

Impact of a trauma bypass protocol on a receiving Emergency Department: a 4-year review

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Abstract

Aims

In May 2019, Dublin Midland Hospital Group and National Ambulance Service introduced an “Orthopaedic/trauma bypass protocol” to ensure that patients with isolated long bone fractures are transported to a hospital with specialised orthopaedic surgical services on site. This study aimed to evaluate the impact of this protocol on the activity and resource utilisation at Tallaght University Hospital (TUH) Emergency Department (ED).

Methods

A retrospective review of all patients conveyed by ambulance to TUH ED under the trauma bypass protocol between January 2020 and February 2025 was conducted. Demographic, injury, and outcome data were extracted from hospital systems. Primary outcomes included ED and hospital length of stay (LOS), discharge destination and mortality.

Results

Of 57,264 ambulance attendances, 1,636 (2.9%) were trauma bypass cases. The mean age was 60.1 years; 979 patients (59.8%) sustained injuries due to low-level falls. ED LOS averaged 10.2 hours; 1,037 (63.4%) of patients were admitted, with a mean hospital LOS of 15.3 days. A total of 37 patients (2.3%) died during admission, and 110 patients (10.3%) required convalescence or long-term care.

Conclusion

While the bypass protocol improved access to specialist care, it placed considerable demands on TUH. Refinement of triage criteria and improved repatriation pathways are needed to support sustainable trauma system implementation.

Introduction

Major trauma is defined as an incident resulting in life-threatening or life-changing injuries that has the potential to cause prolonged disability or death, such injuries can be caused by blunt or penetrating mechanisms such as falls and motor vehicle collisions, stab wounds and gunshot wounds.¹ Major trauma is a leading cause of morbidity and mortality in Ireland and worldwide.^{2,3}

Trauma services in Ireland have developed in an ad hoc manner.⁴ In 2014 and 2015, 30% of major trauma patients had to be transferred to another hospital for urgent or ongoing care as their care needs could not be provided by the initial receiving hospital.⁴ Internationally, integration of trauma care services into a regionalized system reduces mortality.^{5,6} The Irish National Trauma Strategy recommends that an inclusive trauma system be established, where a network of facilities and services co-ordinate in the care of injured patients along standardised pathways.⁴ Tallaght University Hospital is designated as a trauma unit within the national trauma strategy.⁴

On the 7th May 2019, the Dublin Midlands Hospital Group and the National Ambulance Service implemented an Orthopaedic Trauma Bypass Protocol. The purpose was to ensure that patients with isolated long bone fractures are transported to a hospital with an orthopaedic surgical service on site, thereby ensuring rapid access to specialist orthopaedic intervention if required. It was further agreed between Dublin Midlands Hospital Group and the National Ambulance Service that patients who required inpatient admission but not operative intervention in Tallaght University Hospital would be repatriated by the ambulance service to Naas General Hospital. To date Tallaght University Hospital has not received any additional funding under the National Trauma Strategy in Ireland programme.

Despite being operational since 2019, there have been no published assessments on the impact of this protocol on Tallaght University Hospital's emergency department and the resource burden on the hospital. This study seeks to characterise the demographics, injury patterns, management and outcomes of patients who presented to the TUH ED through the Orthopaedic Trauma bypass Protocol.

Methods

This single-centre study utilised a retrospective chart review. No ethical concern was identified by the joint research ethics committee of Tallaght University Hospital and St James's Hospital (Project ID: 4855). The project was classified and approved as a service evaluation by Tallaght

University Hospital's Quality Safety Risk Management Department. No external funding was requested for its conduct.

The primary outcome was to quantify the number of out of catchment ambulance trauma presentations to an Irish University Emergency Department following the implementation of a regional Trauma Bypass Protocol. The secondary outcomes included ED length of stay, disposition and hospital length of stay (LOS).

The criteria set by the National Ambulance Service trauma access protocol for transport to major trauma receiving hospital was patients with long bone fractures, defined for the purposes of the protocol as:

- Upper limb: from shoulder to wrist inclusive
- Lower limb: from hip to ankle inclusive (including suspected fracture neck of femur).

Patients with any of the following criteria secondary to injury must be transported directly from the scene of injury to an appropriate trauma receiving hospital.	
Respiratory rate	<10 or >29 breaths per minute
Systolic blood pressure	<90mmHg
Glasgow coma score	13 or less
Penetrating injury	All penetrating injuries to head, neck, torso, and extremities proximal to elbow and knee (gunshot wounds, stab wounds or impalement on a sharp object)
Flail chest	
Pelvic fractures	
Two or more proximal long-bone fractures	
Crush, degloved or mangled extremity	
Amputation proximal to wrist and ankle	
Open or depressed skull fracture	
Paralysis	
Paramedic discretion	In addition to the above criteria, if the treating paramedic has a high index of clinical suspicion of significant occult injury, the patient may be transported to a trauma receiving hospital, even if they do not precisely fit the above criteria.

