
# Setting Up a ~~Rib Fixation~~ Service

## Chest Wall reconstruction & Stabilisation

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# Introduction

What's the need for Chest Wall Reconstruction?

Define characteristics of injury requiring intervention

Define management Strategies

What are the Challenges?

# Myths and old wives tales

Rib fractures can be managed with pain killers and antibiotics alone

……..we always have in the past

# Lieutenant Kristopher Hagen

*Journal of Bone and Joint Surgery - 1945*

- Case report –
- “ Multiple rib fracture treated with Drinker Respirator”
- Referenced; Stove in Chest and Steering wheeling injury

622 THE BRITISH JOURNAL OF SURGERY

# THE STOVE-IN CHEST WITH PARADOXICAL RESPIRATION

By H. PROCTOR
SURGEON, ACCIDENT HOSPITAL, BIRMINGHAM
AND P. S. LONDON
SURGEON, ACCIDENT HOSPITAL, BIRMINGHAM

May 1955

1. Reduced ventilation
2. Increased respiratory rate and pain
3. Inability to cough
4. Anxiety due to sense of suffocation
5. Compromised filling of the heart
6. Paralytic ileus

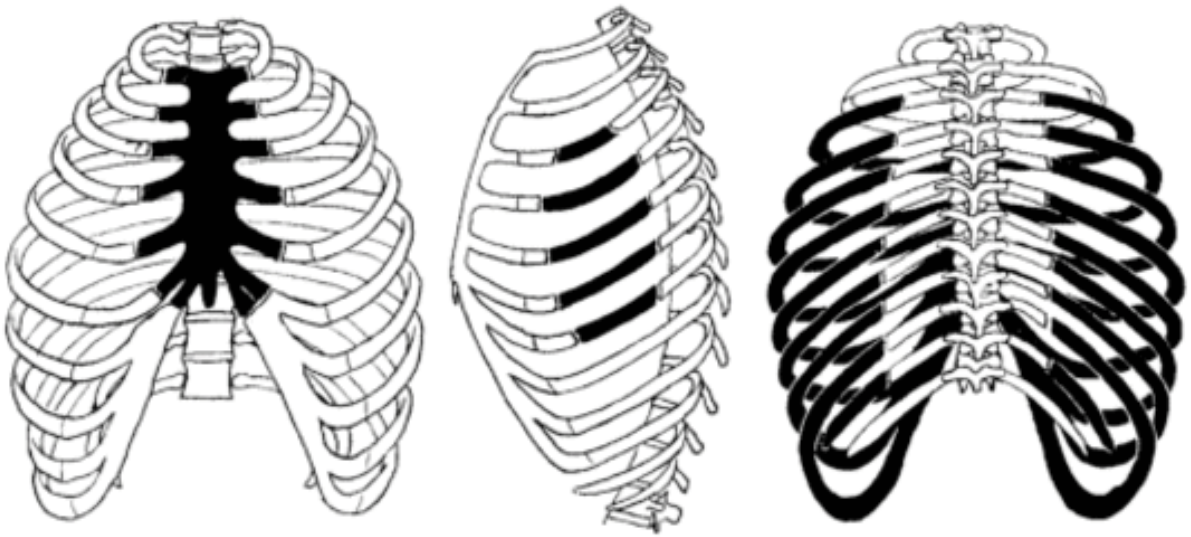



FIG. 774.—Types of injury. The floating segments are in solid black. A, Anterior; B, Lateral; C, Posterior.

# THE CRUSHED CHEST

## Management of the Flail Anterior Segment

Sillar W. Glasgow. J Bone and Joint Surgery 1961

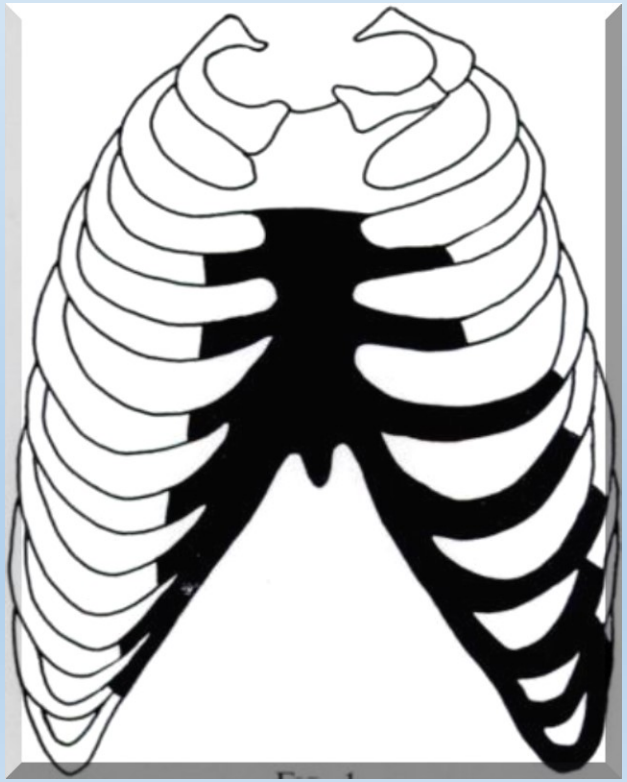
"… Although tracheostomy is undoubtedly the greatest single contribution to the problem *(severe chest trauma)*, it will not of itself ensure the survival of a patient with a large flapping anterior segment….

In the meantime efforts to re-establish normal respiratory physiology by restoring architecture of the thoracic cage are perhaps being abandoned too easily…"

