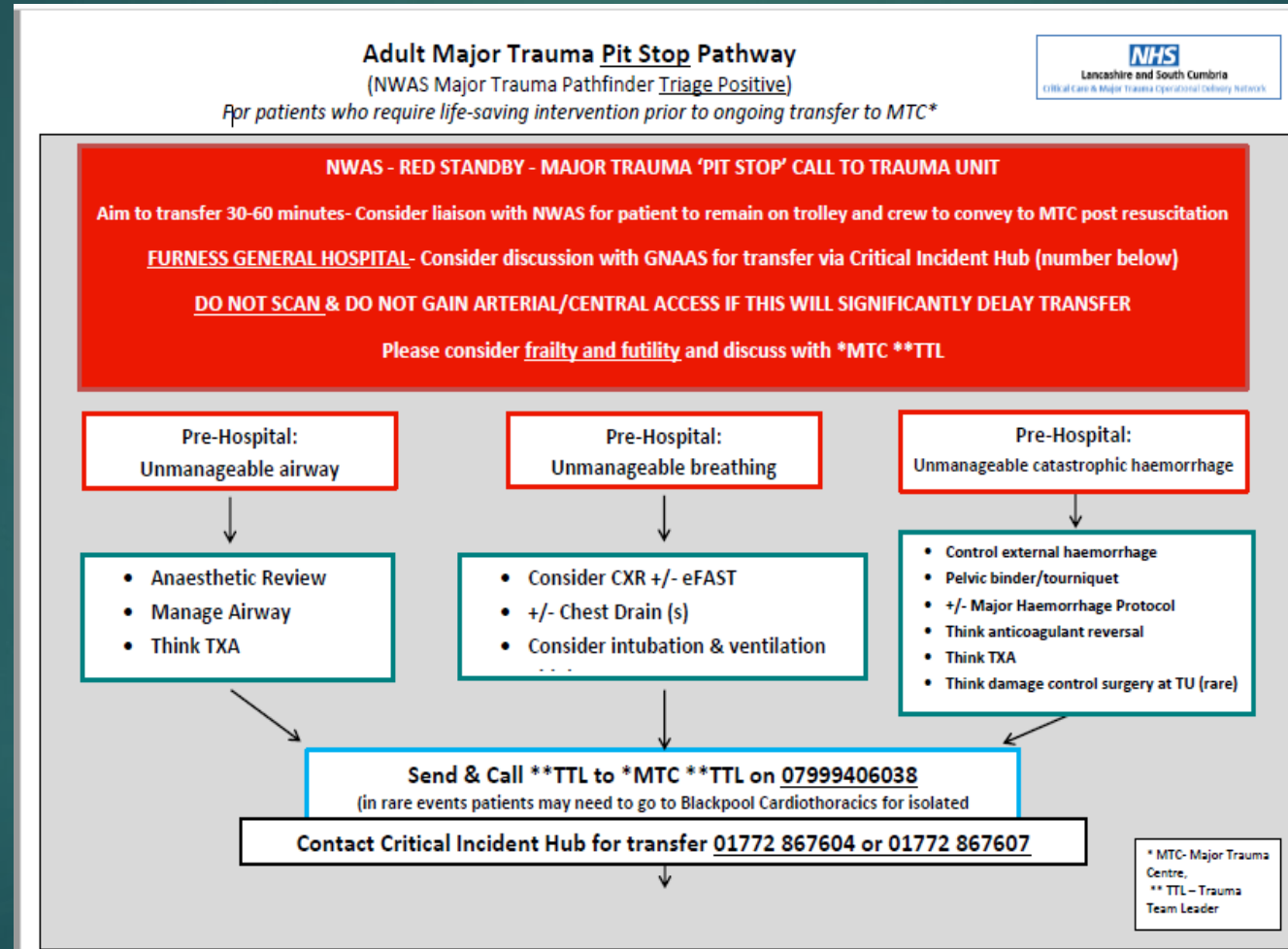
# 2020/21 Report on Silver Trauma

- ▶ 59% patients  $\geq$  65 years old, 2/3 female
- ▶ 29% ISS > 15
- ▶ 88% fall < 2m
- ▶ Injured body regions – brain and limbs
- ▶ Only 12% transferred to MTC
- ▶ 10% mortality