Table 1. National ambulance service criteria for transport to major trauma receiving hospital

The study setting is Tallaght University Hospital ED, an adult ED which sees patients aged 16 years and older and has 62,000 attendances annually. Tallaght University Hospital is a level 4 model hospital with a mixed suburban and rural catchment area. The traditional Tallaght University Hospital catchment area extends across southwest Dublin (predominantly in the postcodes of Dublin 12, Dublin 22, Dublin 16 and Dublin 24) and North Wicklow (Blessington area). The capacity of Tallaght University Hospital is 465 inpatient beds plus 94 beds off site.

Data for this study was sourced from the TUH ED Information System (Symphony, EMIS Health). Eligible patient records that met the criteria to be included in this study were all patients aged 16 years or older who presented to the Tallaght University Hospital emergency department by ambulance from out of catchment locations via the agreed Trauma Bypass Protocol between the 1st January 2020 and the 28th February 2025. Ambulance patients were excluded from the study if they attended TUH emergency department from within the hospital's catchment area and/or by modes of arrival other than by ambulance.

The following patient-specific data was collated: age, gender, mechanism of injury discharge outcome, discharge destination and ED length of stay. For patients admitted, additional information including hospital length of stay and specific discharge locations was abstracted from the hospital's inpatient electronic record system Synergy.

Three data abstractors abstracted the data from the hospital's information's systems. Any queries regarding incomplete or missing data were dealt with by consultation with a consultant in emergency medicine. Data pertaining to prehospital queries were relayed to colleagues in the National Ambulance Service.

Descriptive statistics, including mean and standard deviation (SD), was conducted using IBM SPSS (version 29.0.2).

Results

A total of 292,676 attendances presented to TUH ED during the study period of 1st January 2020 and the 28th February 2025. Of these, 19.7% (n=57,264) presented to TUH ED by ambulance.

Study population

1,636, 2.9% of all ambulance attendances, were brought in under the trauma bypass protocol. The mean age of patients was 60.1 years (SD 22.6 years), ranging from 16 to 102 years. Of these, 780 patients (47.7%) were male and 856 (52.3%) were female.

The majority of patients were conveyed by ambulance from locations in County Kildare (n=1467, 89.7%), followed by County Wicklow (n=130, 7.9%) and County Carlow (n=28, 1.7%) (Table 1).

Mechanism of injury

The most frequent mechanism of injuries was fall from below 2m (n=979, 59.8%) followed by road traffic accident (n=295, 18%) and fall from above 2m (n=153, 9.4%), as summarised in Table 2. Patients who presented with trauma secondary to a fall from less than 2m were predominantly female (n=622, 72.7% of included female cohort) and the mean age was 68.6 years. Patients who presented with trauma secondary to a road traffic accident were predominantly male and the mean age was 43.7 years (Table 2).

Mechanism of Injury	Female		Male		Total		Mean age (standard deviation)
	N	%	N	%	N	%	
Fall from more than 2m	59	6.9%	94	12.1%	153	9.4%	50.6 (
Fall from less than 2m	622	72.7%	357	45.8%	979	59.8%	68.9 (19.6)
Bicycle accident	2	0.2%	24	3.1%	26	1.6%	43.9 (16.8)
Road traffic accident	112	13.1%	183	23.5%	295	18.0%	43.7 (19.25)
Crush	5	0.6%	36	4.6%	41	2.5%	40.3 (14.8)
Other	39	4.6%	43	5.5%	82	5.0%	61.7 (23.1)
Shooting	0	0.0%	1	0.1%	1	0.1%	42
Stabbing	1	0.1%	4	0.5%	5	0.3%	24 (5.9)
Blow with weapon	1	0.1%	8	1.0%	9	0.6%	41.6 (11.3)
Blow without weapon	15	1.8%	30	3.8%	45	2.8%	40.1 (20.41)
Total	856	100.0%	780	100.0%	1636	100.0%	

Table 2. Mechanism of Injury

Outcomes

The mean ED patient experience time for the study cohort was 10.2 hours (standard deviation 8.2 hours).

Four hundred and fifty-four patients (27.8%) were discharged from Tallaght University Hospital Emergency Department. Of these 191 (11.7%) were discharged home and 167 were discharged to fracture clinic, trauma assessment clinic and orthopaedic clinics. Fifty-four patients (3.3%) were discharged to from Tallaght University Hospital Emergency Department to other hospitals for admission or outpatient follow-up.

1,037 (63.4%) of the patients conveyed to Tallaght University Hospital Emergency Department were admitted to TUH (Table 1). The mean length of stay for admitted patients in Tallaght University Hospital was 15.3 days (standard deviation 24.9 days). The most common discharge destination for admitted patients to Tallaght University Hospital was home at (n=669), while one hundred and ten patients went to convalescence, fifty-two patients went into long-term care and thirty-seven patient died (Table 3).

