NCA National Office of Clinical Audit

MTA Major Trauma Audit

MAJOR TRAUMA AUDIT

NATIONAL REPORT 2017

REPORT PREPARED WITH ASSISTANCE FROM MEMBERS OF THE MTA GOVERNANCE COMMITTEE

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NATIONAL OFFICE OF CLINICAL AUDIT (NOCA)

NOCA was established in 2012 to create sustainable clinical audit programmes at national level. NOCA is funded by the Health Service Executive Quality Improvement Division and operationally supported by the Royal College of Surgeons in Ireland.

The National Clinical Effectiveness Committee (NCEC, 2015, p.2) defines national clinical audit as "a cyclical process that aims to improve patient care and outcomes by systematic, structured review and evaluation of clinical care against explicit clinical standards on a national basis". NOCA supports hospitals to learn from their audit cycles.

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NATIONAL CLINICAL EFFECTIVENESS COMMITTEE (NCEC)

NATIONAL CLINICAL EFFECTIVENESS COMMITTEE
Major Trauma Audit
NCEC National Clinical Audit No. 1

The National Clinical Effectiveness Committee (NCEC) is a Ministerial committee of key stakeholders in patient safety and clinical effectiveness. Its mission is to provide a framework for endorsement of guidelines and audit to optimise patient and service user care. The NCEC's remit is to establish and implement processes for the prioritisation and quality assurance of clinical guidelines and clinical audit and subsequently recommend them to the Minister for Health for endorsement and mandating for national implementation.

ACKNOWLEDGMENTS

This work uses data provided by patients and collected by their healthcare providers as part of their care. NOCA would like to thank the valuable contribution of all participating hospitals, in particular the Major Trauma Audit coordinators and clinical leads. Without their continued support and input, this audit could not continue to produce meaningful analysis of trauma care in Ireland.

TARN
THE TRAUMA AUDIT & RESEARCH NETWORK

NOCA has engaged the internationally recognised Trauma Audit and Research Network (TARN) to provide its methodological approach for MTA in Ireland. TARN has been in operation in the UK since the 1990s and has been at the forefront of quality and research initiatives in trauma care. It is the largest trauma registry in Europe and is clinically led, academic and independent.

TARN use a standardised dataset for trauma patients, allowing review of care at both organisational and national level, thereby assuring the quality of and ultimately improving trauma care.

HSE
Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive
Quality Improvement Division

The Quality Improvement Division (QID) was established to support the development of a culture that ensures improvement of quality of care is at the heart of all services that the HSE delivers. HSE QID works in partnership with patients, families and all who work in the health system to innovate and improve the quality and safety of its care.

ACKNOWLEDGING SIGNIFICANT CONTRIBUTIONS FROM THE FOLLOWING:

RCSI
ROYAL COLLEGE OF PHYSICIANS OF IRELAND
HSE
Joint Faculty of Intensive Care Medicine of Ireland
Pre-Hospital Emergency Care Council

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DESIGNED BY SWERVE

National Office of Clinical Audit

Major Trauma Audit

National Report

2017

NOCA National Office of Clinical Audit

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11th January 2019

Major Trauma Audit National Report 2017

Dear Dr Deasy,

Many thanks for your presentation of the 2017 Major Trauma Audit National Report to the NOCA Governance Board on January 9th.

On behalf of the Board, I commend you and your colleagues for the significantly improved data capture in 2017 in this third annual report.

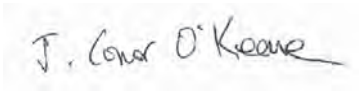
We welcome the presentation of hospital level data for the first time and the parallel commitment to working with individual hospitals, especially the quality improvement initiatives based on the Major Trauma Audit National Report at a local level in several hospitals documented in the report.

The National Office of Clinical Audit is pleased that you and your colleagues efforts to produce reliable Irish trauma data has been recognised by the Department of Health's Trauma System Report and will form a sound basis for the development of a trauma system in Ireland.

We look forward to continued quality improvement initiatives by you and your colleagues to effect improvement in trauma care, benchmarked within the wider TARN network.

Congratulations and well done.

Yours sincerely,



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FOREWORD

Dean Sullivan, Deputy Director General - Strategy and Chair of the Trauma Implementation Group

DEAN SULLIVAN

I would like to congratulate the National Office of Clinical Audit and the Major Trauma Audit Governance Committee for their excellent work in providing us with the Major Trauma Audit National Report 2017. I would also like to acknowledge the input of staff in the 26 hospitals that contributed to the Major Trauma Audit for the significant improvements in the quality and extent of the data available for this report.

The Health Service Executive recognises clinical audit as a reliable method of proactively measuring the effectiveness and performance of healthcare against agreed standards for high quality. NOCA will support hospitals to re-establish and enhance their local major trauma audit governance committees to use data from the MTA to drive improvement in the quality of care provided to service users by identifying action to bring practice in line with these standards.

There is evidence in the Major Trauma Audit National Report 2017 of significant challenges for patients from the way trauma services are currently configured. The HSE will progress the implementation of recommendations from 'A Trauma System for Ireland, Report of the Trauma Steering Group' and recommendations from 'The National Emergency Medicine Programme, A strategy to improve safety, quality, access and value in Emergency Medicine in Ireland' over the coming years. The Major Trauma Audit will support the measurement of how the trauma system responds to these changes ahead.

The Report also demonstrates the risk and impact of 'low falls' which, without intervention, are likely to increase as Ireland's population ages. In acknowledging the success of a 'whole of society' /key stakeholder approach to reducing road accidents, a similar approach to reducing the rate and impact of low falls is necessary. The HSE is improving the integration of community and acute healthcare services in response to the demographic trend. However, further engagement on reducing the number of 'low falls' across a wider stakeholder group will be coordinated through the soon to be established National Trauma Office.

It is clear from the Report that much remains to be done to ensure that Ireland has the best standard of care for patients who suffer major trauma. Improvements will include providing patient care in the most appropriate location to patients' needs, improvements in the coordination of hospital level responses to patients presenting with major trauma, and making changes to what we do in order to reduce the increasing trend in presentations of older persons with 'low falls'.

I look forward to seeing the positive impact of these changes through data from future Major Trauma Audit reports.

GLOSSARY OF TERMS AND DEFINITIONS

AIS	Abbreviated Injury Scale score. A value between 1 (minor) and 6 maximum/incompatible with life) can be assigned to each injury. TARN currently uses the AIS 2005 (update 08) dictionary, that is published by the Association for the Advancement of Automotive Medicine (2005).
Charlson Comorbidity Index (CCI)	The Charlson Comorbidity Index predicts the one-year mortality for a patient who may have a range of comorbid conditions (a total of 22), such as heart disease, AIDS or cancer. Each condition is assigned a score of 1, 2, 3, or 6, depending on the risk of dying associated with each one.
CI	Confidence Interval
CRG	Clinical Reference Group
CT	Computed tomography (CT) is a scanning technique that uses X-rays to take highly detailed images of the body.
Data Coverage	Also known as case ascertainment; refers to the number of cases eligible for inclusion in the audit with data captured.
Data Accreditation	The quality of data entered per individual case.
Direct Admissions	Direct admissions refers to patients who came directly to hospital and were then transferred to another hospital (patients who were transferred into a hospital for ongoing care are excluded).
ED	Emergency department
ePCR	Electronic patient care report
GCS	Glasgow Coma Scale (a measure of the level of consciousness)
HDU	High Dependency Unit
HIPE	Hospital In-Patient Enquiry system
HIQA	Health Information and Quality Authority
HPO	Healthcare Pricing Office
HSCP	Hospital and social care professionals
HSE	Health Service Executive
ICU	Intensive Care Unit
Individual TARN submissions/ patients	Individual TARN submissions are those where there is no transfer between hospitals and where transfers have been matched by TARN.
Interquartile Range (IQR)	A measure of the variability or dispersion – it is also called the midspread or middle 50% being equal to the difference between the 75th and 25th percentiles or between the upper and lower quartiles.
IPMS	Integrated Patient Management System

ISS	Injury Severity Score. A score ranging from 1, indicating minor injuries, to 75, indicating very severe injuries that are very likely to result in death (Gennarelli and Wodzin, 2008). An ISS between 9 and 15 is considered moderate. An ISS of 16 or more is considered severe. ISS is calculated using the Abbreviated Injury Scale (AIS).
LOS	Length of Stay
Low falls	Falls of 2 metres (2 m) or less
Major Trauma Centre (MTC)	A major trauma centre is a multispecialty hospital, on a site, optimised for the provision of trauma care. It is the focus of the trauma network and manages all types of injuries, providing consultant-level care (NHS Clinical Advisory Group, 2010).
Mean	This value is determined by adding all the data points in a population and then dividing the total by the number of points. The resulting number is known as the mean or the average.
Median	The middle value in a range. It is less easily distorted by very high or very low values than other aggregation methods, such as the mean.
MTA	Major Trauma Audit
Multidisciplinary	A group of people of different professions, including medical personnel from multiple specialties (i.e. emergency medicine, orthopaedics, cardiothoracics, nursing, physiotherapy, occupational therapy, and other allied healthcare professionals), with job plan responsibilities for the assessment and treatment of major trauma patients, and who convene (including face-to-face or virtually) collaboratively to discuss patient treatment and care and to plan shared clinical care goals.
NAS	National Ambulance Service
NCEC	National Clinical Effectiveness Committee
NICE	National Institute for Health and Care Excellence. This organisation sets standards for patient care, including for severe head injury and trauma service delivery.
NICE head injury guidelines	CT imaging of the head should be performed within one hour of arrival for patients with a head injury and a GCS of less than 13.
NHS	National Health Service in England, Scotland, Wales and Northern Ireland
NOCA	National Office of Clinical Audit
NTO	National Trauma Office
Patient episode	Data relating to a patient's journey inclusive of all submissions, i.e. if the patient was transferred to another hospital, all submissions are linked up to create a full patient episode.
PCR	Patient care report

PHECC	The Pre-Hospital Emergency Care Council (PHECC) is a statutory agency with responsibility for standards, education and training in the field of pre-hospital emergency care, and also maintains a statutory register of Emergency Medical Service practitioners.
PMC	Pre-existing medical conditions
PPI	Public and Patient Interest
Severe head injury	Severe head injuries are defined as having an AIS score of 3 or more in the head (with or without injuries to other body regions).
SHO	Senior House Officer
Submission	Data relating to one part of a patient's journey of care, for example the first hospital episode. If the patient is transferred to another hospital, a new submission is created in that and any subsequent hospitals. A patient may have more than one submission included in their patient episode.
TARN	Trauma Audit & Research Network
TBI	Traumatic Brain Injury is a marker of brain injury in trauma classified by GCS.
Trauma network	A trauma network is a coordinated integrated system within a defined geographical region for Network delivering care to injured patients from injury to recovery through prevention, pre-hospital care, transportation, emergency and acute hospital care, and rehabilitation.
Trauma unit	A trauma unit is a hospital in a trauma network that provides care for most injured patients.
UK	United Kingdom
Trauma	Trauma is a term which refers to physical injuries of sudden onset and severity which require immediate medical attention.
Ws	A measure of excess deaths or survivors (W) standardised according to hospital case mix using the TARN fraction. A hospital with the same case mix as the overall TARN population will have identical W and Ws values. A hospital whose case mix differs from the overall TARN population will have different W and Ws values.

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EXECUTIVE SUMMARY

The Major Trauma Audit (MTA) was established by the National Office of Clinical Audit (NOCA) in 2013. This audit focuses on care of the more severely injured trauma patients in our healthcare system. The methodological approach for the MTA is provided by the Trauma Audit & Research Network (TARN). In 2016, the MTA became the first national clinical audit endorsed by the National Clinical Effectiveness Committee (NCEC) and mandated by the Minister for Health. Since 2016, all 26 eligible hospitals have been participating in the audit and data have been collected on more than 15,000 trauma patients to date. The maturing nature of the audit now enables us to look at hospital-level data for the first time in this report.

In February 2018, the Department of Health published a report entitled *A Trauma System for Ireland: Report of the Trauma Steering Group*. The MTA Governance Committee for NOCA welcomed this report, which sets out the future plan for the development of an inclusive trauma system with a specific focus on the prevention of unnecessary deaths and improved access to trauma specialist services in order to enable people who sustain major trauma to attain the best possible recovery. The report highlighted the role of national clinical audit in providing reliable and robust data that can measure access to care, standards of care, processes and outcomes. The MTA will capture the changes brought about by the creation of the new inclusive trauma system and its effect on performance and outcomes, and can be used by healthcare commissioners, stakeholders and society to monitor the effects of the reconfiguration of trauma care delivery.

It has been proven that the introduction of a Major Trauma System in Australia and London has resulted in a 50% reduction in mortality in major trauma patients. In the UK overall, a 20% reduction in deaths was observed with similar dramatic reductions in severe disability. With regard to deaths due to road traffic accidents alone in Ireland, it has been estimated that we have one avoidable death per fortnight and two patients suffering avoidable severe disability per week. There is no other disease in the developed world where there are similar gains to be made in terms of saving lives. Introduction of coordinated systems in cancer, stroke and cardiac care in Ireland have been successful in achieving improvements in outcomes in these areas. Any delay in introducing a trauma system in Ireland will result in significant ongoing avoidable loss of life from major trauma.

This third MTA report presents findings on patients who sustained life-threatening and/or life-changing trauma and who were treated by Ireland's healthcare system during 2017. Of note, coverage has improved considerably, from 73% of patients having their care monitored through the MTA in 2016 to 86% in 2017. This is a testament to the importance that hospitals are placing in this quality assurance process.

Major trauma care is currently being delivered across 26 hospitals in Ireland; however, no one hospital in Ireland has all the necessary trauma services on site, and no hospital in Ireland currently receives the requisite number of severely injured patients to be considered adequate to maintain the trauma management skills of doctors, nurses and allied healthcare practitioners by international standards. For patients and their families, the current arrangements for the delivery of trauma care are such that access to specialist care is compromised and transfer to another hospital is often required. This interrupts continuity of care and lengthens time to recovery, as care is delivered sequentially rather than concurrently. The provision of a seamless, safe, optimal package of care for patients with multiple injuries is very challenging in the current configuration of trauma care delivery. This is evident in the processes of care data presented in this report.

This is the first year that the MTA has provided hospital-level data. The NOCA MTA has worked with hospitals over the last four years to ensure reliable reporting, and it is a fundamental principle of the

MTA that hospitals are able to see how they compare to each other. This drives quality improvement, as hospitals can identify their processes that work well compared to their peers, as well as what can be improved, seeking out the experience of hospitals that have achieved successes. To that end, it is essential that each participating hospital maintains a local MTA governance committee in order to continuously evaluate its data and performance, and to ensure the highest data quality standards.
This report describes the profile of patients sustaining major trauma and their mechanisms of injury. There has been a marked change in the age profile of patients sustaining major trauma since the late 1990s. Patients today are older; their medical needs are more complex and they have a longer length of hospital stay, and many do not return to independent living. Their most common mechanism of injury is a low fall at home. We need to prevent low falls in a manner similar to how we have reduced the carnage on our roads through a multi-agency, multipronged approach.