# THE CRUSHED CHEST

## Management of the Flail Anterior Segment
## Sillar W. Glasgow. J Bone and Joint Surgery 1961

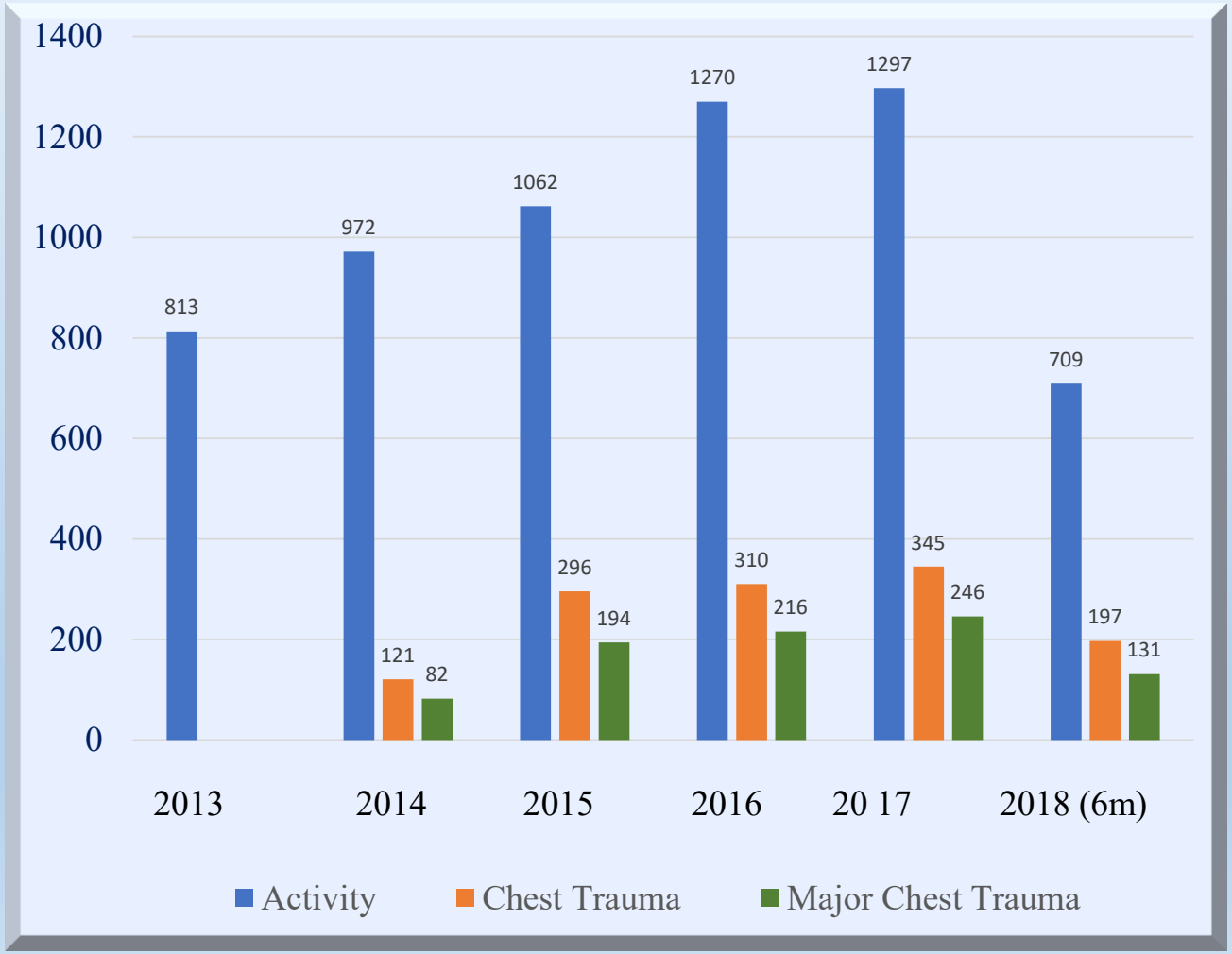
"The shape of the mobile segment as defined by dissection after death…"



Mortality of 35 Treated Patients

| | No. Patients | Deaths | Percentage |
|---|---|---|---|
| Lateral Segments | 15 | 8 | 53.3% |
| Anterior Segments | 8 | 7 | 87.5% |
| Mixed | 4 | 3 | 75% |
| Unknown | 8 | 7 | 87.5% |

# Annual Trauma and Chest Trauma Activity
## (University Hospital of North Midlands Data)




Total trauma = 6833

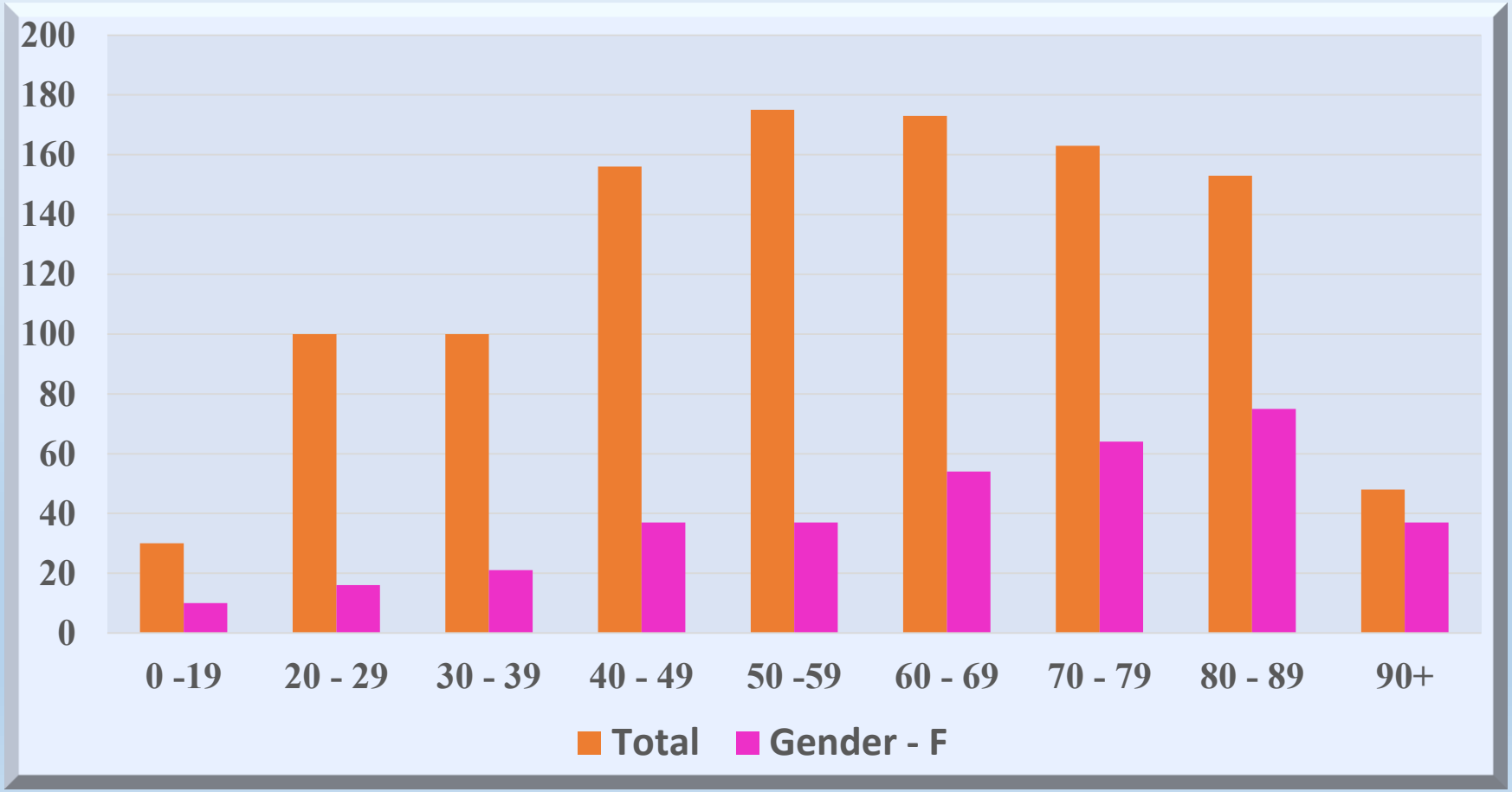
Total Chest Trauma = 1305 (19.1%)

