Year 3 SSC Coversheet

Title of your project	Impact of Major Trauma Centre Implementation on Time to Theatre for Spinal Fractures
Student Number	21027764
Project Description and Aims: Please describe in brief what the broad purpose of your SSC project is. (please also note if there were any changes from your original proposal)	• To evaluate the effect of the University Hospital of Wales becoming a **Major Trauma Centre (MTC)** in 2020 on the **time to theatre** for patients with **cervical and thoracolumbar spinal fractures**. • To conduct a **retrospective service evaluation**, analysing two time periods: **2016–2018** (pre-MTC) and **2023–2025** (post-MTC). • To determine the **average time interval** between confirmed radiological diagnosis and surgical intervention for spinal fractures in each period. • To assess whether MTC designation has led to **improvements or delays** in surgical access for these patients. • To compare **time to theatre** between patients with **neurological deficits** and those **without**, identifying any significant differences in treatment prioritisation. • To compare outcomes between **cervical** and **thoracolumbar fractures**, exploring whether injury location influences time to surgical management.
Educational Objectives: What did you intend to achieve from your project?	1. **Science and Scholarship:** Develop skills in data collection, analysis, and interpretation within a clinical service evaluation context. Develop presentation skills. 2. **Practice:** Gain insight into trauma and spinal surgery pathways, including factors affecting surgical timing. 3. **Professionalism:** Enhance understanding of multidisciplinary team coordination and the role of audit in improving patient care quality.
SSC Logistics: Describe here the activities you have undertaken during your SSC placement.	Met with supervisor to discuss project and understand how to carry it out. Attended surgeries and gained theatre time. Data collection and refinement to create a database. Database analysis and statistical analysis. Meetings with the SSC supervisor throughout the project. Write up the poster, abstract and paper.
Was Ethics Approval required?	No
Word Count (for abstract and poster)	Abstract = 508 Poster = 939

AI Declaration	I declare that this work is entirely my own and no part of it has been produced by Generative AI tools.

Impact of Major Trauma Centre Implementation on Time to Theatre for Spinal Fractures

Abstract

Background
Major Trauma Centre (MTC) designation aims to centralise expertise, streamline referral pathways, and improve timeliness of care for complex trauma patients. Spinal fractures make up a significant proportion of major trauma workload and often require surgical intervention, especially when linked to a neurological deficiency. Longer hospital stays, higher rates of morbidity, and worse neurological results could result from postponing surgery. Time to theatre (TTT) is therefore a key performance indicator within trauma systems.

This audit evaluated whether MTC designation was associated with changes in TTT for operatively managed spinal fractures at a single tertiary MTC.

Methods
A retrospective audit was conducted of patients undergoing operative management for spinal fractures across two predefined periods: pre-MTC (2015-2018) and post-MTC (2022-2025) designation. An initial database was filtered to include only confirmed spinal fractures within the study periods. Patients were included if they underwent operative management.

Admission time and neurological status on admission were obtained from Welsh Clinical Portal documentation, and theatre start time from TheatreMan records. TTT was defined as the interval in hours from hospital admission to theatre start time. Patients without a valid admission time were excluded (n = 10).

Due to positively skewed distributions, continuous variables were summarised using mean ± standard deviation and median (IQR). TTT was compared between eras using independent samples t-tests. Disparities in neurological presentation were evaluated using chi-squared testing. Differences between combined MTC and neurological subgroups were assessed using one-way ANOVA. Threshold for statistical significance was $p < 0.05$.

Results
A total of 184 patients met inclusion criteria (75 pre-MTC; 109 post-MTC), demonstrating increased operative case volume following MTC designation. The proportion of patients presenting with neurological deficit did not differ significantly between eras χ^2 (1) = 0.01, p = 0.917), suggesting a comparable case mix.

Mean TTT decreased from 47.8 ± 51.0 hours pre-MTC to 37.2 ± 49.5 hours post-MTC. Although there was a reduction of 10.6 hours, this difference did not reach statistical significance (t (182) =1.41, p=0.161; 95% CI -4.3 to 25.4; Cohen's d=0.21), indicating a small effect size. Median TTT also decreased (22.5 hours [IQR 49] vs 16.0 hours [IQR 36]), indicating skewed distributions with prolonged outliers in both eras.