PROGRESS SINCE THE LAST REPORT

Informing trauma policy

- The Department of Health's report, *A Trauma System for Ireland: Report of the Trauma Steering Group,* acknowledged the importance of the role of MTA data for the development and measurement of the new trauma system.
- The proposed development of the National Trauma Office (NTO) offers great opportunity in bringing together diverse stakeholders involved in the delivery of trauma care so that robust, seamless pathways of clinical care can be established. NOCA will work with the NTO to support its work.
- Guidance will be sought from the NTO in defining the patients who should bypass smaller hospitals and be conveyed directly to a Major Trauma Centre (MTC) so that the MTA can ensure that this is happening safely and effectively.
- Transfer processes can be monitored through the MTA in order to assure the public of equity of access to specialist trauma services.
- Trauma team reception of severely injured patients has been shown to decrease time to critical interventions and to improve patient outcomes; little meaningful progress has been made to date to support the roll-out of trauma teams in the initial assessment of severely injured patients arriving to hospitals in Ireland. The constitution of trauma teams and their activation criteria needs to be addressed as a matter of urgency by the involved stakeholders perhaps through the NTO.
- Effective rehabilitation can be the difference between lifelong disability and returning to work; the constituents of the rehabilitation 'prescription' need to be defined by stakeholder groups and compliance measured thereafter through the MTA.

Data quality

- In 2016, NOCA committed to supporting the hospitals' improved data coverage. A target of 80% data coverage and 95% data accreditation was set. In Chapter 3, the improvement in coverage is highlighted, with many more hospitals reaching these targets than in the MTA 2016 Report.
- A process has been put in place between the Healthcare Pricing Office (HPO) and NOCA whereby cases that were identified as potentially major trauma using Hospital In-Patient Enquiry (HIPE) codes, but that were later realised on review of case notes by audit coordinators to not meet the MTA inclusion criteria, are excluded. Previous reports under-reported the proportion of data coverage, as this process was not yet in place.
- Work by NOCA is still ongoing to develop quality-of-life and functional outcome measures for patients suffering major trauma.

REPORT HIGHLIGHTS 2017

86%

86% data coverage (5061 cases)

61

Median age was 61 years

57%

57% of patients had a 'low fall' of less than 2 metres

50%

50% of patients sustained an injury in their own home

11%

11% of patients were received by a trauma team

57%

57% of patients who had surgery had surgery on a limb/s

9

Median length of stay was 9 days

95%

95% of major trauma patients survived

21%

21% of patients were transferred to another hospital for further care

60%

60% of patients were discharged directly home

MAJOR TRAUMA REPORT 2017
KEY FINDINGS

- The coverage (i.e. case ascertainment) of data collection has improved from 73% to 86%, following the removal of ineligible cases. Twenty-one hospitals achieved the data collection target of 80%. The number of individual patient submissions for 2017 is 5,061 compared to 4,426 in 2016. The number of patients sustaining major trauma in 2017, as defined by an Injury Severity Score (ISS) higher than 15, was 1,628.
- There has been a further increase in the mean and median age of major trauma patients to 58 and 61 years, respectively. The age profile of major trauma patients has important implications for healthcare planning.
- Low falls are the most common mechanism of injury for patients aged 45 years and older and for children. Among patients aged 15–44 years, the most common mechanism of injury is road trauma.
- Home is the location of injury in half of all major trauma cases.
- Major trauma patients in the younger age groups are more likely to be pre-alerted, received by a trauma team, seen by a consultant in the emergency department (ED) and transferred to another hospital for further specialist care.
- This is the first MTA report that compares hospitals across a number of measures, including data quality, access to care, processes and outcome measures, and that identifies variation across hospitals, in line with other NOCA reports.
- When compared to international standards, there are deficits in clinical care identified, including low levels of consultant-led trauma teams receiving severely injured patients, poor adherence with National Institute for Health and Care Excellence (NICE) head injury guidelines for time to computed tomography (CT) imaging and low levels of direct admission to neurosurgical care in moderate and severe traumatic brain injury cases.
- Many patients in the Irish setting continue to be brought to hospitals that do not have the services on site to manage their injuries; we provide a subgroup analysis of transfers to highlight the need for the proposed Trauma System for Ireland.
- TraumaDoc, which is a decision support and documentation tool, has been endorsed by the MTA Governance Committee to support a standardised approach to documentation and trauma data capture across hospitals in Ireland (Appendix 4).
- The Health Information and Quality Authority (HIQA) has recently published guidance on data quality required in audit, and the MTA has successfully completed a data quality statement using the HIQA standards.

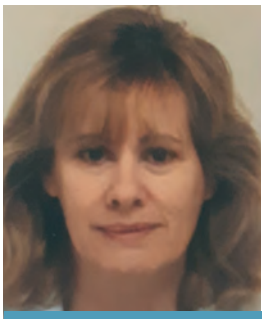
MAJOR TRAUMA REPORT 2017
KEY RECOMMENDATIONS

- Ireland does not have a coordinated trauma system. The MTA Governance Committee welcomes A Trauma System for Ireland: Report of the Trauma Steering Group, that was published in February 2018 and urges its prioritised implementation.
- A multi-agency, multidisciplinary response is required to develop a strategy to prevent the most common mechanism of injury in Ireland: low falls. Lessons learned from policy changes in road safety, offer a model that could be applied to home safety, where the majority of low falls occur.
- To address the variation across the audit, each participating hospital should support the actions recommended by its local MTA governance committee.
- NOCA will support hospitals to enhance and where required re-establish their local MTA governance committees.
- The MTA recommends stakeholder collaboration to define the composition of a trauma team and activation criteria. Similarly, defining rehabilitation assessment and prescription is important so that standards of care can be benchmarked.

PATIENT AND PUBLIC REPRESENTATIVE PERSPECTIVE

The collaboration between the National Office of Clinical Audit (NOCA) and Public and Patient Interest representatives (PPI) over the last two years has helped to provide a new depth to the work carried out by the various audits. The unique perspective brought by PPI ensures that a patient centred focus is maintained and compliments the work of the audit and NOCA. It also ensures that the data in the national reports are used to reach a wider audience beyond healthcare personnel.

As PPI for the Major Trauma Audit, we have the opportunity to contribute towards the development and direction of the audit. We work alongside the clinicians, HSCP, audit manager and clinical lead on the governance committee, with a shared goal for quality improvement in healthcare. We are empowered to be the voice of the public and patients and support an open and transparent process of data reporting and we welcome the first instance of hospital level reporting from MTA shown in this report.



ORLAITH FERGUSON

Our role developing the summary report, alongside this national report, is vital for spreading the findings of this report to a public audience. A public awareness of the high incidence of falls at home leading to instances of major trauma can only be addressed through public engagement and ensuring the right stakeholders receive the information from this report.

COLM WHOOLEY

We look forward to seeing the positive impact of these changes through data from future Major Trauma Audit reports.

Orlaith Ferguson
MTA Public and Patient Interest (PPI) Representative

Colm Whooley
MTA Public and Patient Interest (PPI) Representative

CHAPTER 1
INTRODUCTION

CHAPTER 1

INTRODUCTION

Traumatic injuries are the leading cause of death and disability in the world. Severely injured patients need timely access to the right hospital for the right treatment in the right time. Currently, for many major trauma patients, the geographical location of their accident dictates which hospital they will be brought to, rather than the severity or complexity of their injuries. The variance in access to services, including emergency services, specialty services, critical care capacity and rehabilitation, continues to challenge the Irish healthcare system. Often, these patients require input and care from multiple specialties; Ireland does not currently have a coordinated, integrated, inclusive trauma system with predetermined, seamless patient pathways in place. No hospital in Ireland reaches MTC designation criteria. The Major Trauma Audit National Report 2016 showed that one in three Major Trauma Audit (MTA) patients is transferred to another hospital to complete the treatment they require (National Office of Clinical Audit, 2018).

Timeliness of care and intervention can play a role in determining patients' outcomes and level of disability if they survive. In order to ensure that patients get the best opportunity for recovery and survival, many jurisdictions have developed an integrated inclusive trauma system. In the United Kingdom (UK), this has led to a 19% reduction in the mortality rate, along with significant improvements in survivors' quality of life (Moran *et al*., 2018).

In 2018, the Department of Health published a report entitled *A Trauma System for Ireland: Report of the Trauma Steering Group*, which sets out a plan for the delivery of trauma care for all patients. It describes a trauma system that is integrated and provides seamless pathways of care for trauma patients regardless of location of injury or severity of injury. The report describes 45 key recommendations that will be implemented following the establishment of the Health Service Executive (HSE) National Trauma Office. The MTA is perfectly positioned to help support the measurement of how the trauma system responds to the changes ahead.

This report is the third national report from the MTA, and it is the first MTA report that will include hospital-level reporting. The report will include details on the methodology, as well as a data quality statement using the Health Information and Quality Authority's (HIQA's) dimensions of data quality. The case mix is described, along with details of the mechanism and location of major trauma. The patient journey is described, including pre-hospital care and throughout the patient pathway within the acute hospital setting. Following the publication of *A Trauma System for Ireland: Report of the Trauma Steering Group* (Department of Health, 2018), a specific focus in this MTA report is a chapter detailing patients who required transfer to another hospital because the hospital they were initially brought to did not have the requisite specialist services to deal with the patients' injuries. Chapter 6 will look at a subgroup analysis of those patients that required transfer, including their age, gender, Injury Severity Score (ISS), mechanism of injury, location of injury, body region injured and outcomes. A number of key measures will be compared at hospital level. The outcomes of patients will also be discussed, with particular focus on mortality and the probability of survival.

One of the key factors underpinning the success of an inclusive integrated trauma system is high-quality data to facilitate local, regional and national quality assurance and improvement initiatives.

The MTA in Ireland was established by NOCA in 2013. NOCA has engaged the internationally recognised Trauma Audit & Research Network's (TARN's) methodological approach for MTA in Ireland. Eligible trauma-receiving hospitals were identified by NOCA with the HSE National Emergency Medicine Programme. There are now 26 trauma-receiving hospitals participating in the MTA.

ABOUT THE TRAUMA AUDIT AND RESEARCH NETWORK (TARN)

TARN has been in operation in the UK since the 1980s and has been at the forefront of quality and research initiatives in trauma care. It is the largest trauma registry in Europe and is clinically led, academic and independent. TARN has been integral to the reconfiguration of trauma care delivery in the UK and monitors the effects of the changes implemented. TARN receives and analyses anonymised MTA submissions from participating Irish hospitals and reports back to these hospitals. This feedback from TARN and NOCA supports hospitals' and clinicians' learning and the continuous improvement of care delivered to patients with major trauma.

AIM AND OBJECTIVES

OUR AIM

The MTA will drive system-wide quality improvement to achieve the best outcomes for trauma patients in Ireland.

OBJECTIVE 1

To support the collection of high-quality data in line with HIQA standards on all major trauma patients in Ireland for local, national and international reporting and comparison.

OBJECTIVE 2

To promote the use of the data for reflective clinical practice, peer review and quality improvement in order to improve quality of care and reduce death and disability from trauma.

OBJECTIVE 3

To provide high-quality data in order to enable research.

OBJECTIVE 4

To work towards collecting quality-of-life and functional outcome measures which provide greater sensitivity to patient-centred outcomes.

WHO IS THIS REPORT AIMED AT?

The work reported here is intended for use by a wide range of individuals and organisations, including:

- **Patients and their families**
- **Patient organisations**
- **Healthcare professionals**
- **Hospital managers**
- **Hospital Groups**
- **Policy-makers.**

The report has been designed in two parts:

1 The *Major Trauma Audit National Report 2017,* which presents key findings on case mix, patient journey, care pathways and outcomes. This report follows the patient's pathway from the scene of the trauma and pre-hospital care to the emergency department (ED), radiology, critical care, surgery, specialty services, rehabilitation and discharge.

2 The *Major Trauma Audit Summary Report 2017,* which highlights the main findings of the analysis of the MTA data and will be of particular interest to patients, patient organisations and the public.

HOSPITALS AND PEOPLE WE WORK WITH

NOTE: Dublin Hospitals have been displayed collectively by hospital group

SAOLTA UNIVERSITY HEALTH CARE GROUP
Letterkenny University Hospital
Mayo University Hospital
Sligo University Hospital
University Hospital Galway and
Merlin Park University Hospital

RCSI HOSPITALS
Beaumont Hospital
Cavan General Hospital
Connolly Hospital
Our Lady of Lourdes Hospital, Drogheda

DUBLIN MIDLANDS HOSPITAL GROUP
Midland Regional Hospital, Tullamore
Midland Regional Hospital, Portlaoise
Naas General Hospital
St James's Hospital
Tallaght University Hospital

IRELAND EAST HOSPITAL GROUP
Mater Misericordiae University Hospital
Regional Hospital Mullingar
St Luke's General Hospital, Kilkenny
St Vincent's University Hospital
Wexford General Hospital

THE CHILDREN'S HOSPITAL GROUP
Our Lady's Children's Hospital Crumlin
Temple Street Childrens University Hospital

UL HOSPITAL GROUP
University Hospital Limerick

SOUTH/SOUTH WEST HOSPITAL GROUP
Cork University Hospital
Mercy University Hospital
South Tipperary General Hospital
University Hospital Kerry
University Hospital Waterford

LETTERKENNY UNIVERSITY HOSPITAL
CLINICAL LEAD: Dr Sinead O'Gorman
AUDIT COORDINATOR: Patrick McGonagle
AUDIT COORDINATOR: Sarah Meagher

MAYO UNIVERSITY HOSPITAL
CLINICAL LEAD: Dr Ciara Canavan
CLINICAL LEAD: Dr Ann Shortt
AUDIT COORDINATOR: Paul Crisham

SLIGO UNIVERSITY HOSPITAL
CLINICAL LEAD: Dr Kieran Cunningham
AUDIT COORDINATOR: Rosemary Maguire
AUDIT COORDINATOR: Erin Lyons

UNIVERSITY HOSPITAL GALWAY
CLINICAL LEAD: Mr Alan Hussey
AUDIT COORDINATOR: Paul Crisham

UNIVERSITY HOSPITAL LIMERICK
CLINICAL LEAD: Dr Cormac Meighan
AUDIT COORDINATOR: Eoin Barry
AUDIT COORDINATOR: Michael Fitzpatrick

CORK UNIVERSITY HOSPITAL
CLINICAL LEAD: Mr James Clover
AUDIT COORDINATOR: Karina Caine
AUDIT COORDINATOR: Ann Deasy