2015 – 18 = 26.7%

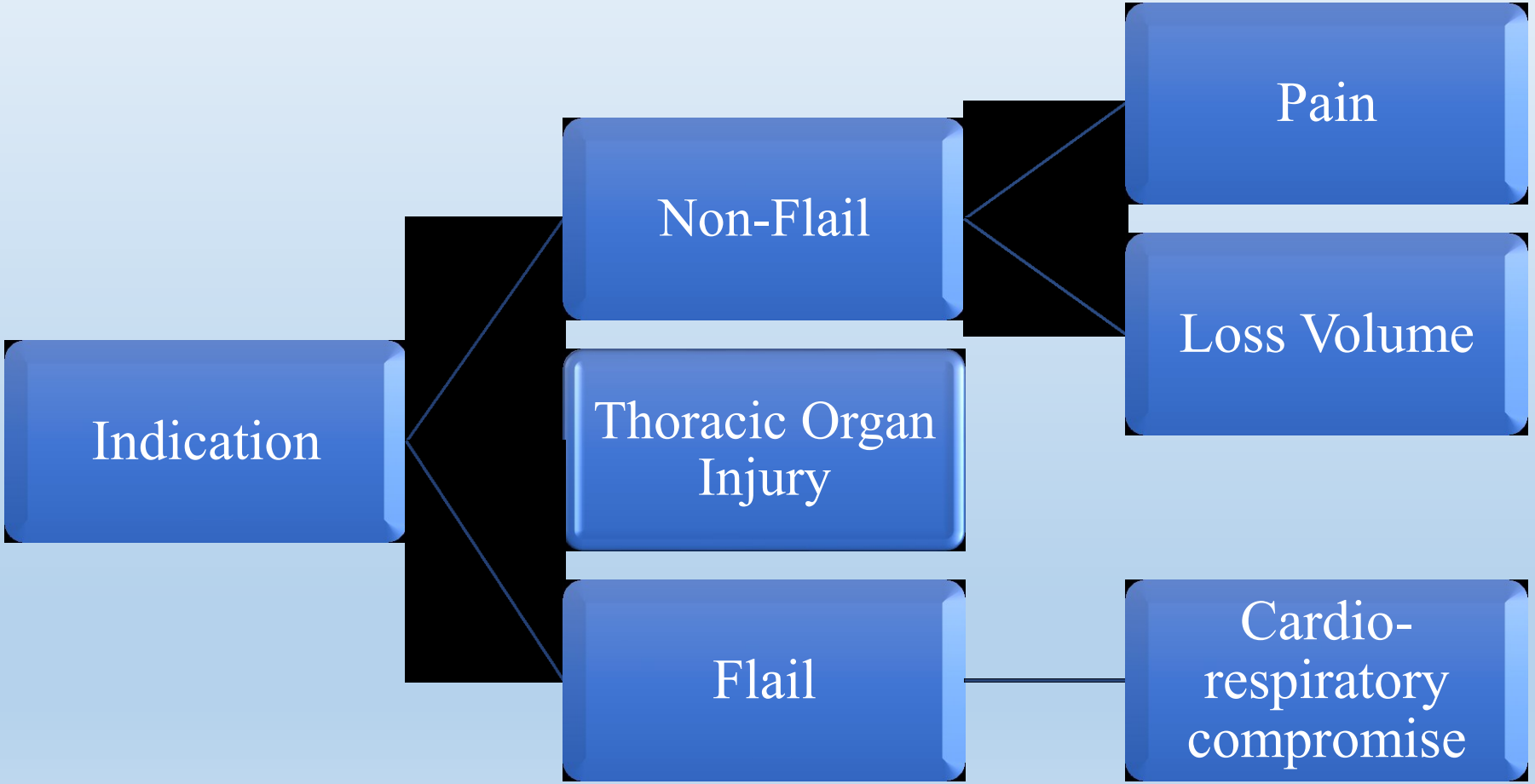
Major chest trauma = 1305 (13.1%)