Discussion

This study represents the first comprehensive evaluation of the Orthopaedic Trauma Bypass Protocol implemented by the Dublin Midlands Hospital Group and the National Ambulance Service, specifically examining its impact on Tallaght University Hospital (TUH) Emergency Department (ED). Our findings highlight the significant volume and clinical complexity of patients redirected under this protocol and offer insight into the resource implications for a designated trauma unit operating within an evolving regionalised trauma system in Ireland. Over the five-year study period, 1,636 patients were brought to TUH ED under the bypass protocol, representing 2.9% of all ambulance attendances. While this proportion may appear modest, the resource impact is significant. The mean ED length of stay (LOS) was 10.2 hours, considerably exceeding the 6-hour target established under Ireland's national emergency department performance indicators.⁴ Furthermore, 63.4% of patients required inpatient admission, with a mean hospital LOS of 15.3 days. In comparison, the national average hospital length of stay is six days highlighting the clinical complexity and resource intensity of the trauma cohort.⁷

The protocol appears to have fulfilled its intended purpose—ensuring that patients with suspected orthopaedic trauma are transported directly to a hospital equipped with orthopaedic surgical capabilities.⁴ Centralisation of trauma care is internationally recognised as a means of improving patient outcomes, with studies demonstrating reductions in mortality

and morbidity when care is delivered through coordinated, regionalised systems.⁸⁻¹¹ However, our findings also point to unintended consequences, including substantial pressure on TUH's ED and inpatient services.

A particularly striking observation is the demographic skew toward older patients with low-energy trauma. Falls from less than 2 metres accounted for nearly 60% of all cases, with a disproportionate representation of older females (mean age 68.9 years). This is consistent with Irish national trauma audit data and international trends, particularly focusing on the shift from traditional profiles of high velocity injuries predominantly observed in younger populations to the emergence of trauma cases among older demographics.¹² NOCA states that low fall remains the highest cause of trauma injury, responsible for 62% of cases.² This aligns with known patterns of fragility fractures, which are increasingly prevalent in ageing populations¹³⁻¹⁴, and underscores the growing burden of geriatric trauma in Ireland and beyond.^{2,12,15} Management of such patients often requires not only orthopaedic expertise but also multidisciplinary input. Expansion of ambulatory frailty pathways, hospital-at-home models, and geriatric-led decision making may reduce admissions and enhance community-based care.¹⁶⁻¹⁷

The fact that 27.8% of patients were managed without admission—either discharged home or referred to outpatient trauma clinics—raises questions about prehospital triage efficiency. Although prioritising access to specialist assessment is justified, especially where operative intervention may be needed, the high non-admission rate may indicate opportunities to refine triage protocols. Over-triage can lead to unnecessary strain on tertiary services and longer ambulance turnaround times, contributing to delays across the wider system.¹⁸

Our data also reflect the significant post-acute care needs of this cohort. Of those admitted, 10.3% were discharged to convalescence or long-term care, and 2.3% (n=37) died during their hospital stay. These outcomes emphasise the frailty and vulnerability of many patients conveyed under the protocol, and the importance of ensuring integrated pathways for rehabilitation and continuing care within an inclusive trauma system.^{4,19}

Despite the protocol's aim to include a repatriation arrangement for patients not requiring operative management at TUH, our study suggests that such pathways were either underutilised or inconsistently implemented. This gap likely contributes to prolonged hospitalisation and bed occupancy, which could be mitigated by establishing clear, timely repatriation processes to support system-wide efficiency.^{4,20}

The authors acknowledge a number of study limitations. Firstly, the study is limited by the inherent limitations of a single centre retrospective review. This may restrict the

generalizability of the findings to other geographical healthcare settings and populations, it does present the real-world implications of a trauma bypass protocol in a single Irish Emergency Department. Secondly, the study was limited by missing data. The authors mitigated this as much as possible with data queries to our colleagues in the national ambulance service to verify location addresses in particular.

Factors such as on arrival, injury severity score and ambulance response times were not captured in the study's data abstraction may have influenced outcomes. Furthermore, the study used surrogate outcome markers such as ED disposition data hospital and length of stay. Future studies could look at long-term functional outcomes and quality of life indices to give a more comprehensive picture of the impact of trauma in our population. A health economic analysis can inform plan and deliver our services around the specific needs of people in each area within our health region.

The Orthopaedic Trauma Bypass Protocol has succeeded in directing patients to specialist care settings in accordance with national trauma system goals⁴. However, the protocol has also introduced a notable and largely unquantified burden on TUH's emergency and inpatient services, particularly in relation to older patients with fragility fractures. Our findings highlight the need for ongoing system evaluation, improved prehospital triage, robust repatriation mechanisms, and investment in post-acute care pathways. These efforts are critical to realising the full benefits of a regionalised trauma system and ensuring its sustainability in the context of an ageing population and increasing trauma caseload.

Declarations of Conflicts of Interest:

None declared.

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