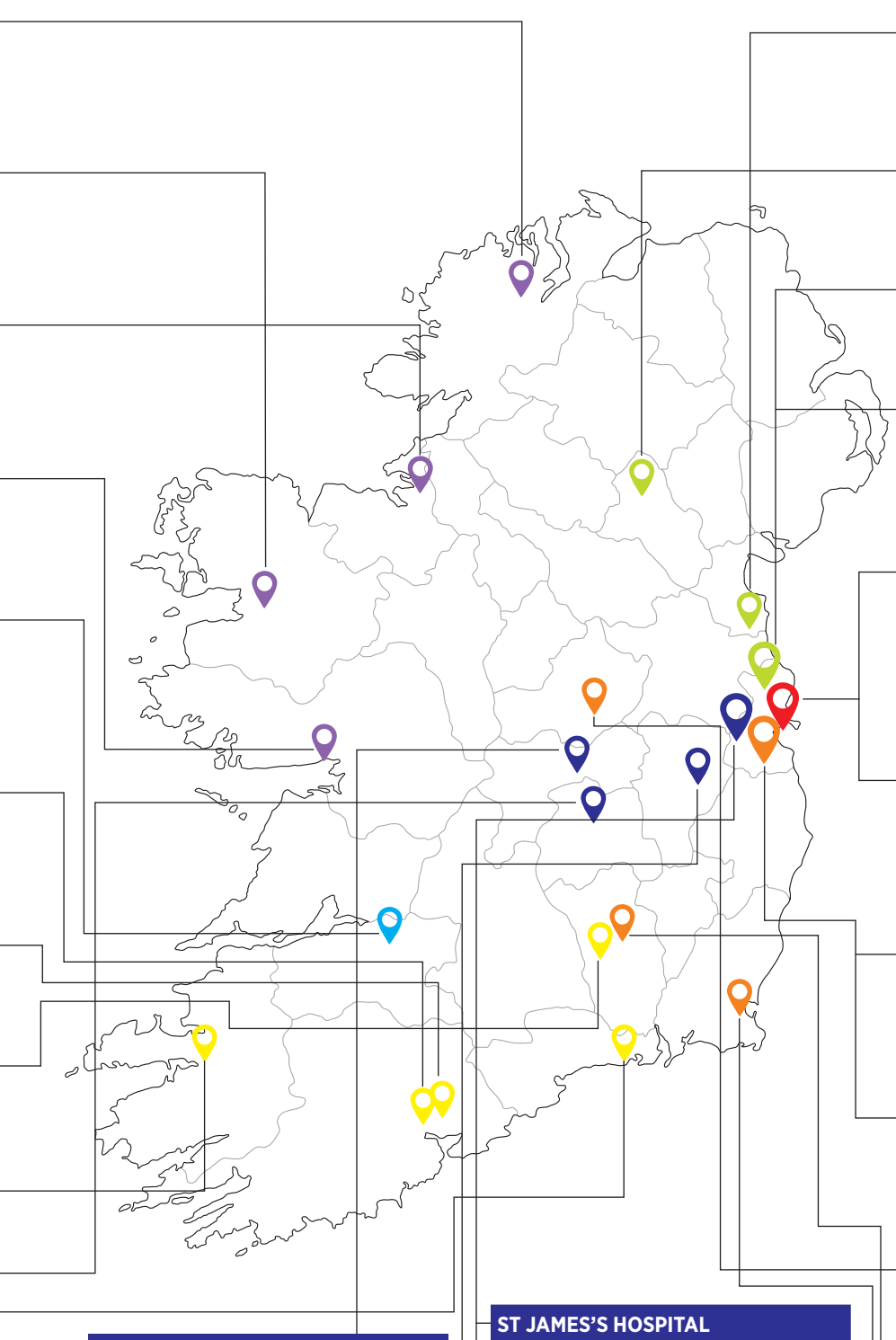
MERCY UNIVERSITY HOSPITAL
CLINICAL LEAD: Dr Chris Luke
AUDIT COORDINATOR: Ann Deasy

SOUTH TIPPERARY GENERAL HOSPITAL
CLINICAL LEAD: Dr Cyrus Mobed
AUDIT COORDINATOR: Susan Ryan

UNIVERSITY HOSPITAL KERRY
CLINICAL LEAD: Dr Niamh Feely
AUDIT COORDINATOR: Esther O'Mahony

UNIVERSITY HOSPITAL WATERFORD
CLINICAL LEAD: Mr Morgan McMonagle
AUDIT COORDINATOR: Margaret Mulcahy

MIDLANDS REGIONAL HOSPITAL, PORTLAOISE
CLINICAL LEAD: Dr Suvarna Maharaj
AUDIT COORDINATOR: Louise Cooke



OUR LADY OF LOURDES HOSPITAL, DROGHEDA

CLINICAL LEAD: Dr Niall O'Connor
AUDIT COORDINATOR: Deborah McDaniel

CAVAN GENERAL HOSPITAL

CLINICAL LEAD: Dr Ashraf Butt
AUDIT COORDINATOR: Eilish Sweeney

CONNOLLY HOSPITAL

CLINICAL LEAD: Dr Emily O'Connor
AUDIT COORDINATOR: Therese Yore

BEAUMONT HOSPITAL

CLINICAL LEAD: Dr Patricia Houlihan
AUDIT COORDINATOR: Anna Duffy
AUDIT COORDINATOR: Anthony O'Loughlin

OUR LADY'S CHILDREN'S HOSPITAL, CRUMLIN

CLINICAL LEAD: Dr Carol Blackburn
CLINICAL LEAD: Mr Brian Sweeney
AUDIT COORDINATOR: Suzanne Byrne
AUDIT COORDINATOR: Louise Purcell

TEMPLE STREET CHILDREN'S UNIVERSITY HOSPITAL

CLINICAL LEAD: Prof Alf Nicholson
AUDIT COORDINATOR: Jennifer Doyle

MATER MISERICORDIAE UNIVERSITY HOSPITAL

CLINICAL LEAD: Dr Tomas Breslin
CLINICAL LEAD: Mr Seamus Morris
AUDIT COORDINATOR: Marion Lynders

ST VINCENT'S UNIVERSITY HOSPITAL

CLINICAL LEAD: Dr John Cronin
AUDIT COORDINATOR: Brenda Cormican
AUDIT COORDINATOR: Sorcha Burns

REGIONAL HOSPITAL MULLINGAR

CLINICAL LEAD: Dr Sam Kuan
AUDIT COORDINATOR: Helen Evans

ST LUKE'S GENERAL HOSPITAL

CLINICAL LEAD: Dr David Maritz
AUDIT COORDINATOR: Frances Walsh

WEXFORD GENERAL HOSPITAL

CLINICAL LEAD: Dr Paul Kelly
CLINICAL LEAD: Dr Mick Molloy
AUDIT COORDINATOR: Roisin O'Neill

ST JAMES'S HOSPITAL

CLINICAL LEAD: Mr Niall Hogan
CLINICAL LEAD: Dr Geraldine McMahon
AUDIT COORDINATOR: Alison Reynolds
AUDIT COORDINATOR: Ricardo Paco

TALLAGHT UNIVERSITY HOSPITAL

CLINICAL LEAD: Dr Ciara Martin
CLINICAL LEAD: Dr Jean O'Sullivan
AUDIT COORDINATOR: Noel Redmond

MIDLANDS REGIONAL HOSPITAL, TULLAMORE

CLINICAL LEAD: Dr Anna Moore
AUDIT COORDINATOR: Neil Perry
AUDIT COORDINATOR: Anita Sawyer

NAAS GENERAL HOSPITAL

CLINICAL LEAD: Dr George Little
AUDIT COORDINATOR: Breda Murphy

CHAPTER 2
MTA METHODOLOGY

MTA METHODOLOGY

DATA COLLECTION PROCESS (INCLUSION CRITERIA)[i]

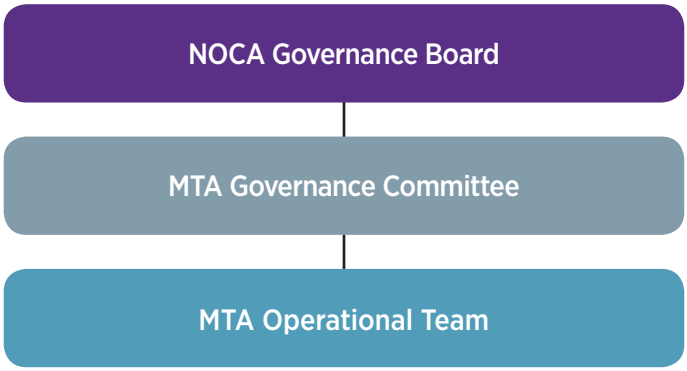
All trauma patients, irrespective of age

who fulfil one of the following length-of-stay (LOS) criteria

- In hospital for >3 days
- Admitted to a critical care area (regardless of LOS)
- Transferred out for specialist care or repatriation (total LOS > 3days)
- Transferred in for specialist care or repatriation (total LOS >3 days)
- Deaths including deaths in the ED, even if cause of death is medical

and whose isolated injuries meet one of the criteria identified in Appendix 1

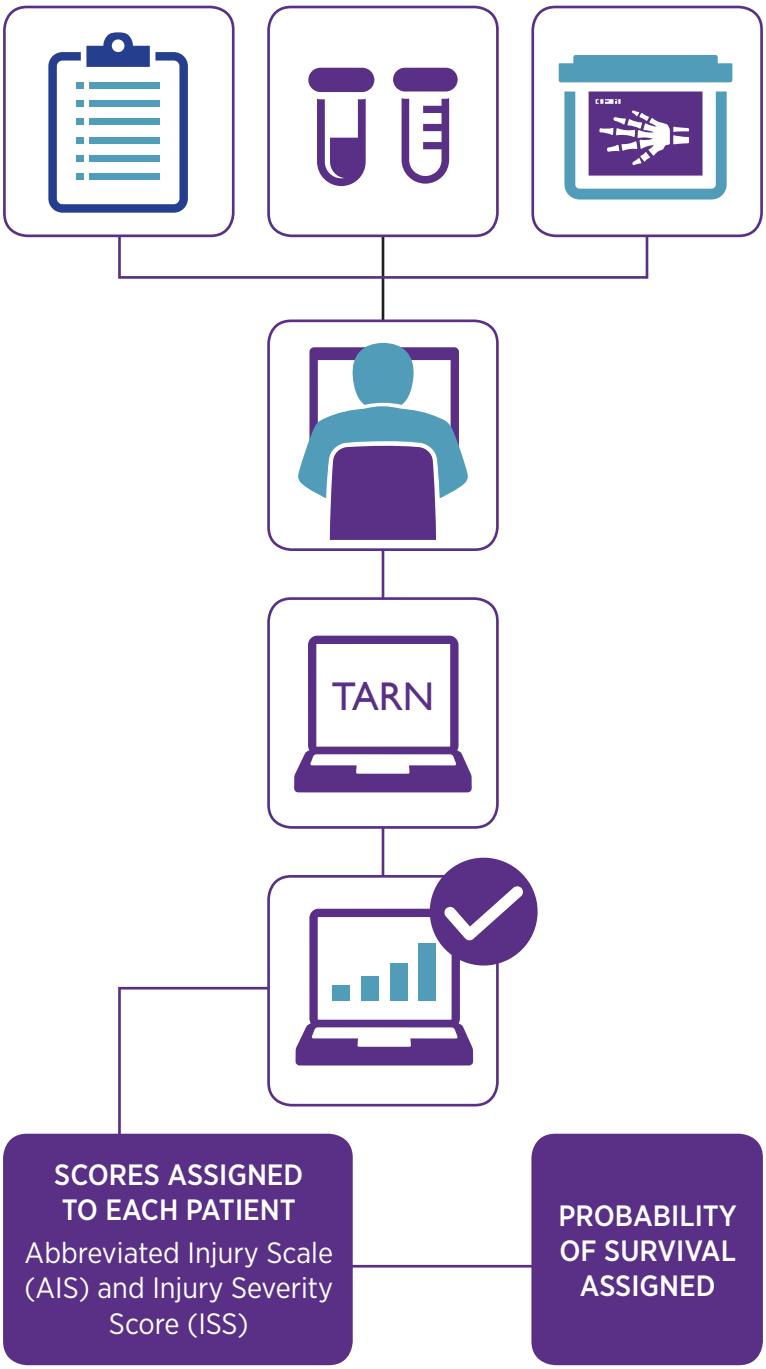
GOVERNANCE STRUCTURE



[i] This report details all major trauma patients who fulfill the inclusion criteria, including those with all classifications of Injury Severity Score (ISS).

DATA COLLECTION PROCESS

Data are collected from various sources such as the pre-hospital patient care report (PCR); hospital clinical records, including laboratory and radiology; the Hospital In-Patient Enquiry (HIPE) scheme; the Integrated Patient Management System (IPMS); coroners' reports; and other data systems. Audit coordinators submit these anonymised data to TARN.



CHAPTER 3
DATA QUALITY

CHAPTER 3

DATA QUALITY

DATA FOR THIS MTA REPORT

This report includes patients who:
1. Arrived for trauma care between 1 January 2017 and 31 December 2017.
2. Fulfilled the TARN eligibility criteria for inclusion (see Appendix 1).

TABLE 3.1: DATA ANALYSIS FOR MTA REPORT 2017

	2017
Number of participating hospitals	26
All TARN submissions[ii]	5787
Individual patients	5061
Not transferred (into or out of first hospital)	3979
Direct admissions[iii]	4735

QUALITY ASSURANCE

TARN provides measures of data coverage (i.e. the case ascertainment of eligible cases measured against the expected number of cases) and accreditation as a means of assessing the quality of MTA data.

DATA QUALITY STATEMENT

The purpose of this data quality statement is to highlight the assessment of the quality of the MTA 2017 data using internationally agreed dimensions of data quality as laid out in *Guidance on a data quality framework for health and social care* (Health Information and Quality Authority, 2018). An overview of the aims and objectives of the MTA data collection is included in Chapter 1, Introduction (page 22). The MTA data source description is detailed in Chapter 2, MTA Methodology (page 30). The data quality statement identifies strengths and areas for improvement, e.g. TARN dataset amendments for an Irish context and the development of a data calendar. An overview of the assessment of the MTA against the dimensions of data quality is presented in Table 3.2.

[ii] Patients may have required transfer to another hospital and therefore may have multiple submission entries.
[iii] Direct admissions refers to the number of patients who first presented directly to a hospital with their trauma (i.e. were not transferred in from another hospital), but who subsequently may have been transferred out for further care).

TABLE 3.2: ASSESSMENT OF DATA QUALITY FOR THE MTA

Dimensions of data quality	Definition (HIQA Guidance, 2018)	Assessment of dimension (MTA)
Relevance	**Data meets the current and potential future needs of users.**	The MTA dataset is reviewed continuously as part of the TARN and MTA governance structures. All data fields are reported on in the national report and in local hospital annual reports. Monthly teleconferences with the audit coordinators enable any new data fields to be discussed and feedback given to TARN.
Accuracy and reliability	**The accuracy of data refers to how closely the data correctly describe what they were designed to measure. Reliability refers to whether those data consistently measure, over time, the reality of the metrics that they were designed to represent.**	The coverage is reported at hospital level in this report for the first time and is reported quarterly to the hospitals and Hospital Groups. Outliers are identified in this report. NOCA works with the Healthcare Pricing Office (HPO) and TARN to determine the expected number of cases and the actual number of eligible cases. In this report, ineligible cases have been removed in an effort to report accurate coverage. Validation processes are in place and further work is ongoing to improve this process.
Timeliness and punctuality	**Timely data are collected within a reasonable agreed time period after the activity that they measure. Punctuality refers to whether data are delivered on the dates promised, advertised, or announced.**	NOCA and TARN issue data collection targets for each hospital to achieve a minimum of 80% submission timeliness. TARN publishes three clinical reports (in March, July and November) and two dashboard reports (in August and February) annually. A full publishing calendar is available on the TARN website. The clinical reports contain a core section containing measures such as most senior clinician and time to CT scanning, and a themed section focusing on a particular type of injury: • March – thoracic and abdominal injuries • July – orthopaedic injuries • November – head and spinal injuries. The dashboard reports have been drawn up and agreed by the Clinical Reference Group (CRG) and are designed to allow effective benchmarking between trauma units in relation to specific measures.
Coherence and comparability	**Coherent and comparable data are consistent over time and across providers and can be easily combined with other sources.**	The MTA dataset follows the patient pathway from the point of the trauma to discharge from an acute hospital. Within the dataset there are best practice standards, including, for example, the *British Orthopaedic Association & British Association of Plastic, Reconstructive & Aesthetic Surgeons Audit Standards for Trauma: Open Fractures (2017)* and the NICE Head injury: assessment and early management guidance (2017). The definitions of the data fields are available on the TARN website and in the NOCA *Major Trauma Audit Handbook for Collection and Review of TARN Data in Ireland.* Monthly teleconferences, MTA/TARN workshops and hospital visits ensure that the audit coordinators all interpret the definitions correctly.
Accessibility and clarity	**Data are easily obtainable and clearly presented in a way that can be understood.**	There are a number of inbuilt reports that can be run by the clinical lead and audit coordinator. The data can be exported locally into Excel for further analysis. The frequency tables for the national report analysis are available in the national report. For clarity, NOCA has developed a data dictionary, NOCA MTA handbook for collection and review of TARN Data in Ireland and holds an annual workshop for the audit coordinators.