2015 – 18 = 18.2%

# Chest Trauma Distribution by Age & Gender
## (Total Chest Trauma Population)

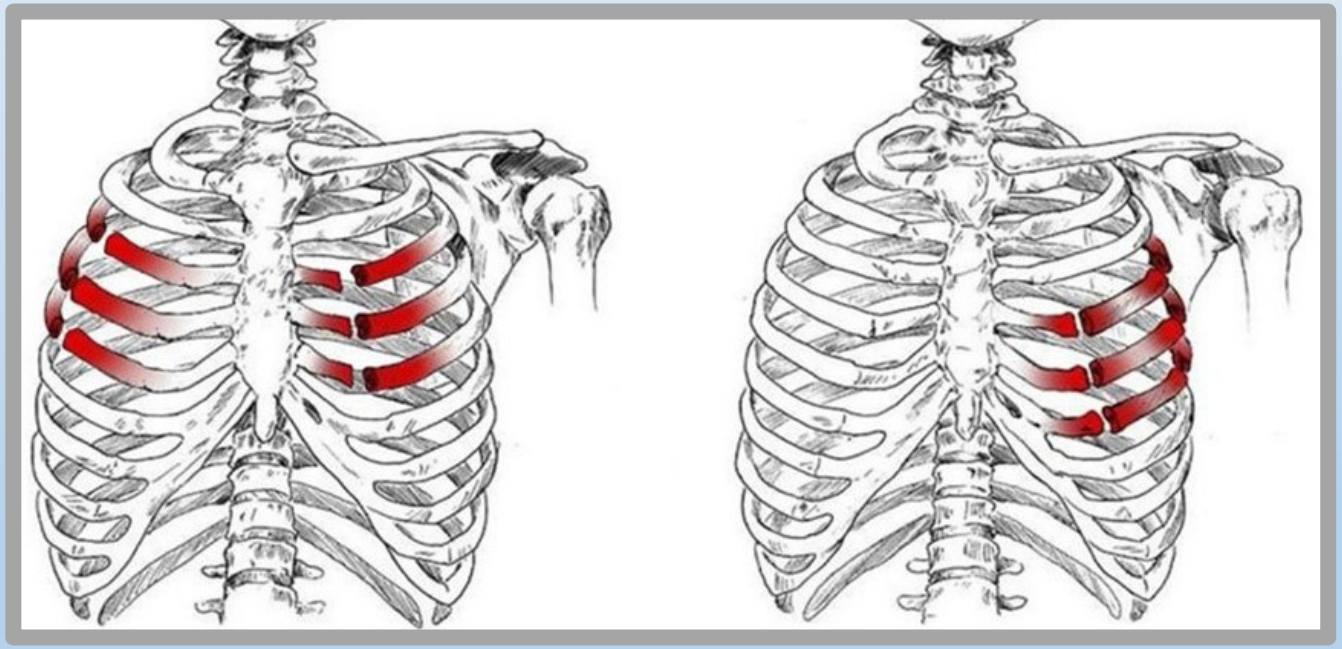


# Indications for Surgical Treatment
# Chest Wall

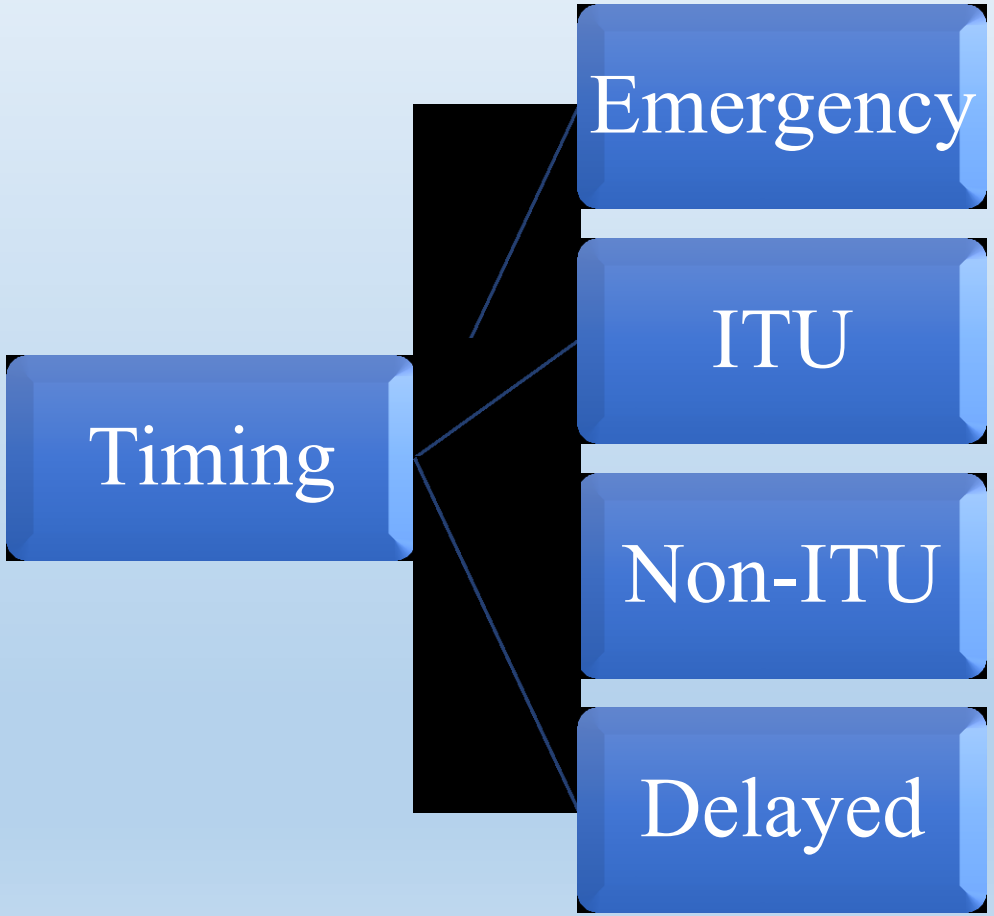


# Flail Chest - Definition

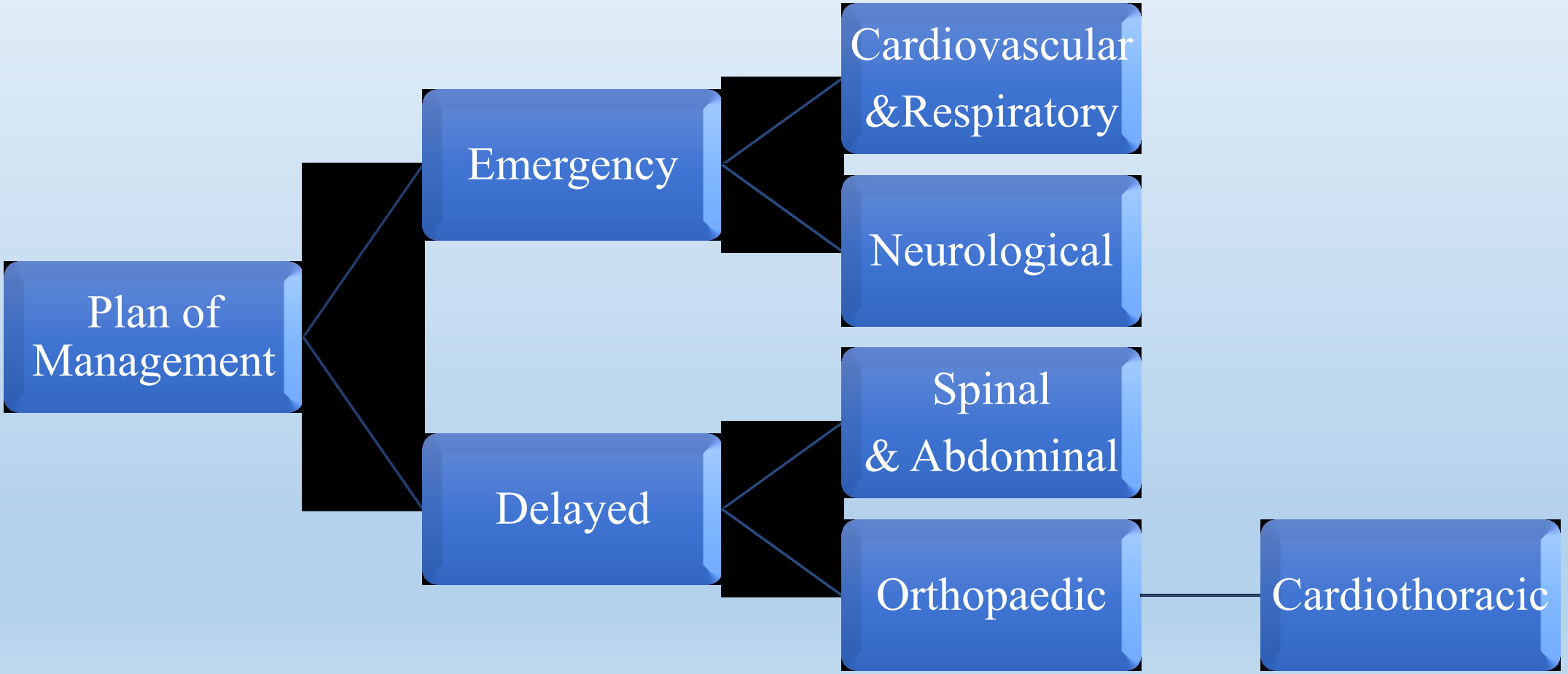
- Instability of the Chest cylinder
- Composite of:
  - Bilateral rib fractures
  - Sternal fractures
  - Clavicular fractures
- Clinical and Radiological