One-way ANOVA comparing combined MTC and neurological groups showed no significant overall difference in TTT (F (3,180) =1.73, p=0.163; η^2=0.028), indicating that only 2.8% of variance in TTT was explained by group allocation. Exploratory pairwise analysis found shorter TTT in post-MTC patients with neurological deficit compared with pre-MTC patients without deficit (mean difference 22.9 hours, p=0.026).

Conclusion

Following MTC designation, operative case volume increased while time to theatre was maintained, with a non-significant trend toward reduction. A stable case mix between eras suggests that service reconfiguration allowed increased workload without prolonging operative delay. Although overall differences were not statistically significant, exploratory findings suggest potential prioritisation of neurologically compromised patients within the MTC framework. Further evaluation using larger, multicentre datasets is required to determine whether trauma system configuration meaningfully affects operative timeliness and clinical outcomes.

Impact of Major Trauma Centre Implementation on Time to Theatre for Spinal Fractures

By Gianni Gonzalez

Poster 264

Objectives

- To compare time to theatre (TTT) for patients undergoing surgery for spinal fractures before and after Major Trauma Centre (MTC) implementation.
- To determine whether TTT differed between patients with and without neurological deficit.
- To examine whether the proportion of neurological deficits changed between eras.

Introduction

In trauma care, spinal fractures are a major cause of morbidity, particularly when they are linked to neurological deficits (1). These injuries can result in long-term disability, impaired functional independence, and reduced quality of life. Early surgical intervention in spinal injury has been associated with improved neurological and functional outcomes, especially when decompression is performed within 24 hours (2).

MTCs were established across the UK to try centralise expertise, streamline referral pathways, and improve timely access to specialist surgical services (3). The MTC approach tries to improve coordination between different disciplines such as emergency, radiological, anaesthetic, and surgical teams by focusing trauma treatments inside specific centres. Effective communication and theatre prioritisation are crucial for spinal trauma to reduce preventable delays.

University Hospital of Wales (UHW) became a MTC in 2020. Evaluating service performance before and after MTC implementation provides insight into whether the structural reorganisation translates into measurable improvements in time to theatre (TTT) for patients requiring operative management of spinal fractures.

Methods

A retrospective audit was conducted at a single tertiary MTC (UHW).

An initial list was generated with patients undergoing spinal surgery between 2013-2025. Records were filtered to include only those within the predefined study period: 2015-2018 (Pre-MTC) and 2023-2025 (Post-MTC). Patients were included if they had a confirmed diagnosis of spinal fracture and underwent operative management for that injury.

Admission time and neurological status on admission was obtained from Welsh Clinical Portal (WCP), and theatre start time from TheatreMan records. Patients without a valid admission time (n = 10) were excluded due to inability to calculate TTT accurately.

Primary outcome was TTT, defined as hours from admission to theatre start. Comparisons were made between pre- vs post-MTC groups and between neurological vs non-neurological cases.

Continuous variables were summarised using mean ± SD and median (IQR), as TTT demonstrated positively skewed distributions. Group comparisons were performed using independent samples t-tests. One-way ANOVA was used to assess differences across combined MTC and neurological subgroups. Associations between categorical variables were assessed using chi-squared testing. Effects sizes (Cohen's d and η^2) were reported to quantify magnitude of differences. Statistical significance was defined as $p < 0.05$.

Results

Study Population

A total of 184 patients met inclusion criteria (75 pre-MTC; 109 post-MTC), showing increased operative case volume after MTC designation. Neurological deficit was present in 64 cases (34.8%). Case mix did not differ between eras ($(\chi^2(1) = 0.01$, $p = 0.917)$, suggesting comparable injury severity and case mix across time periods.