DATA COVERAGE BY HOSPITAL

The data coverage refers to the measure of major trauma cases entered against the overall expected number of cases (this is also referred to as case ascertainment). The expected number of cases is estimated based on the Hospital In-Patient Enquiry (HIPE) codes for the previous year (i.e. 2016), but is amended throughout the reporting year according to the actual HIPE file for 2017. The TARN eligibility criteria for inclusion (Appendix 1) are applied to the national HIPE codes and each hospital is notified of the expected number of cases. The MTA National Report 2016 highlighted that this methodology had limitations, as it overstated the expected number of cases, thereby understating data coverage. A process has been set up between NOCA and the HPO to amend the expected number of cases for each hospital using the hospital denominator adjustment process.

The national coverage level for the 2017 MTA is 86% (Figure 3.1), and is the result of the hard work and commitment of our audit coordinators and clinical leads as well as the process introduced to remove the ineligible cases from the hospital denominators. Twenty-one hospitals achieved the TARN case ascertainment target (data coverage) target of 80% coverage in 2017. This is an increase from nine hospitals in the MTA National Report 2016.

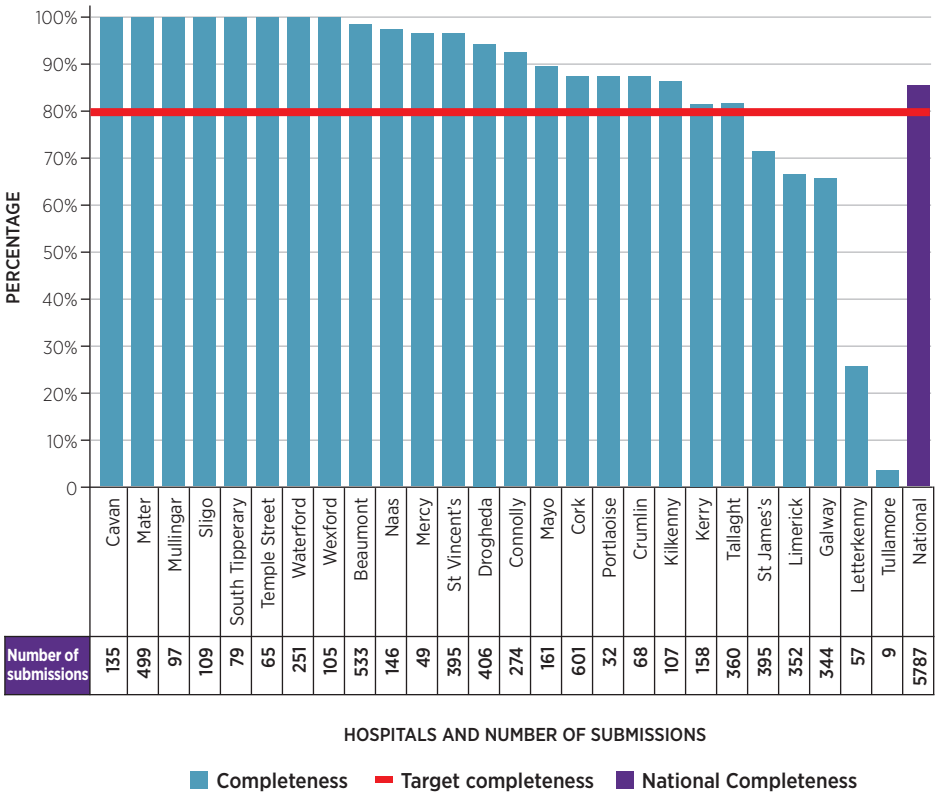


FIGURE 3.1: DATA COVERAGE PERCENTAGES BY HOSPITAL*

* Due to hospital staffing issues a number of audit coordinators were unable to complete data collection for 2017.

DATA ACCREDITATION BY HOSPITAL

The completion of key data fields is used as the second measure of data quality. TARN applies a standard of 95% for this measure. The national data accreditation level for the MTA is 97%, which is excellent (Figure 3.2). Twenty-five hospitals achieved the data accreditation national standard.

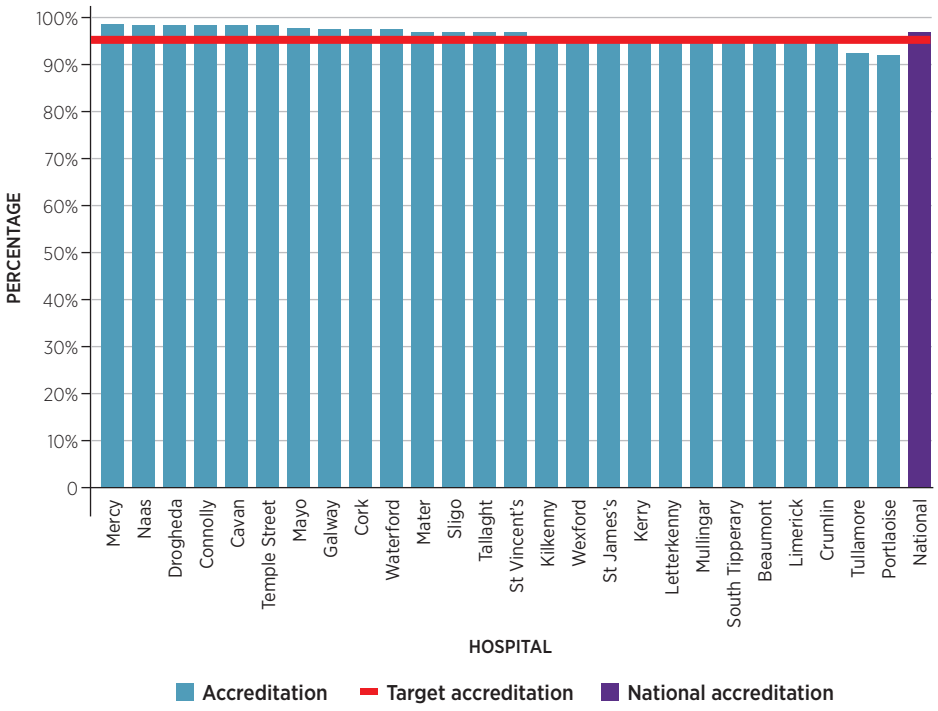


FIGURE 3.2: DATA ACCREDITATION PERCENTAGES BY HOSPITAL

There was an improvement in 2017 in the data accreditation score by key data fields (Figure 3.3). There has been ongoing education provided by NOCA to the audit coordinators in order to maximise the capture of specific data fields including incident/999 call details and pupil reactivity. It is expected that the roll-out of the electronic patient care record (ePCR) by the HSE National Ambulance Service (NAS) will result in a marked improvement in incident data reporting.

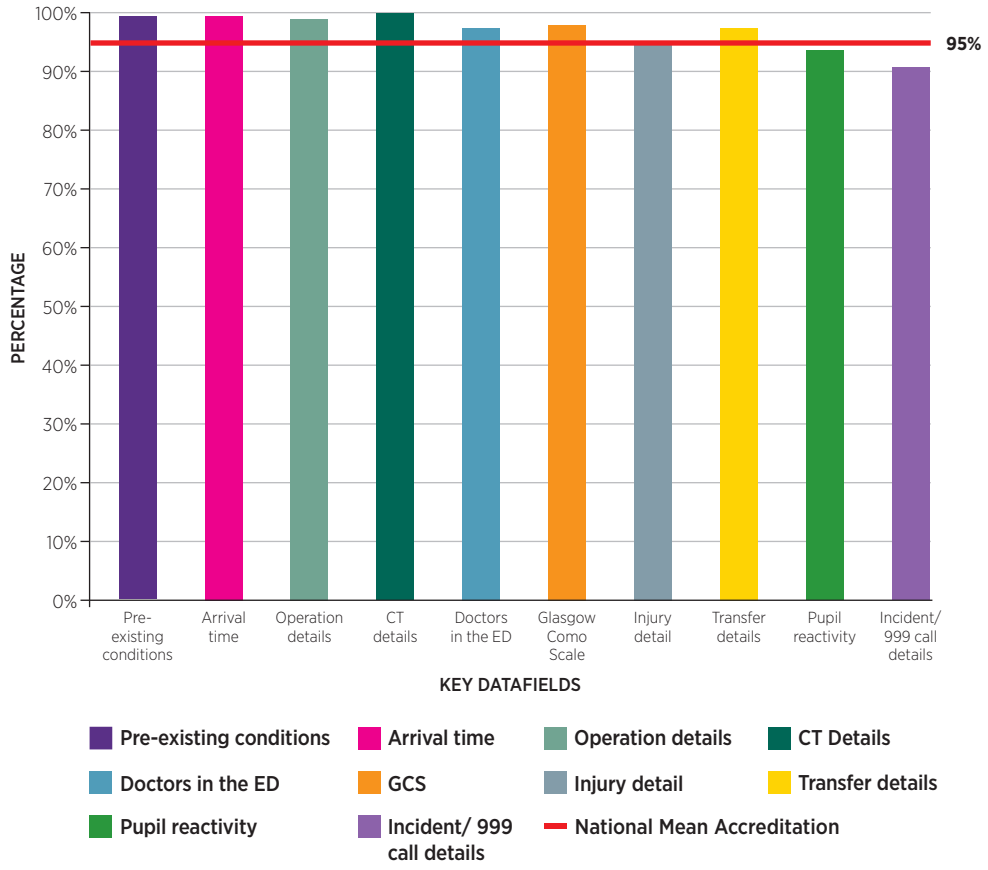


FIGURE 3.3: DATA ACCREDITATION BY KEY DATA FIELDS

A DAY IN THE LIFE OF A MAJOR TRAUMA AUDIT COORDINATOR

Therese Yore, Major Trauma Audit Coordinator, Connolly Hospital

I have a very 'yin-yang' working life, comprising two days on the floor in the ED and two days as a Major Trauma Audit (MTA) Coordinator. Two completely opposite types of working days – the ED is organised chaos, whereas the office is quiet. But they complement each other. In the ED I can capture traumas coming through, make sure that the patient care record is updated, remind staff on of the importance of documentation and capturing 'times' etc. Also, from an ED perspective, it's great to follow a patient's journey through the system and report back to staff on how they fared.

I took up the position of TARN Coordinator in April 2014. Initially, I had great difficulty in obtaining HIPE reports due to a backlog in Connolly Hospital Blanchardstown, and it wasn't until late 2016 that I received my first report. So, I had to devise an alternative way of identifying potential submissions. I did this by interrogating the ED computer system, Symphony. By using the e-audit tab, I can search the list of admitted patients and identify those who have been admitted with trauma. In turn, by cross-referencing the hospital admission system and the X-ray systems ... voilà, I have a list of suitable candidates. Very time-consuming, but I get results. I have tweaked this approach and right now I have on my desk several pieces of information relating to different categories of patients – all at different stages of their journey through the hospital system. This means that I work in real time. Once I receive my HIPE reports, I find that I have captured approximately 70% of the relevant patient data already.

Pictured: TARN, MTA Audit Coordinators, MTA Clinical Leads & NOCA, TARN workshop 2018, RCSI

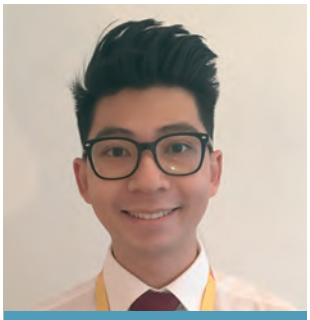
On my MTA days, I start work at 7.00am. This timing was my choice, but when the alarm goes off at 5.45am I wonder why I chose such an early start. That said, it's great to get in to work when the hospital is quiet. My first job is to check the Symphony system since I was last on duty. Like most coordinators, I find it challenging to obtain patient charts, but I try to have a list ready for Medical Records by 8.00am. While I'm waiting for charts, I do as much work as possible on each submission. I pull the original ED card and extract as much information as I can. As a result, once I receive the chart it doesn't take me long to go through it.

The harvesting and inputting of data is only one facet of an MTA Coordinator's role, but it is vitally important in that it enables the compiling of clinical reports and dashboards, which then need to be critically interrogated.

Attending governance meetings and hosting teaching sessions are other areas that require my ongoing attention. Dealing with requests to assist with research proposals also falls under my remit.

Each month, I download the Performance Review Indicators (PRI) and data quality reports. This helps me to keep up to date and also to highlight any new high patient deaths. My MTA days fly by and I derive great satisfaction from knowing that documenting the plethora of strands that make up a trauma patient's experience enables improvements to be implemented, which in turn creates better health outcomes for patients.

Anthony Yan, Medical Student, University College Cork



ANTHONY YAN

I am currently a final year medical student at University College Cork with an interest in becoming an emergency physician. Under the supervision of an emergency medicine consultant, I am researching the patterns of injury associated with ladder falls as part of my final year project. In return for entering 40 hours data entry at CUH, I will not only have a greater understanding of the TARN dataset but I will be contributing to the data coverage locally and receive the data for my project. Comprehensive training was provided by the MTA audit manager and the local audit coordinators in CUH Karina Caine and Ann Deasy support and supervise my data entry. The experience I have gained as a result of this work has helped me understand the patient hospital journey, as well as patient health outcomes following major trauma. These skills and insights will prove invaluable when I start work as a doctor. I would highly recommend the training I received to other healthcare students who have a special interest in trauma. Look out for my work on ladders!

CHAPTER 4

WHO WAS INJURED AND HOW WERE THEY INJURED?

CHAPTER 4

WHO WAS INJURED AND HOW WERE THEY INJURED?

AGE AND GENDER

The mean age of patients in this report is 58 years, and the median age is 61 years; this is an increase of three years and two years, respectively, on the *MTA National Report 2016*. Major trauma predominantly affects younger men and older women. While overall, 58% (n=2941) of patients in 2017 were male (Figure 4.1), among those aged over 75 years, females were the predominant gender (Figure 4.1A).