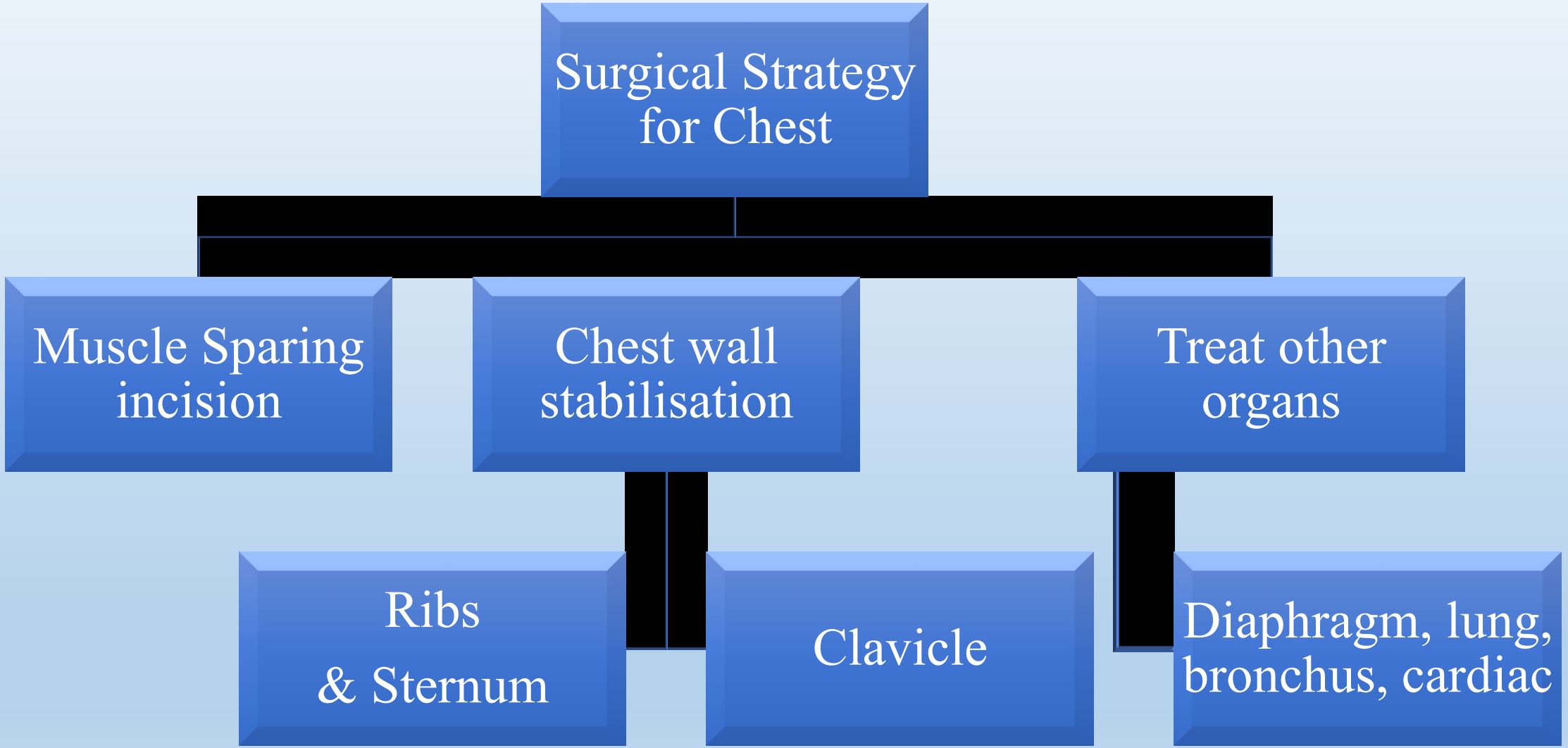


# Timing of Surgical Treatment

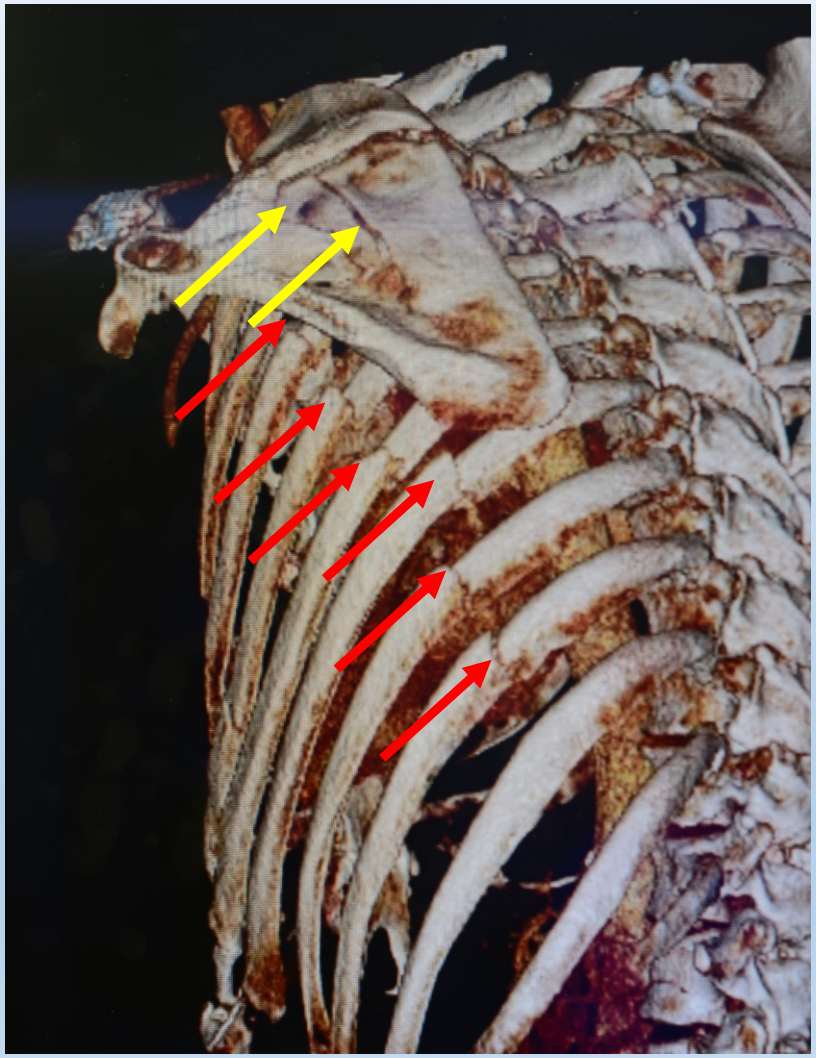


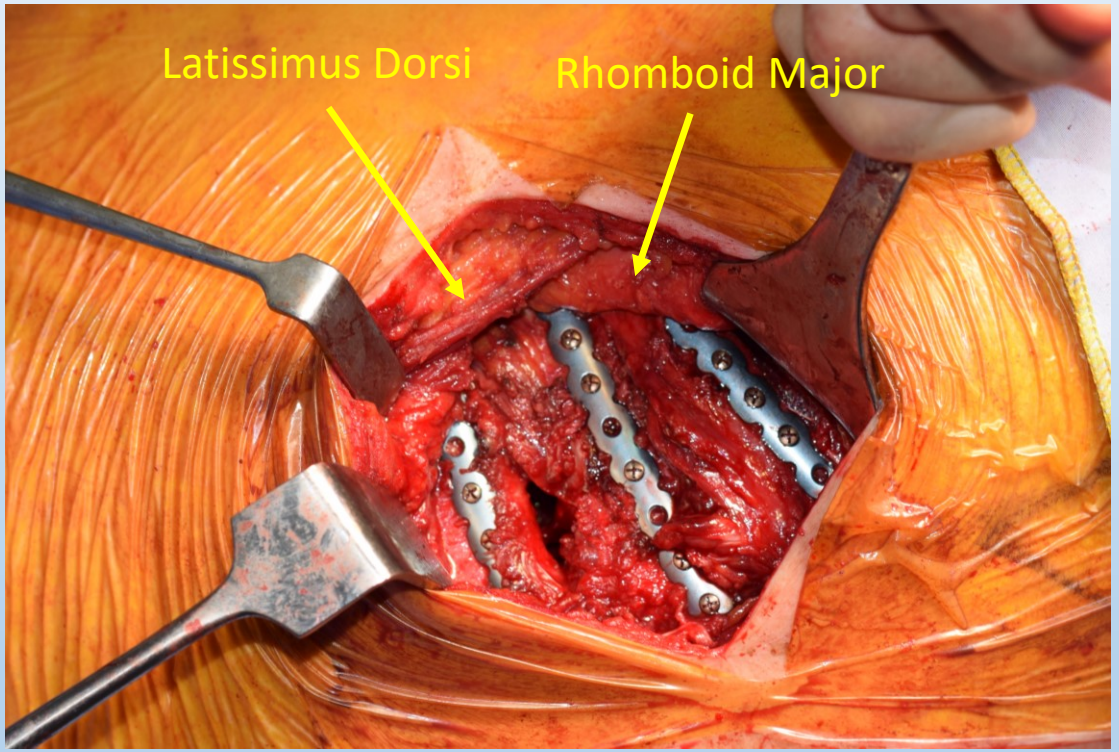
# Clinical Management Hierarchy of Collaboration




Surgical Strategy for Chest
Muscle Sparing incision
Chest wall stabilisation
Treat other organs
Ribs & Sternum
Clavicle
Diaphragm, lung, bronchus, cardiac