# Pathways

- ▶ Head injury pathway
- ▶ Hepato-biliary pathway
- ▶ Pit stop pathway
- ▶ Injured patient pathway
- ▶ Penetrating chest trauma pathway
- ▶ Blunt chest trauma pathway

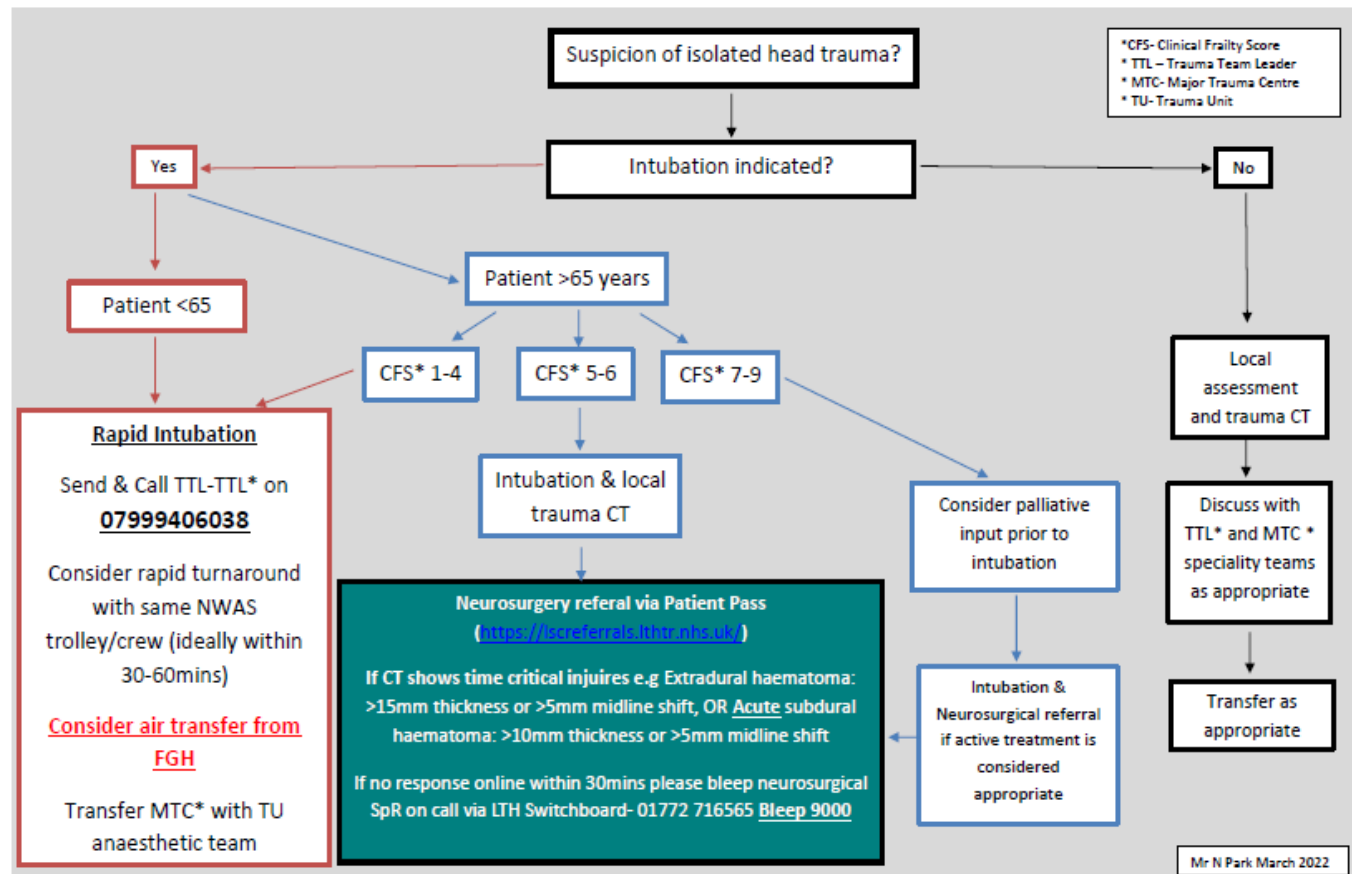
# Pit Stop Pathway



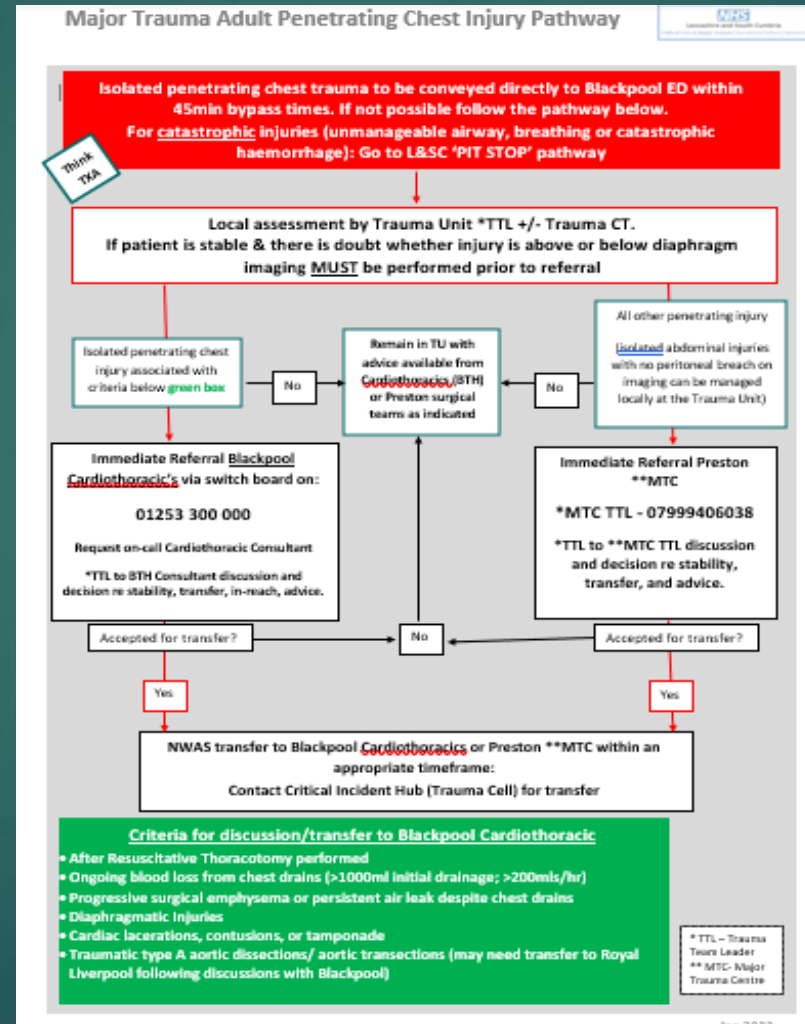


# Isolated HI Pathway

## Lancashire & South Cumbria Isolated Head Injury: Trauma Unit Pathway



# Penetrating Chest Trauma Pathway



# Challenges

- ▶ TARN data quantity and quality
- ▶ MTRC
- ▶ ED pressures inc recruitment/retention
- ▶ Silver trauma – numbers, under triage, delays to CT, etc
- ▶ Management of young major trauma
- ▶ Training & education
- ▶ MDT support