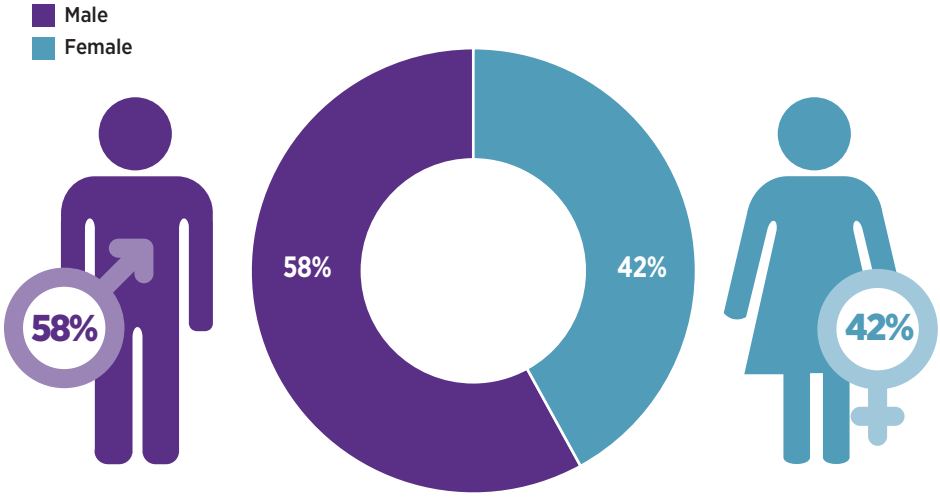
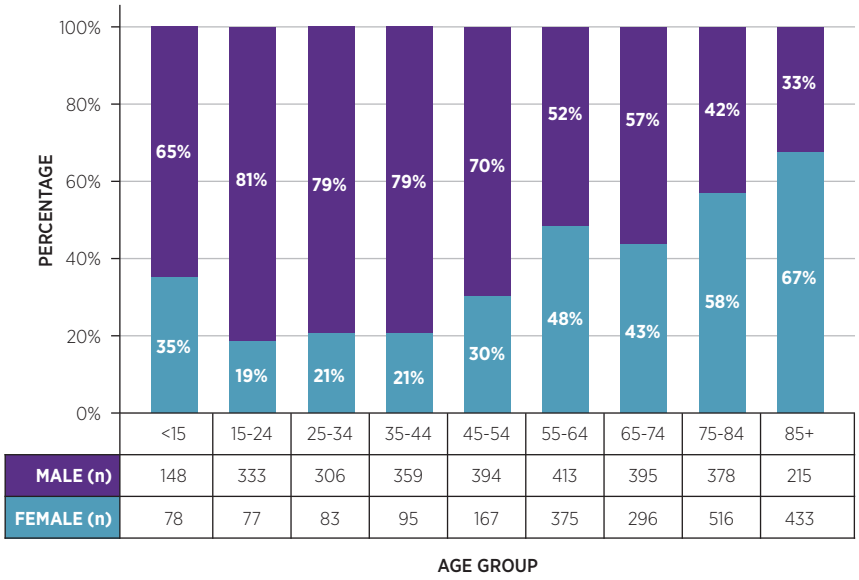


FIGURE 4.1: PERCENTAGE OF MTA PATIENTS BY GENDER (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

Fifty-one per cent of patients (n=2602) were aged 15–64 and in the working-age population. Older adults, aged 65 years or older, represented 44% (n=2233) of patients, a 4% increase from the *MTA National Report 2016*.



	<15	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
MALE (n)	148	333	306	359	394	413	395	378	215
FEMALE (n)	78	77	83	95	167	375	296	516	433

FIGURE 4.1A: PERCENTAGE OF MTA PATIENTS BY GENDER AND AGE GROUP (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

PRE-EXISTING MEDICAL CONDITIONS

The Charlson Comorbidity Index (CCI) has been adapted and validated for predicting the outcome and risk of death for many comorbid diseases (Charlson *et al*., 1987). The CCI is used in statistical adjustment for comorbidities in TARN. Older patients will generally have a greater burden of significant comorbidities.

Figure 4.2 shows that, in 2017, 47% of patients (n=2357) had no significant pre-existing conditions, 38% (n=1939) had mild comorbidities, 11% (n=576) had moderate comorbidities and 3% (n=150) had severe comorbidities. The distribution of comorbidities, when presented by age bands, shows that the number of comorbidities increases with age (Figure 4.2A).

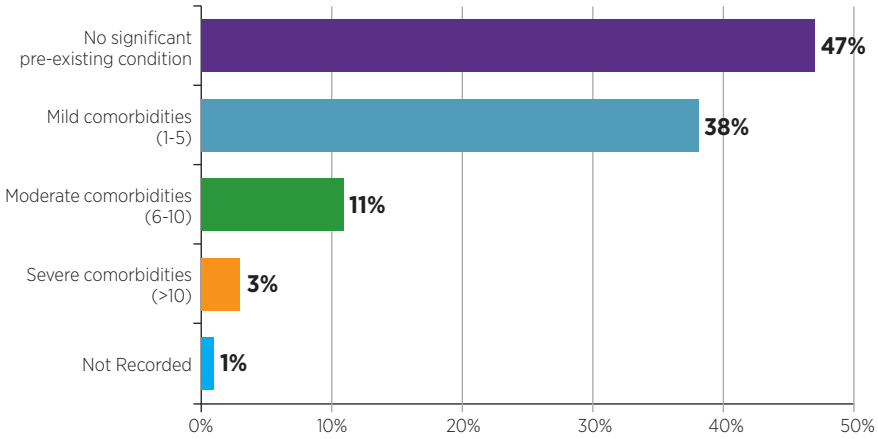


FIGURE 4.2: CCI SCORE OF MTA PATIENTS (N=5061)*

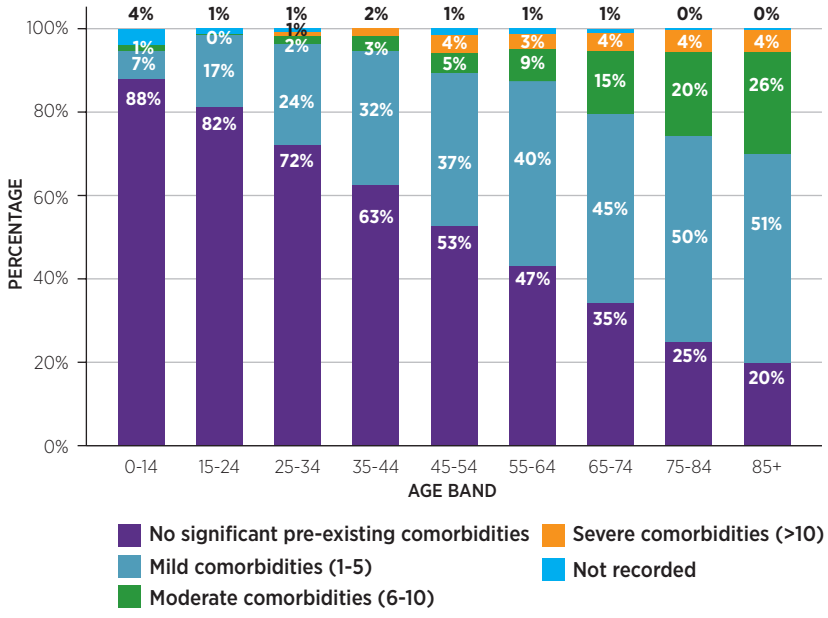


FIGURE 4.2A: CCI SCORE OF MTA PATIENTS BY AGE GROUP (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

MECHANISM OF INJURY

Falls of less than 2 m, termed 'low falls', continue to be the most frequent cause of injury (57%, n=2861), an increase of 6% from the *MTA National Report 2016*. The second most frequent cause of major trauma is road trauma (17%, n=858), followed by falls of greater than 2 m (11%, n=578) (Figure 4.3). Low falls are the most common mechanism of injury in those aged 45 years or older and in children. In children, a height of 2 m could be considered high relative to their height. In those aged 15–44 years, the most common mechanism of injury is road trauma (Figure 4.3A).

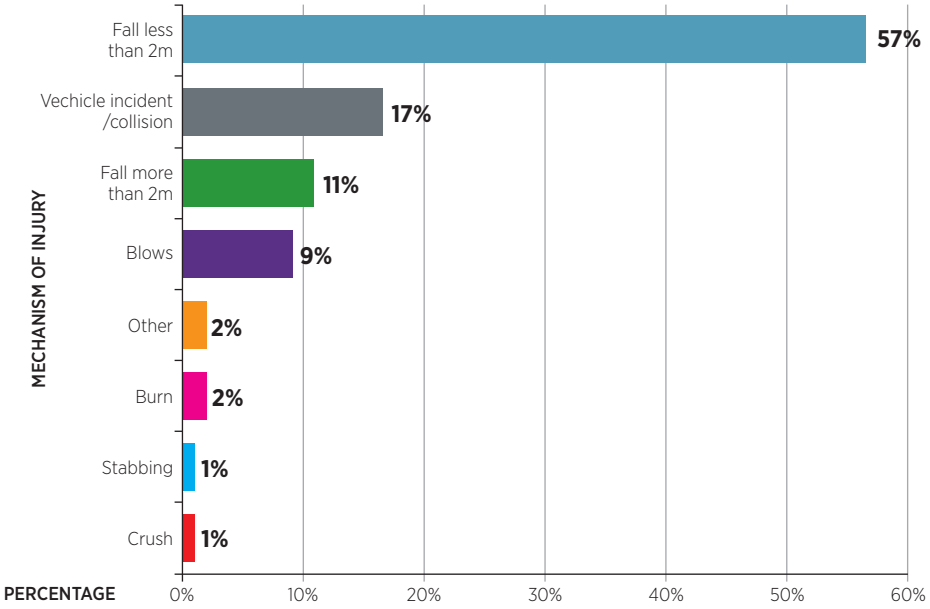


FIGURE 4.3: MECHANISM OF INJURY (N=5061)*

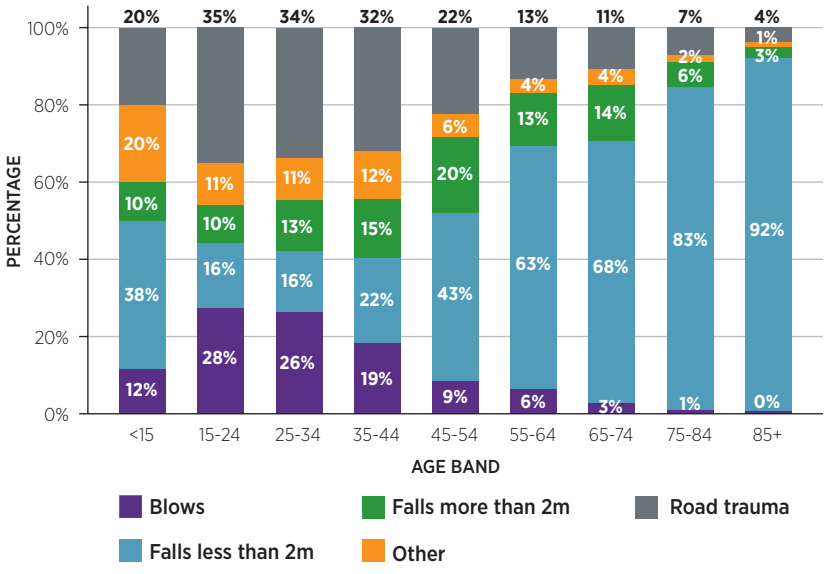
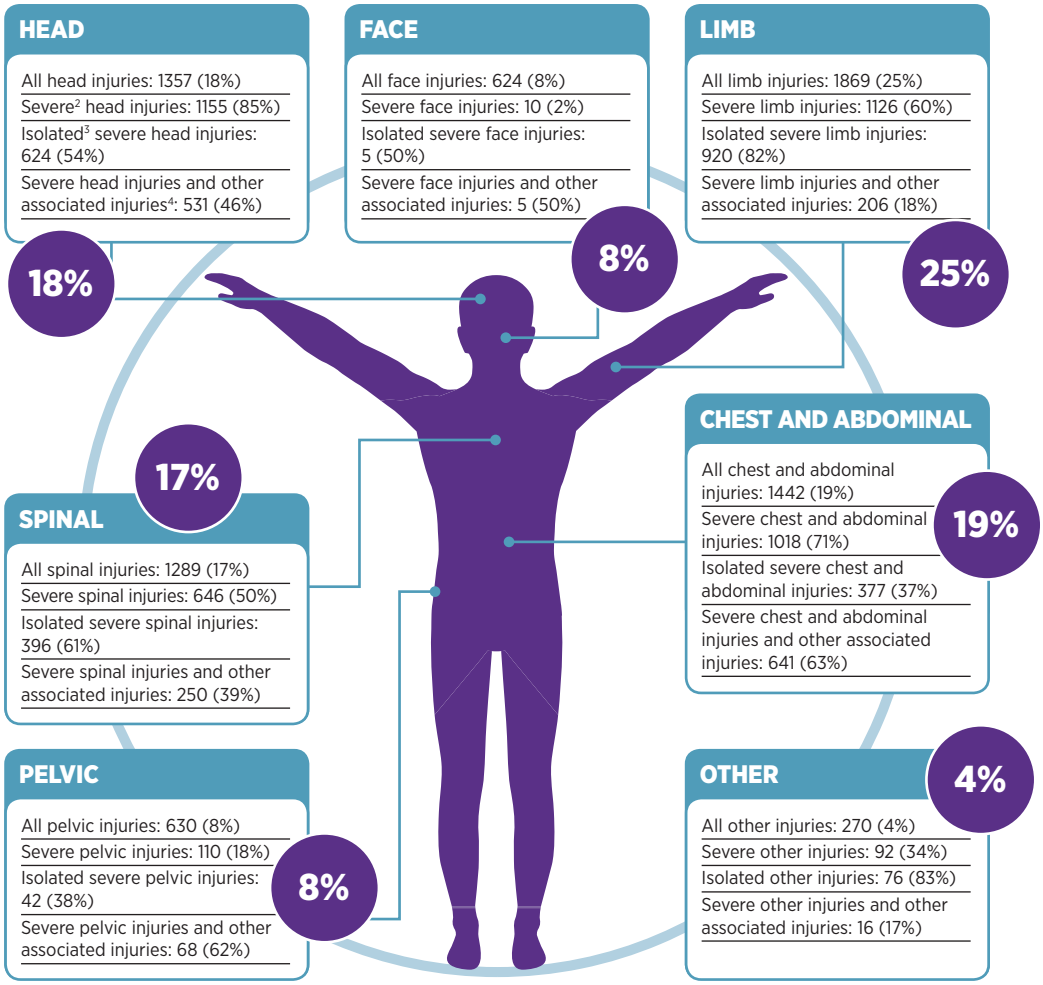


FIGURE 4.3A: MECHANISM OF INJURY BY AGE GROUP (N=5061)*

[ii] Please note: Percentages may not sum to 100% due to rounding.

INJURIES SUSTAINED

All injures[1] recorded (N=7481)



[1] All injury category includes (AIS 1–6)
[2] Severe category includes (AIS ≥3)
[3] Isolated severe injuries only include (AIS ≥3) injuries to that specific body region
[4] Severe injuries and other associated injuries includes (AIS ≥3) + other injury (AIS ≥3)

FIGURE 4.4: INJURIES SUSTAINED BY BODY REGION (N=7481)

Almost one third, (32%, n=1641) of major trauma patients have injured two or more body regions (Table 4.1).