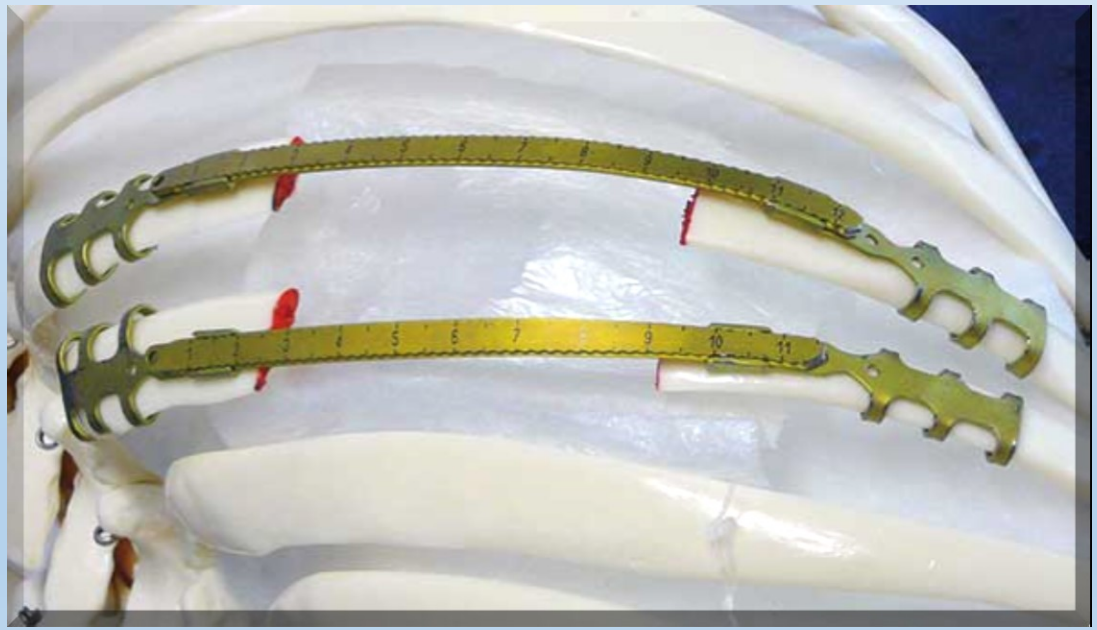
# Muscle Sparing Incision



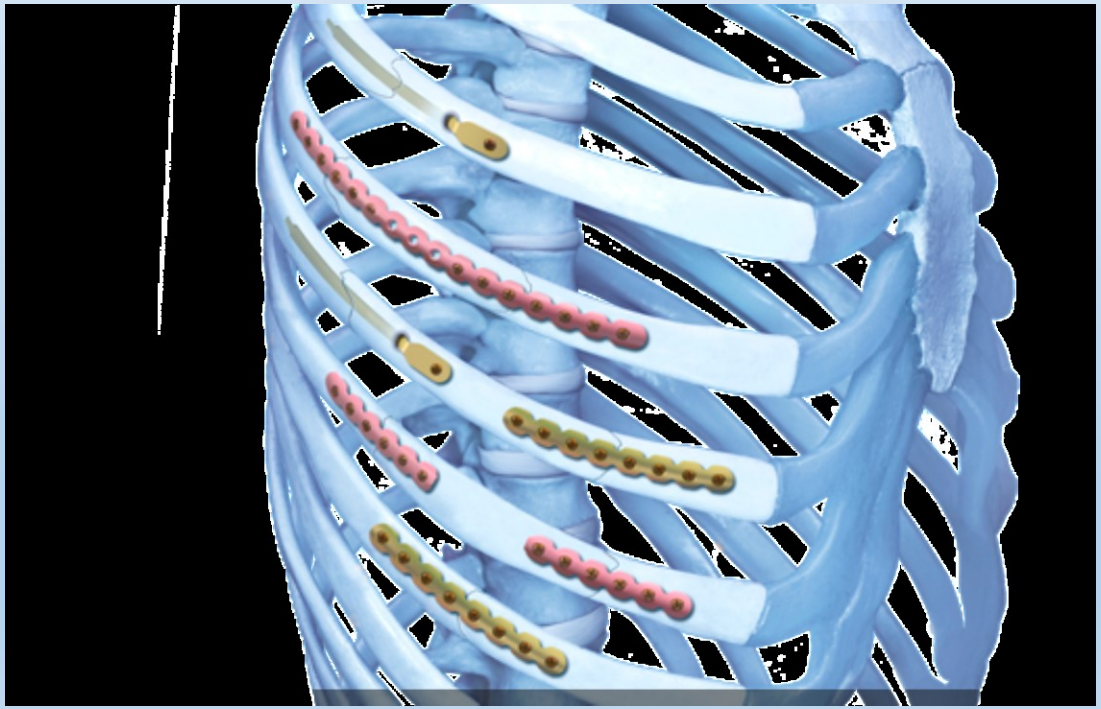


# Instrumentation

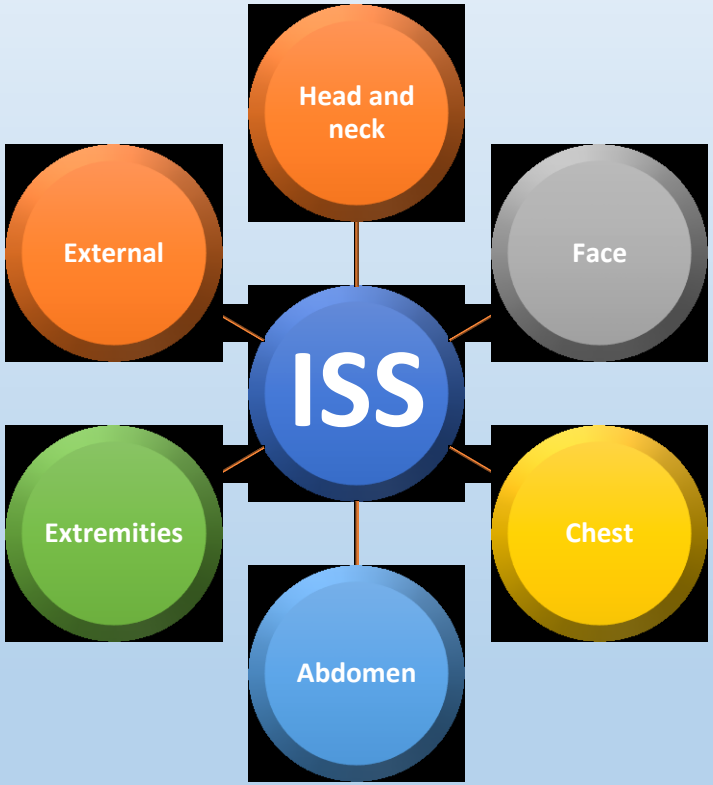
## MedXpert – Stratos



## Synthes Matrix Rib



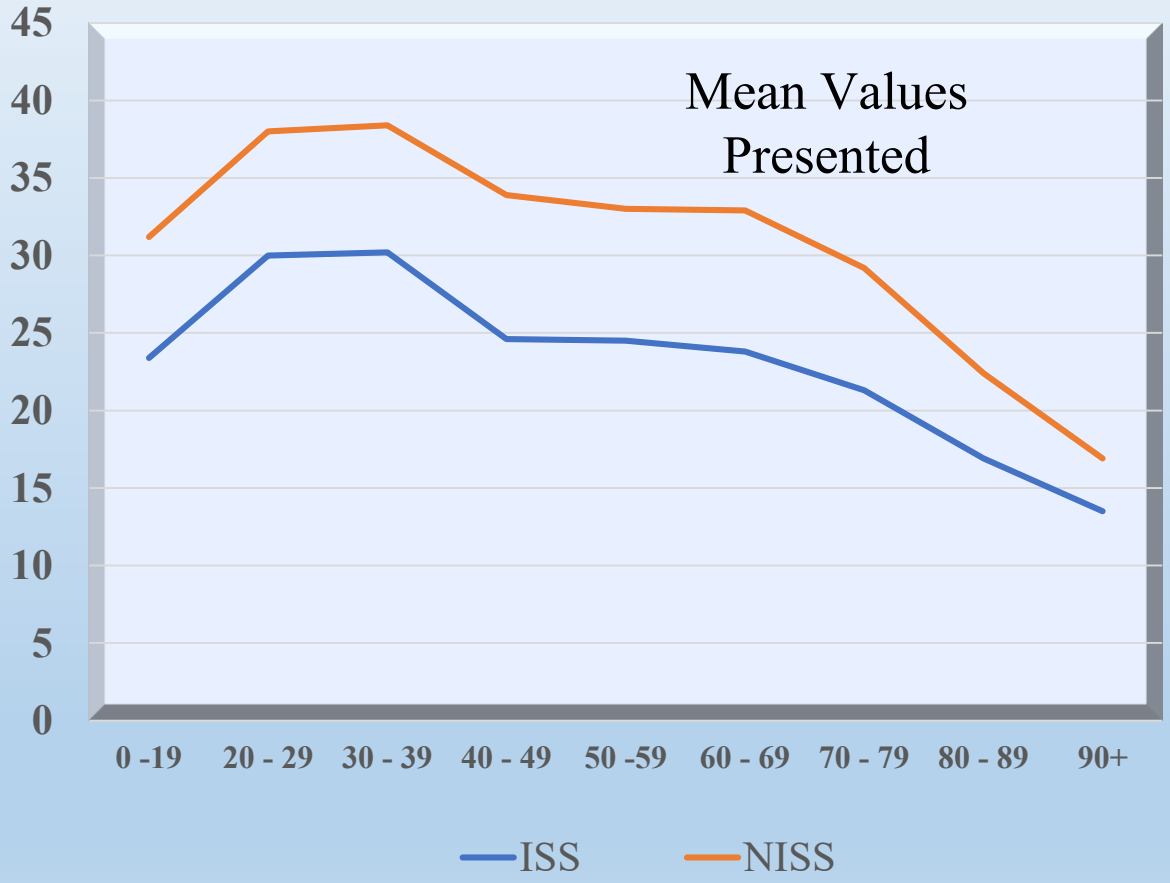
# ISS/ NISS Scoring – Computer Based Coding




| Abbreviated Injury Score | Mortality Expectation % |
|---|---|
| 1 - Minor | 0 |
| 2 - Moderate | 1 - 2 |
| 3 - Serious | 8 – 10 |
| 4 - Severe | 5 - 50 |
| 5 - Critical | 5 - 50 |
| 6 - Maximum | 100 |