Primary Outcome: Time to Theatre (TTT)

Mean TTT decreased from 47.8 ± 51.0hr pre-MTC to 37.2 ± 49.5hr post-MTC (Figure 1). Although a reduction of 10.6 hours , it did not reach statistical significance ($t(182) = 1.41$, $p = 0.161$). The 95% confidence interval for the mean difference ranged from −4.3 to 25.4 hours, crossing zero. Cohen's d was 0.21, which indicates small effect size.

Median TTT was 22.5 hours (IQR 49) pre-MTC and 16.0 hours (IQR 36) post-MTC, reflecting positively skewed distributions with prolonged outliers in both eras. Although central tendency shifted downward, substantial variability remained.

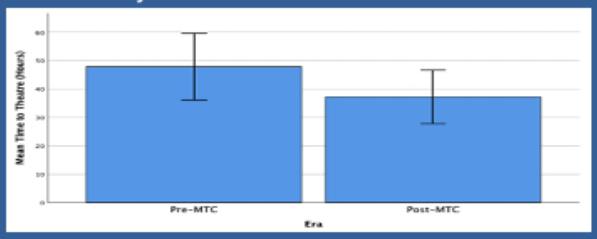

Figure 1: Mean time to theatre (TTT) before and after Major Trauma Centre (MTC) designation. Error bars represent 95% confidence intervals. Although mean TTT was lower post-MTC (37.21 vs 47.80 hours), this difference was not statistically significant ($t(182) = 1.41$, $p = 0.161$).

Neurological Status and Combined Group Analysis

Mean TTT was 45.4 hours in patients without neurological deficit and 34.1 hours in those with deficit ($p = 0.143$), suggesting a non-significant trend toward prioritisation of neurologically compromised patients.

One-way ANOVA comparing combined MTC and neurological groups demonstrated no significant overall difference in TTT ($F(3,180) = 1.73$, $p = 0.163$; $\eta^2 = 0.028$), indicating that only 2.8% of variance in TTT was explained by group allocation (Figure 2).

Exploratory pairwise comparison identified shorter TTT in post-MTC patients with neurological deficit compared with pre-MTC patients without deficit (mean difference 22.9 hours, $p = 0.026$; Cohen's d = 0.49), representing a moderate effect size.

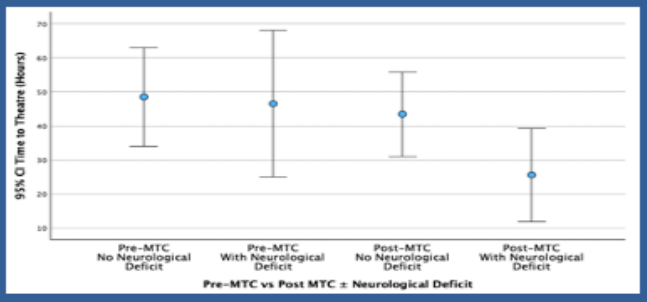

Figure 2: Distribution of time to theatre (TTT) stratified by Major Trauma Centre (MTC) status and neurological deficit. Bars represent mean TTT. A trend towards shorter TTT in post-MTC neurological cases is observed; overall group differences were not statistically significant (ANOVA $p = 0.163$).

Conclusion

Following MTC designation, the operative case volume increased while overall TTT was maintained, with a non-significant trend toward reduction. This suggests that service reconfiguration was accommodated without a negative effects on operative timeliness. The case mix remained stable between eras, suggesting that observed differences were unlikely to reflect changes in injury severity.

Although the overall reductions in TTT did not reach statistical significance, subgroup findings indicate possible prioritisation of neurologically compromised patients within the MTC framework.

Variability in TTT remains substantial across both eras, highlighting ongoing opportunity for service optimisation. Importantly, the patient list included emergency, urgent, scheduled and elective procedures. Including non-emergency cases may have contributed to skewed distributions and diluted measurable differences in the prioritisation of acute patients. Future studies assessing solely emergency and urgent spinal trauma cases may better isolate the impact of MTC designation. Larger, multicentre analyses are required to determine whether trauma system configuration produces clinically meaningful improvements in operative timing and patient outcomes.

Acknowledgements

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References

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