TABLE 4.1: NUMBER OF BODY REGIONS INJURED PER PATIENT (N=5061)

NUMBER OF BODY REGIONS INJURED	NUMBER OF PATIENTS	%
1	3420	68%
2	1133	22%
3	315	6%
4	133	3%
5	43	1%
6	16	<1%
7	<5	<1%
Total	5061	100%

INJURY SEVERITY SCORE

When auditing the management of major trauma, it is important to have a method for grading the severity of trauma sustained by a patient. Each injury is scored between one and six based on its severity. An Abbreviated Injury Scale (AIS) score of one represents a minor injury, whereas an AIS score of six represents an injury that is not survivable (Appendix 1). This contributes to the overall ISS for that patient, which is rated on a scale from 0 to 75 (Baker et al, 1974).

TABLE 4.2: ISS CLASSIFICATION

ISS CLASSIFICATION	ISS SCORE	EXAMPLES OF INJURIES
Low-severity injury	1-8	Fractured wrist and ankle Simple skull fracture Small bleed in liver
Moderate-severity injury	9-15	Fractured femur Small brain contusion (bruising)
Severe injury	> 15	Large subdural haematoma (bleed between skull and brain) Fracture of the pelvis with significant blood loss Severe injuries to multiple body regions

A breakdown of the ISS across all injured patients is presented in Figure 4.5. This shows that, in 2017, 42% (n=2135) of major trauma patients suffered moderate-severity injuries and 32% (n=1628) suffered severe injuries (This figure represents patients whose data were captured at either their admitting hospital or the receiving hospital). The distribution of ISS by age group is shown in Figure 4.5A.

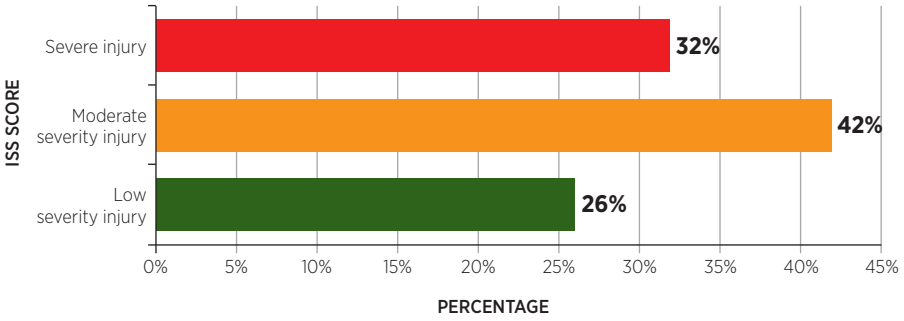


FIGURE 4.5: PERCENTAGE OF PATIENTS BY ISS (N=5061)*

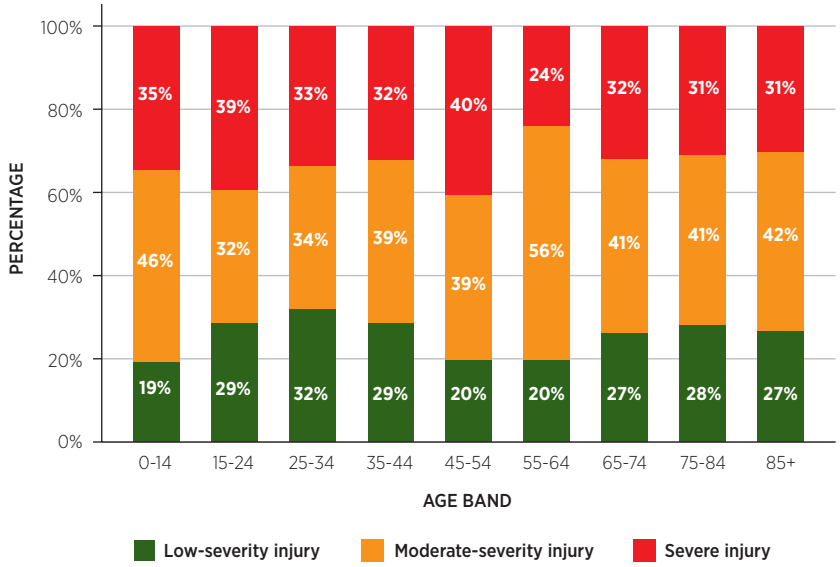


FIGURE 4.5A: INJURY SEVERITY BY AGE GROUP (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

PLACE OF INJURY

Home was recorded as the place where half (50%, n=2535) of major trauma injuries occurred, which is a 3% increase from 2016. Thirty-six per cent (n=1809) of injuries occurred in a public place or road (Figure 4.6), which is a 3% decrease from 2016. The place of injury is presented by age in Figure 4.6A. Home is the predominant place of injury in the 0–14 year-old age band and among those aged 55 years and older. Major trauma patients aged 15–54 years are more likely to be injured in a public area or on the road (Figure 4.6A). The ISS by place of injury is described in Figure 4.6B.

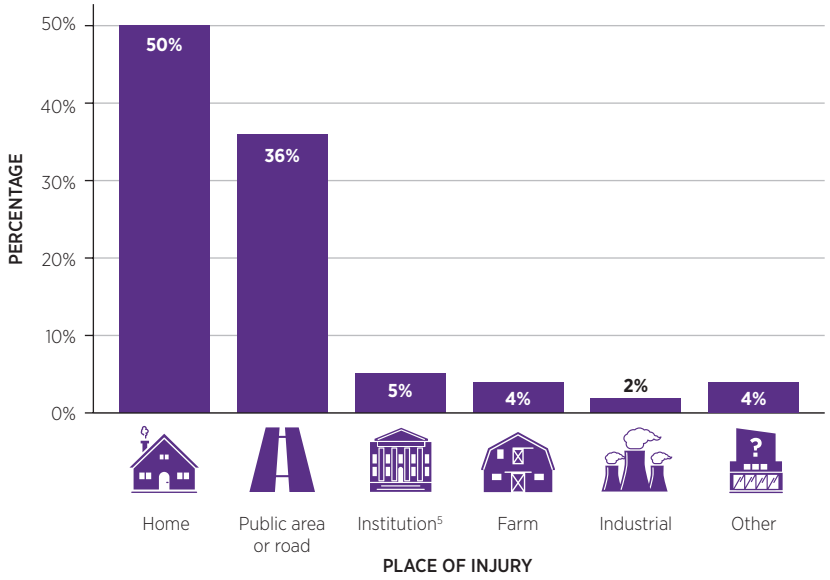


FIGURE 4.6: PLACE OF INJURY (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.
5 Institution includes hospitals, prisons, care homes and educational institutions such as schools.

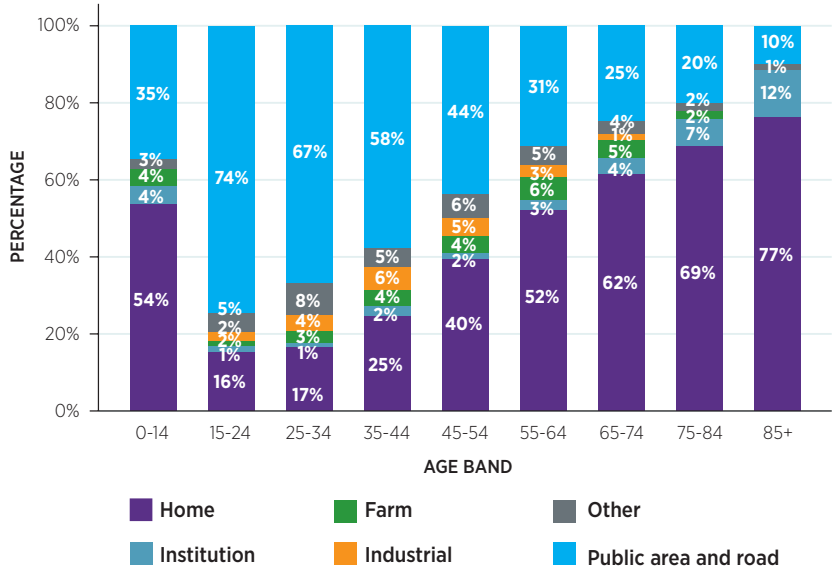


FIGURE 4.6A: PLACE OF INJURY BY AGE GROUP (N=5061)*

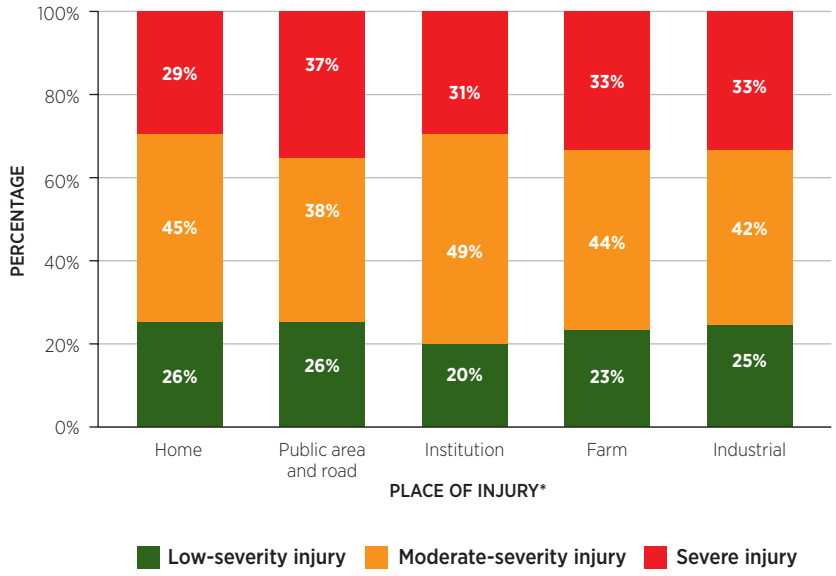


FIGURE 4.6B: PLACE OF INJURY BY ISS (N=5061)*

* Please note: 'Other' category (n=201) are excluded from this chart.

* Please note: Percentages may not sum to 100% due to rounding.

INJURIES SUSTAINED AT HOME

The home was the most common location of injury, with 50% (n=2535) of injuries sustained there (Figure 4.6). In order to determine what factors may influence such a high incidence of injuries in this location, the following were examined: gender and age, location of injury by gender, and mechanism of injury.

- Fifty-three per cent (n=1356) of major trauma patients injured at home were female (Figure 4.7).
- Low falls were the most common mechanism of injury, seen in 77% (n= 1944) of cases; this is an increase of 5% from the *MTA National Report 2016* (Figure 4.8).

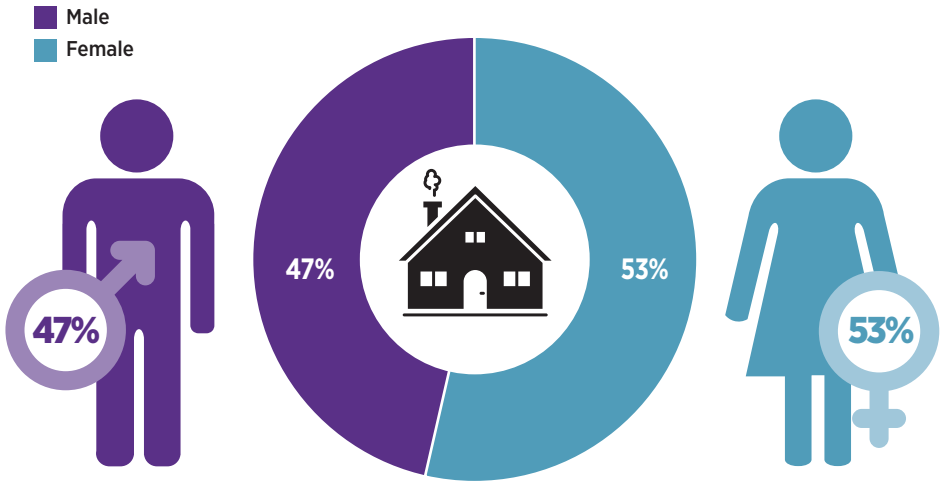


FIGURE 4.7: INJURIES SUSTAINED AT HOME BY GENDER (n=2535)*

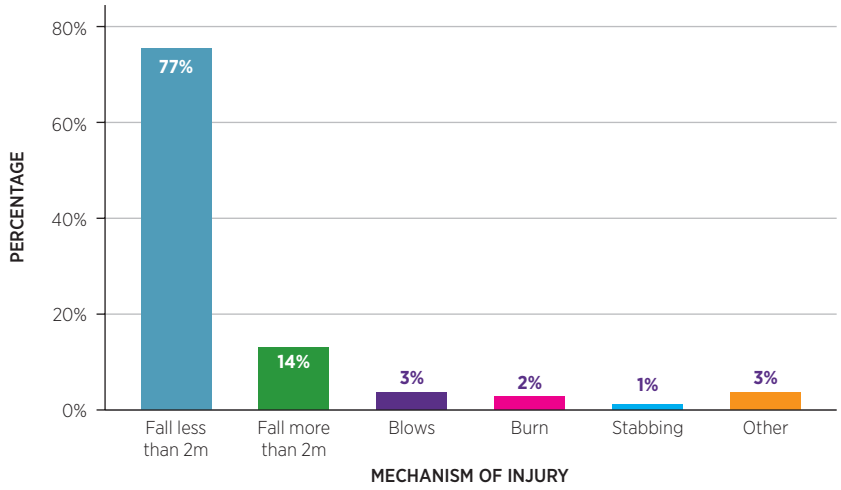


FIGURE 4.8: INJURIES SUSTAINED AT HOME BY MECHANISM OF INJURY (n=2535)*

* Please note: Percentages may not sum to 100% due to rounding.

In the group of patients who sustained injuries at home (n=2535) and who had a recorded CCI score, there is a trend towards more moderate comorbidities as age increases (Figure 4.9) (22 patients had an unknown CCI score and were excluded).