Major Chest Trauma $\geq$ 3

# Injury Score According to Age (Total Chest Trauma Population)



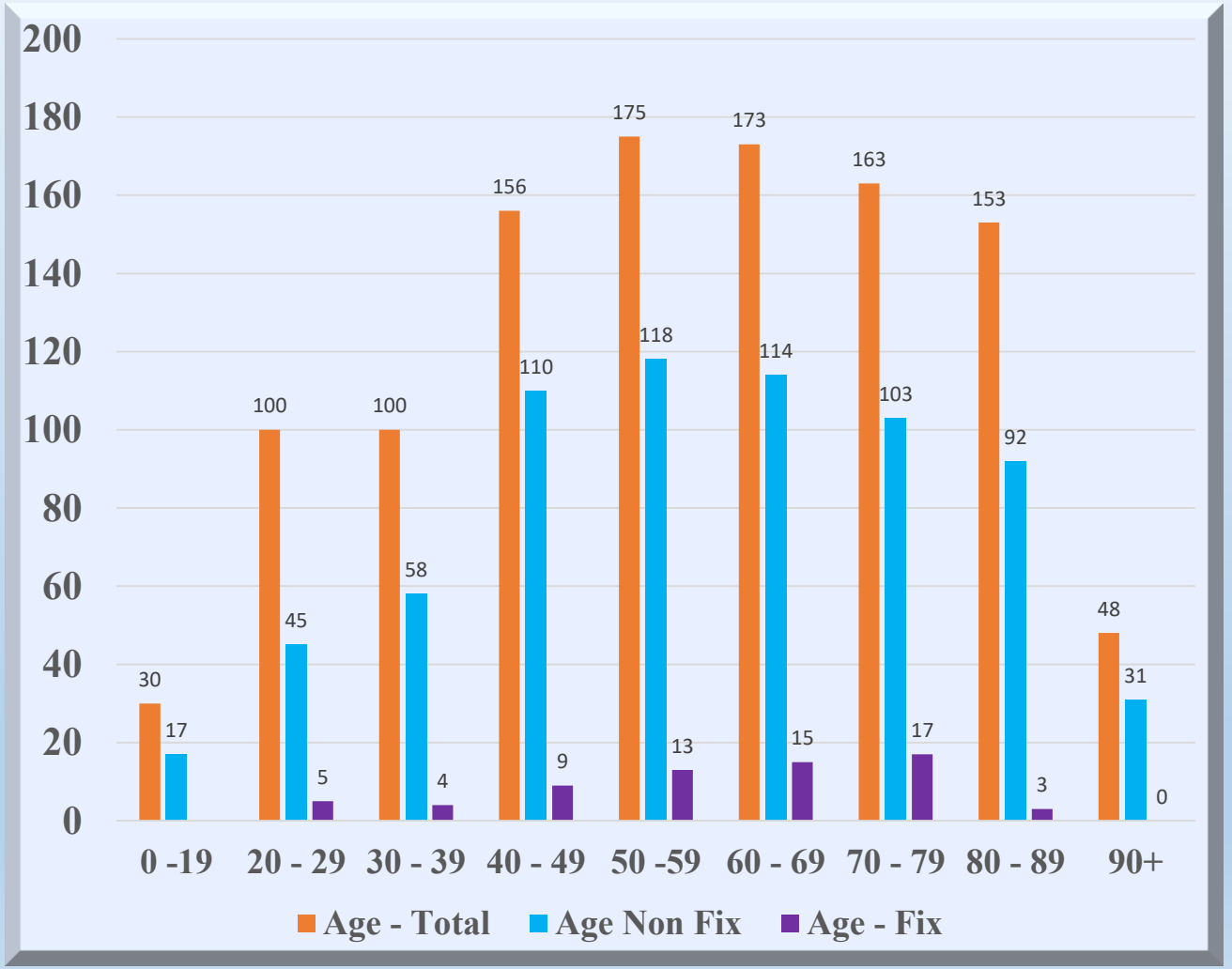

**National Audit Office**

**Prediction of Mortality 2010**

| ISS Score | % Mortality |
|---|---|
| 16 – 25 | 10.5 |
| 26 - 40 | 22.1 |
| 41 - 74 | 44.3 |
| 75 | 79.6 |

# Chest Trauma Distribution by Age
# Minor, Non-Fixed Major & Fixed Major

| Total | 1305 |
|---|---|
| Minor | 407 (31.2%) |
| Major Non-Fix | 814 (62.4%) |
| Major Fix | 84 (6.4%) |