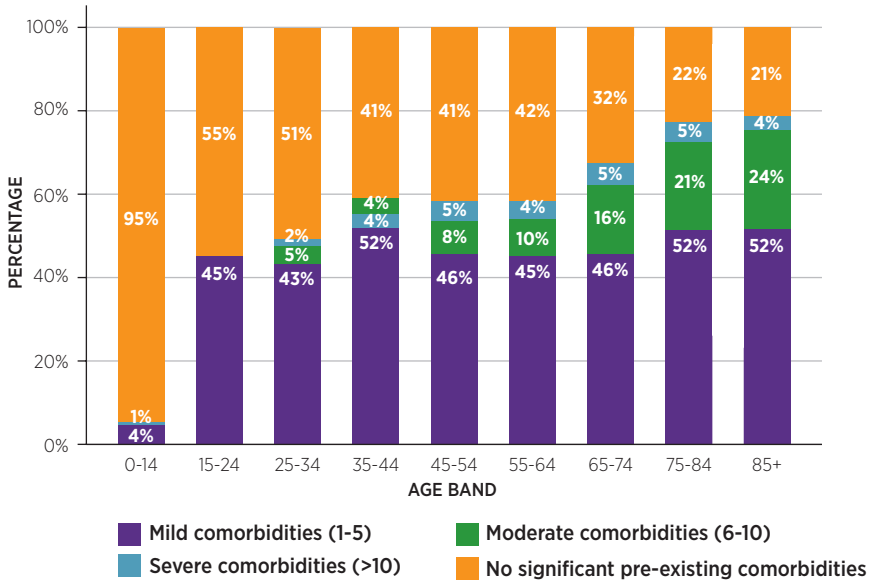


FIGURE 4.9: CCI SCORE OF PATIENTS INJURED AT HOME BY AGE (n=2513)*

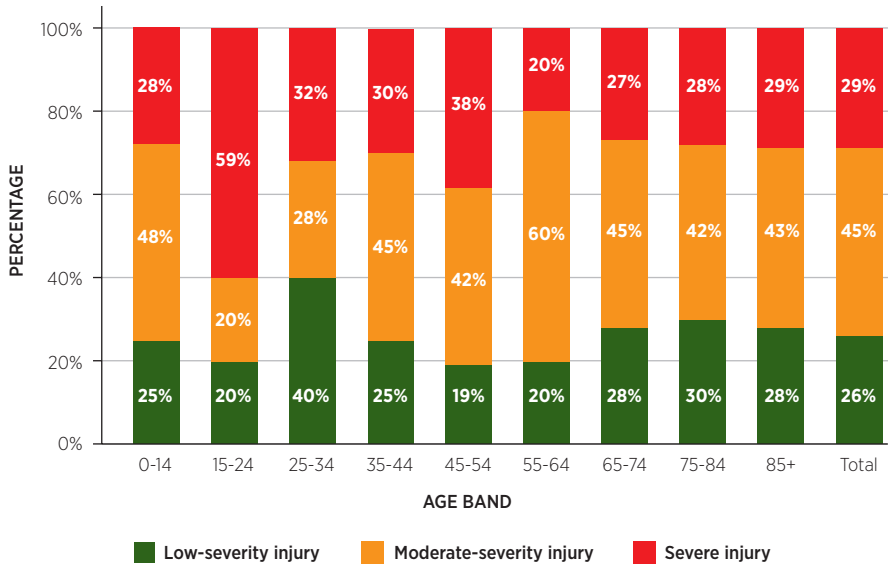


FIGURE 4.10: INJURIES SUSTAINED AT HOME BY ISS AND AGE GROUP (n=2535)*

* Please note: Percentages may not sum to 100% due to rounding.

Of those injured at home (n=2535), 7% (n=174) died during admission to hospital (Figure 4.11).

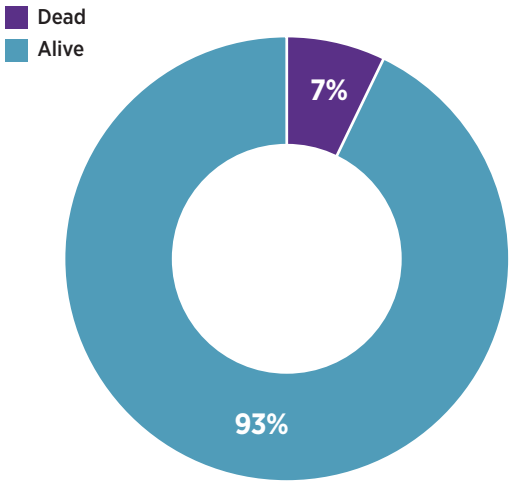


FIGURE 4.11: INJURIES SUSTAINED AT HOME BY MORTALITY (n=2535)*

* Please note: Percentages may not sum to 100% due to rounding.

TYPE OF ROAD TRAUMA

Road trauma accounts for 17% (n=858) of all trauma in this report. Car occupants accounted for 49% (n=423) of road trauma, of whom 69% (n=292) were in the driver's seat; 20% (n=175) of road trauma patients were cyclists, 17% (n=147) were pedestrians and 12% (n=102) were motorcyclists (Figure 4.12).

Pedestrians continue to have the highest percentage of severe injuries (ISS >15) caused by road trauma (52%, n=77) (Figure 4.12A).

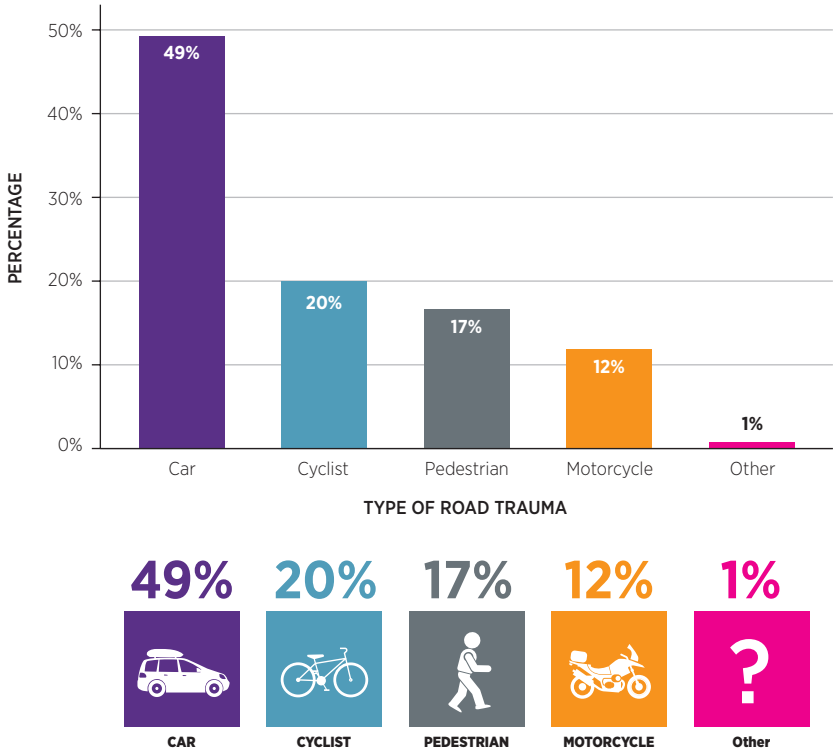


FIGURE 4.12: TYPE OF ROAD TRAUMA (n=858)*

* Please note: Percentages may not sum to 100% due to rounding.

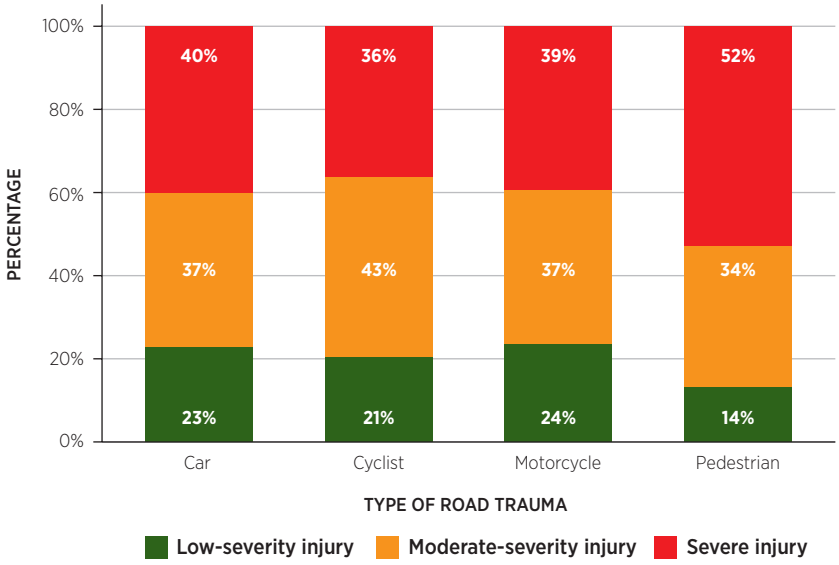


FIGURE 4.12A: TYPE OF ROAD TRAUMA BY ISS (n=858)*

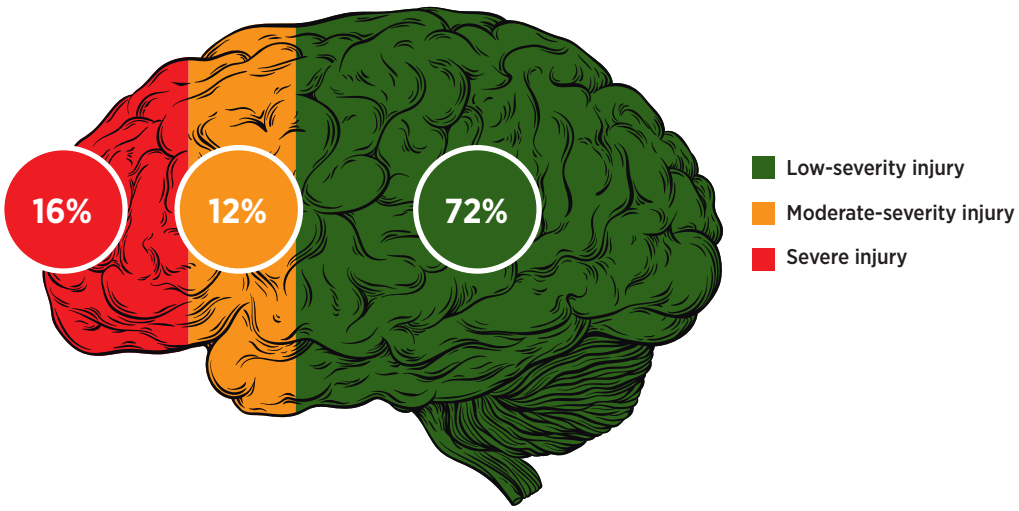
* Please note: 'Other' category (n=11) are excluded from this chart.

* Please note: Percentages may not sum to 100% due to rounding.

HEAD INJURIES

Head injuries accounted for 18% (n=1357) of all MTA injuries (N=7481); this includes all severity of head injury (AIS 1–6) (Figure 4.13). Severity of head injury can be classified using a combination of AIS classification on the basis of brain CT scan findings (Appendix 1) and presenting Glasgow Coma Score: mild (GCS 13-15), moderate (GCS 9-12) and severe (GCS < 9).

Figure 4.13A shows the severity of TBI by age group. The predominant mechanism of injury in patients with severe TBI (n=180) was road trauma (31%, n=56) and low falls (31%, n=56). Falls of greater than 2 m accounted for 22% (n=40) of patients with TBI (Figure 4.13B). As age increases, MTA patients with a severe head injury are more likely to die (Figure 4.13C).



25 cases data missing on GCS – excluded

FIGURE 4.13: SEVERE HEAD INJURY PATIENTS BY AIS CLASSIFICATION (AIS ≥3) (n=1130), FURTHER CLASSIFIED INTO TBI SEVERITY BY GCS*

* Please note: Percentages may not sum to 100% due to rounding.

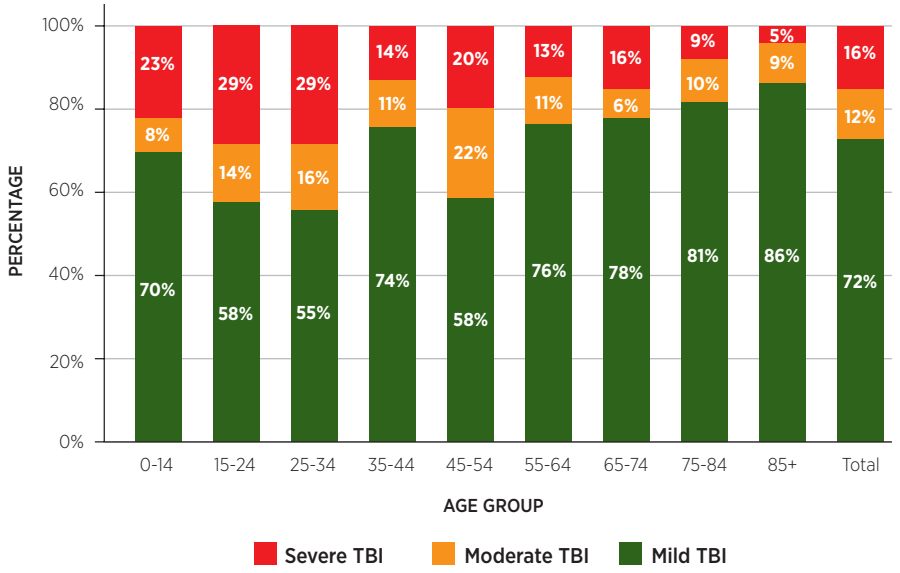


FIGURE 4.13A: TBI SEVERITY BY GCS SCORE, BY AGE GROUP FOR PATIENTS WITH SEVERE HEAD INJURIES (AIS ≥3) (n=1130)*

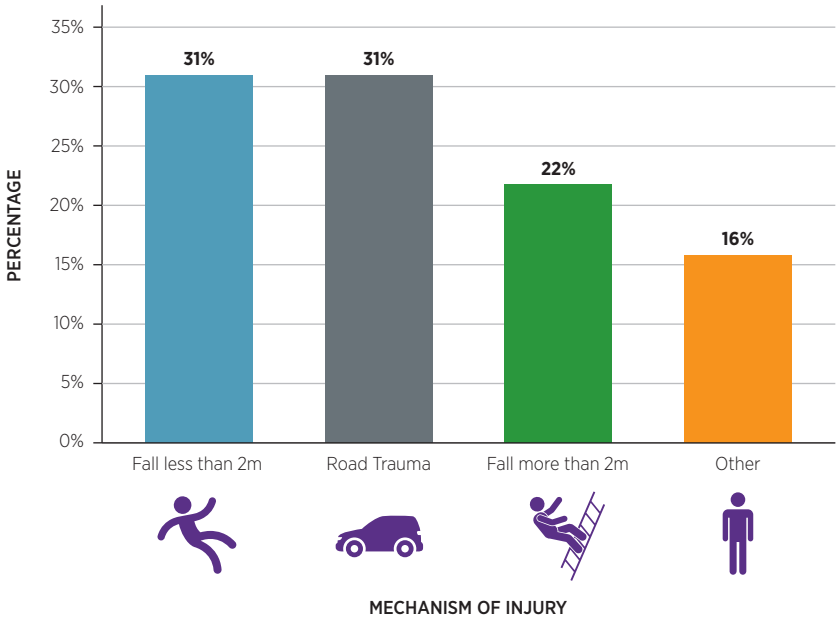


FIGURE 4.13B: CAUSE OF INJURY IN PATIENTS WITH SEVERE TBI (AIS ≥3 & GCS<9) (n=180)*

* Please note: Percentages may not sum to 100% due to rounding.

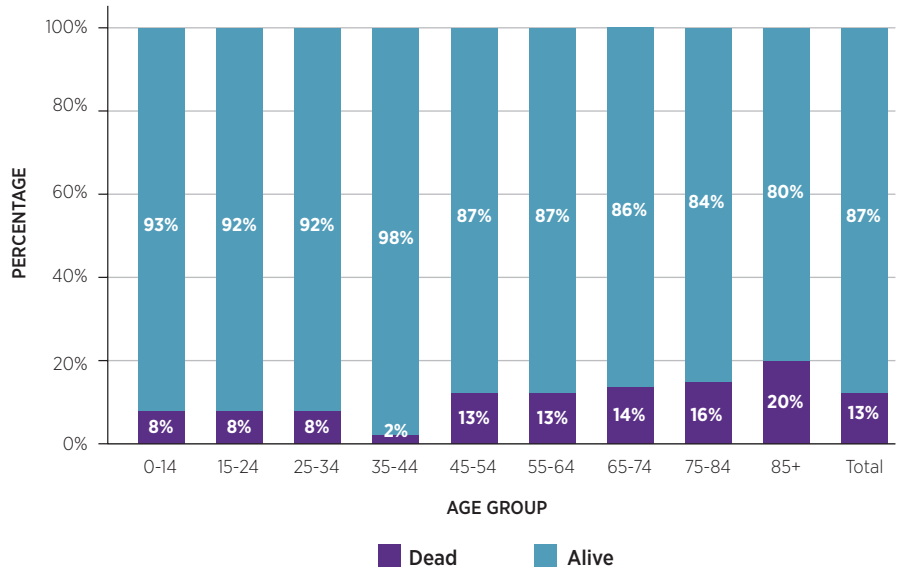


FIGURE 4.13C: MORTALITY OF MTA PATIENTS WITH SEVERE HEAD INJURY BY AIS CLASSIFICATION AND BY AGE GROUP (n=1155)*

* Please note: Percentages may not sum to 100% due to rounding.