# NISS Scores For Chest Trauma Cohort

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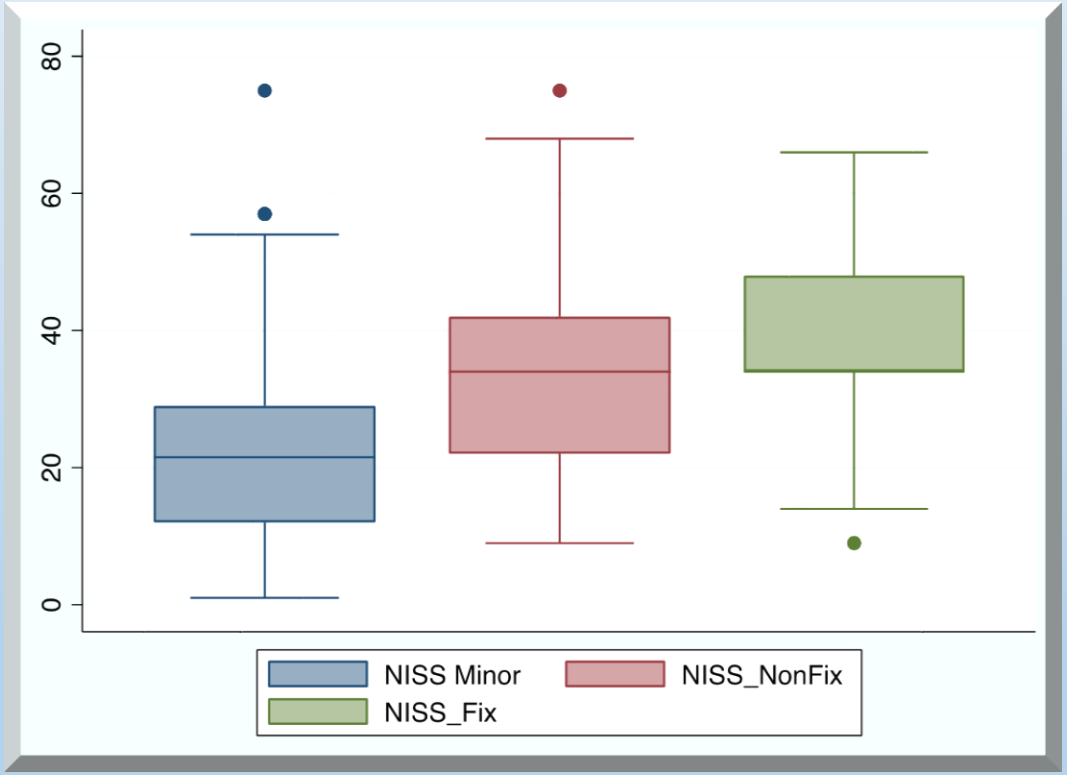
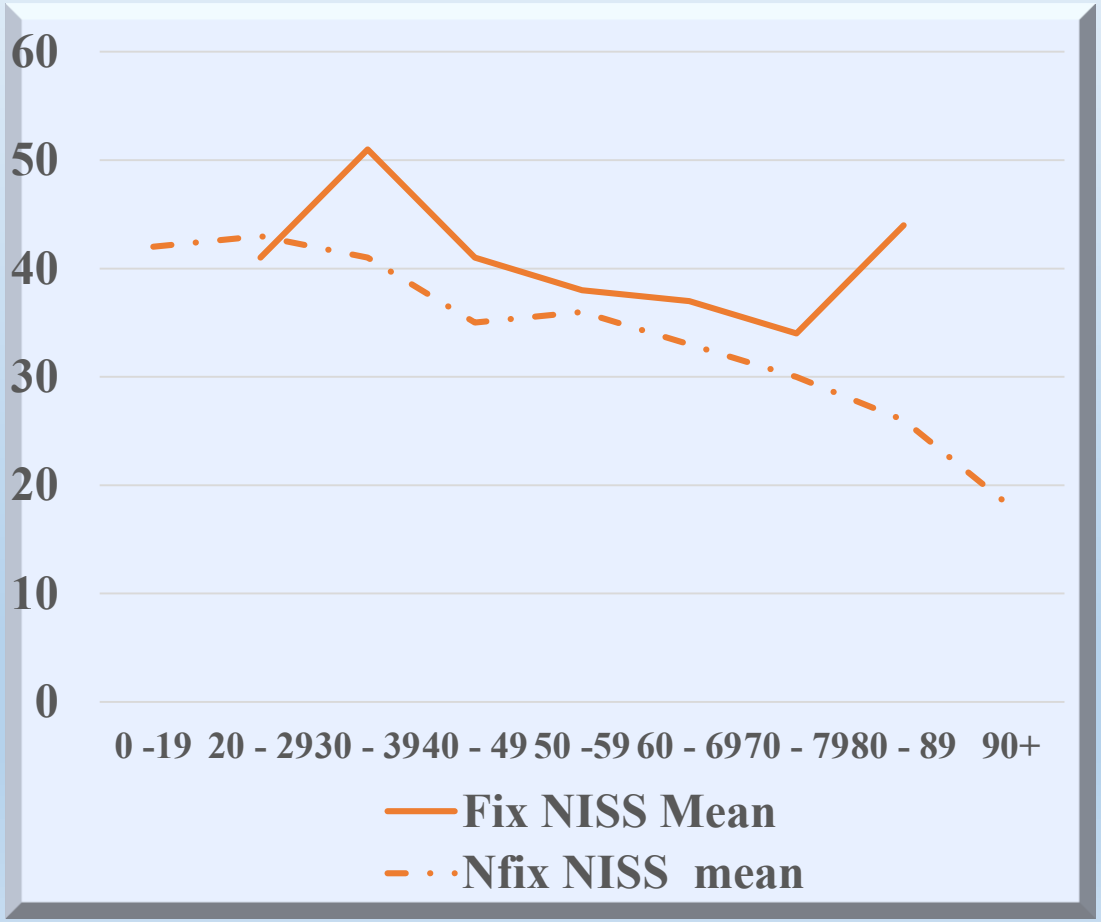
# Minor, Rib Non-Fixed or Fixed




Fix vs Non Fix $p<0.01$

Fix vs Minor $p < 0..0001$

# Comparison of Outcomes

| | Rib Fixed (84) (CI 95%) | Non-Rib Fixed (814) (CI 95%) | |
|---|---|---|---|
| Thorax AIS | 3.83 (3.7 – 3.9) ↑ | 3.36 (3.3 – 3.4) | P<0.0001 |
| Ventilated | 6.54 (4.1 – 9.0) ↑ | 2.9 (2.3 – 3.5) | P <0.001 |
| ITU Stay | 10.8 (7.5 – 14.2) ↑ | 4.8 (4.1 – 5.5) | P<0.0001 |
| Length of Stay | 22.3 (17.6 – 27.0) ↑ | 17.6 (15.9 – 19.3) | p = 0.04 |
| Interval to To Rib Fix | 4.9 days | - | - |
| Mortality | 2 (2.38%) ↓ | 89 (10.9%) | P = 0.013 |

# Comparison of Mortalities

| | Mortality (%) | Comparison to Non- Fix | Comparison to Fix |
|---|---|---|---|
| Minor | 6.39 | p = 0.01 | p = 0.14 |
| Major Non-Fix | 10.93 | - | p = 0.013 |
| Major Fix | 2.38 | p = 0.013 | - |

# Associated Injuries

| | Isolated Chest Trauma | Chest Trauma & Poly Trauma | Camparison to Rib Fix Cohort |
|---|---|---|---|
| Minor | 14.5% | 85.5% | $p < 0.01$ |
| Major Non-Fix | 43.6% | 56.4% | $p < 0.01$ |
| Major Fix | 63.1% | 36.9% | |

# Interpretation Data

- Patients having chest wall reconstruction have:
  - Higher trauma risk of death and require increased critical care
  - AIS Thoracic Score is greater than Non-fixed patients
  - Chest wall reconstruction significantly improves survival

# Challenges to Setting Up a Chest Wall Reconstruction Service

Identifying patients who require treatment

Convincing colleagues of the value of treatment

Identify funding

Identify theatre time

# Thank You