CHAPTER 5

THE PATIENT JOURNEY

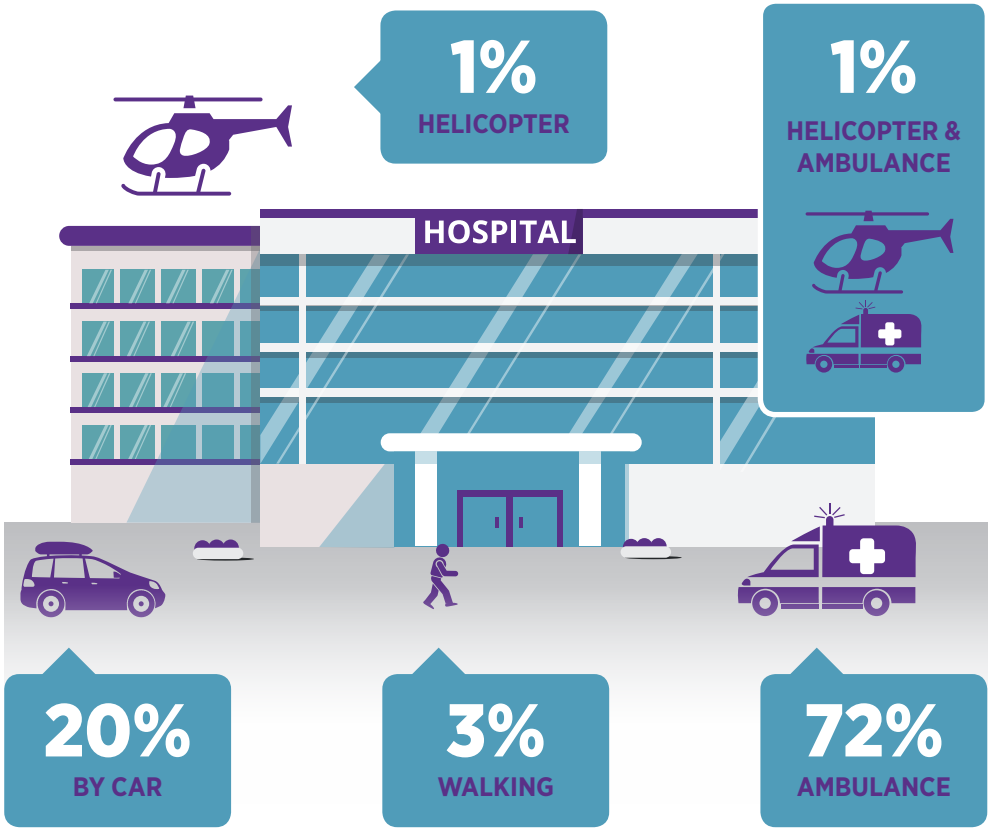
THE PATIENT JOURNEY

Major trauma care is currently being delivered across 26 hospitals in Ireland; however, no one hospital in Ireland has all the necessary trauma services on site, and no hospital in Ireland currently receives the requisite number of severely injured patients to be considered adequate to maintain the trauma management skills of doctors, nurses and allied health practitioners by international standards. For patients and their families, the current arrangements for the delivery of trauma care are such that access to specialist care is compromised and transfer to another hospital is often required. This interrupts continuity of care and lengthens time to recovery, as care is delivered sequentially rather than concurrently. The provision of a seamless, safe, optimal package of care for patients with multiple injuries is very challenging in the current configuration of trauma care delivery.

MODE OF ARRIVAL

Road ambulance was the most common mode of transportation to hospital in 2017 (72%, n=3430) (Figure 5.1).

The Helicopter Emergency Medical Service is delivered through a service level agreement between the Irish Air Corps, the Department of Defence and the HSE, and is based out of Athlone offering daytime services. Irish Coast Guard helicopters may, in certain circumstances, be tasked to transport major trauma patients.



Patients who were transferred to another hospital are excluded. Data on patients whose mode of transport to hospital was 'Other' or 'unknown' are not presented above.

FIGURE 5.1: MODE OF ARRIVAL AT HOSPITAL (n=4735)*

* Please note: Percentages may not sum to 100% due to rounding.

MOST SENIOR PRE-HOSPITAL HEALTHCARE PROFESSIONAL

Data capture relating to the pre-hospital part of the trauma patient's journey has been challenging for the MTA; the National Ambulance Service (NAS) has recently moved to an electronic patient care record (ePCR) which is expected to facilitate audit.

Of those major trauma patients attended to by a pre-hospital professional (n=3507), 54% (n=1891) were attended to by a paramedic and 32% (n=1104) were attended to by an advanced paramedic (Figure 5.2). There are four medical doctors that volunteer critical care support to the NAS and can be tasked to respond by the National Emergency Operations Centre.

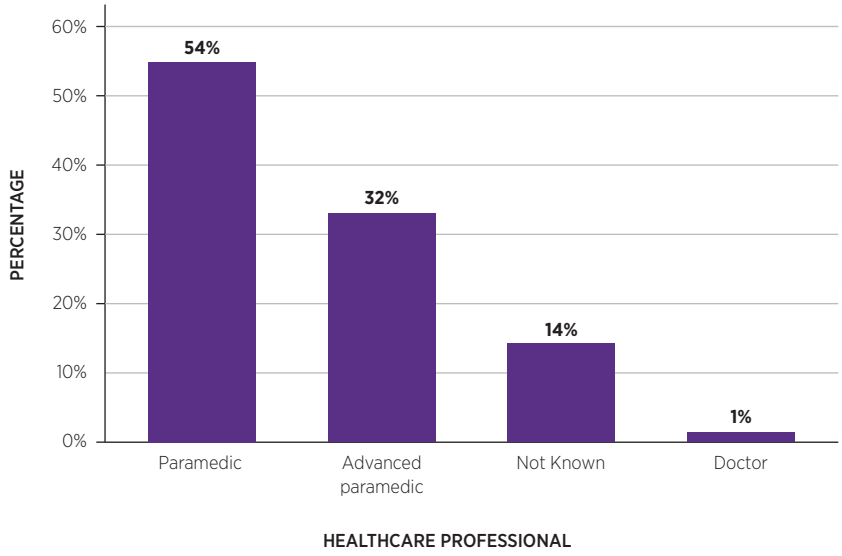


FIGURE 5.2: MOST SENIOR PRE-HOSPITAL HEALTHCARE PROFESSIONAL (n=3507)*

Only direct admissions by either ambulance or helicopter are included in Figure 5.2

* Please note: Percentages may not sum to 100% due to rounding.

TRAUMATIC BRAIN INJURY AND ADMISSIONS TO A NEUROSURGICAL UNIT

In 2017, there were 1,153 patients with TBI with an AIS of three or higher (Figure 5.3). Of these, 15% (n=178) were admitted directly to a neurosurgical unit. A further 22% (n=253) were subsequently transferred to a neurosurgical unit following reception to hospital.

There were 179 patients with a severe TBI (AIS ≥3, GCS <9); of those, 13% (n=23) were admitted directly to a neurosurgical unit, 41% (n=74) were transferred to a neurosurgical unit from another hospital and 46% (n=83) were not transferred (Figure 5.3A).

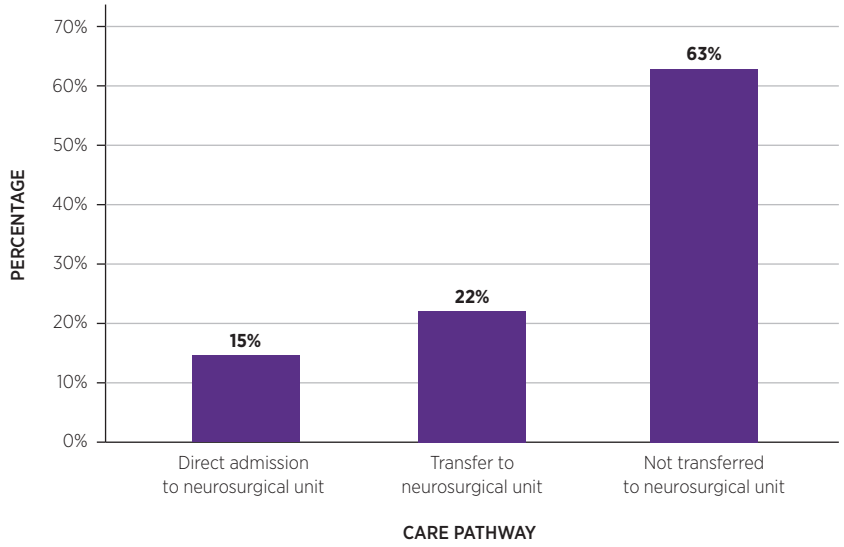


FIGURE 5.3: CARE PATHWAY OF PATIENTS WITH SEVERE HEAD INJURY BY AIS (n=1153)*

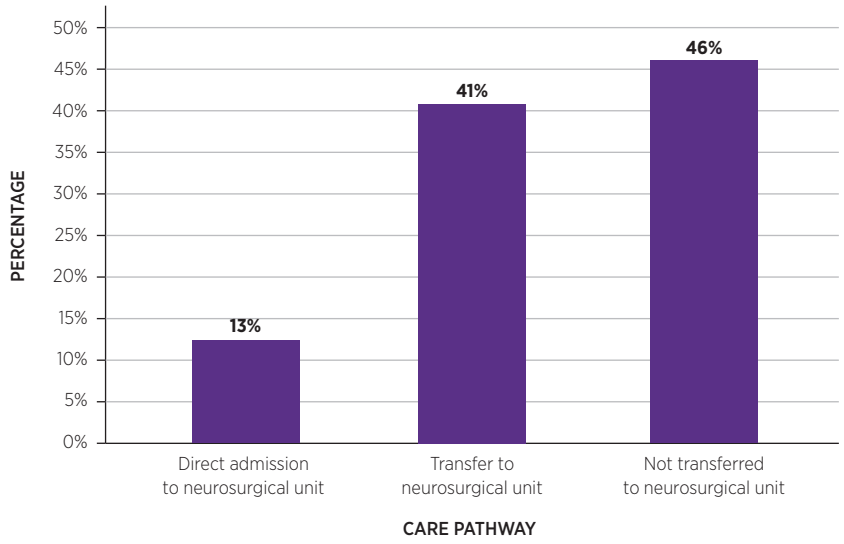


FIGURE 5.3A: PATIENTS WITH SEVERE TBI AND ADMISSIONS TO A NEUROSURGICAL UNIT (AIS ≥3 AND GCS <9) (n=179)*

* Please note: Percentages may not sum to 100% due to rounding.

CHAPTER 6

TRANSFERS OF PATIENTS (SUBGROUP ANALYSIS)

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TRANSFERS OF PATIENTS (SUBGROUP ANALYSIS)

A fundamental principle in healthcare is getting the 'right patient to the right service at the right time' in order to optimise the outcome for that patient. In 2017, 21% (n=1082) of patients were transferred at least once to another hospital for further care (Figure 6.1). It is anticipated that the development of an integrated trauma system for Ireland, comprising MTCs and trauma units organised in networks, will reduce the number of patients who will need subsequent transfer for definitive care, as more patients will be transported directly to the 'right' hospital in the first place, and that, where a transfer is required, it will be a more streamlined process (Department of Health, 2018). In 2012, the United Kingdom restructured its trauma system in a similar manner as what is proposed for Ireland. This resulted in improved access to specialist services for injured patients; the development of high-volume centres with greater consultant-led care, expertise and rapid CT imaging; and rewards (tariffs) for hospitals that met certain quality metrics. Ultimately, the restructuring of the trauma system led to dramatic improvements in both care processes and outcomes, including survival for patients (Moran *et al*., 2018).

The decision to transfer a patient for management of their injuries and the timeliness of the transfer should be based on medical need and best practice; however, it may also relate to the availability of a bed and other resources at the receiving hospital. The transfer process is cumbersome, requiring multiple phone calls, a transfer team and ambulance, and often denudes smaller hospitals of staff for the duration of the transfer. There are contesting, and sometimes conflicting, priorities at play in the transfer of patients.

This chapter focuses on patients who were transferred for care of their injuries.

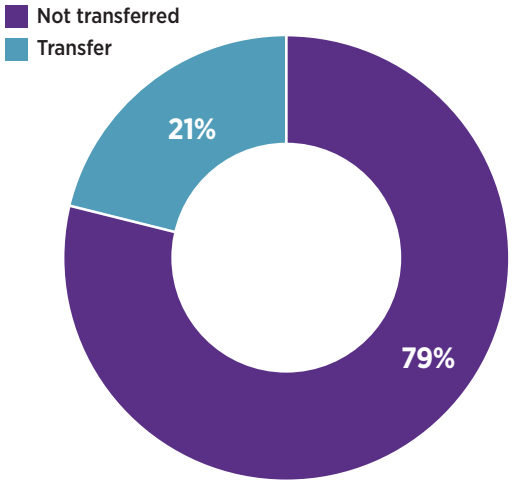


FIGURE 6.1: PERCENTAGE OF PATIENTS TRANSFERRED TO ANOTHER HOSPITAL (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

TRANSFERS BY HOSPITAL

Figure 6.2 shows the percentage of patients transferred out by hospital, including what percentage had a severe injury (ISS >15) and what percentage had a low- or moderate-severity injury (ISS ≤15). This graph shows that there is variance in the percentage of transfers across hospitals. The percentage of patients transferred out was calculated by dividing the number of patients transferred out by the total number of patients admitted to each hospital. Please note a patient may have been admitted to more than one hospital and therefore may be counted twice in this graph. Transfers in were calculated in the same way.

It is clear that Model 3 hospitals have a higher percentage of transfers than Model 4 hospitals. Patients brought to Model 4 hospitals are more likely to receive the definitive care they require.

Model 3 hospitals provide 24/7 acute surgery, acute medicine and critical care.
Model 4 hospitals are similar to Model 3 hospitals but provide tertiary care and in certain locations, supra-regional care.
Hospitals with supra-regional/national services include:
• **Beaumont Hospital - Neurosurgery, renal transplant**
• **Cork University Hospital - Plastic and reconstructive surgery, neurosurgery, cardiothoracic surgery, oral and maxilla-facial surgery**
• **Mater Misericordiae University Hospital - Cardiothoracic surgery, heart and lung transplant, spinal surgery, extracorporeal membrane oxygenation (ECMO)**
• **St James's Hospital - Cardiothoracic surgery, burns surgery, plastic and reconstructive surgery, oral and maxilla-facial surgery**
• **St Vincent's University Hospital - Liver transplant, pancreatic surgery**
• **Tallaght University Hospital - Pelvic and acetabulum reconstruction**
• **Temple Street Children's University Hospital - Neurosurgery**

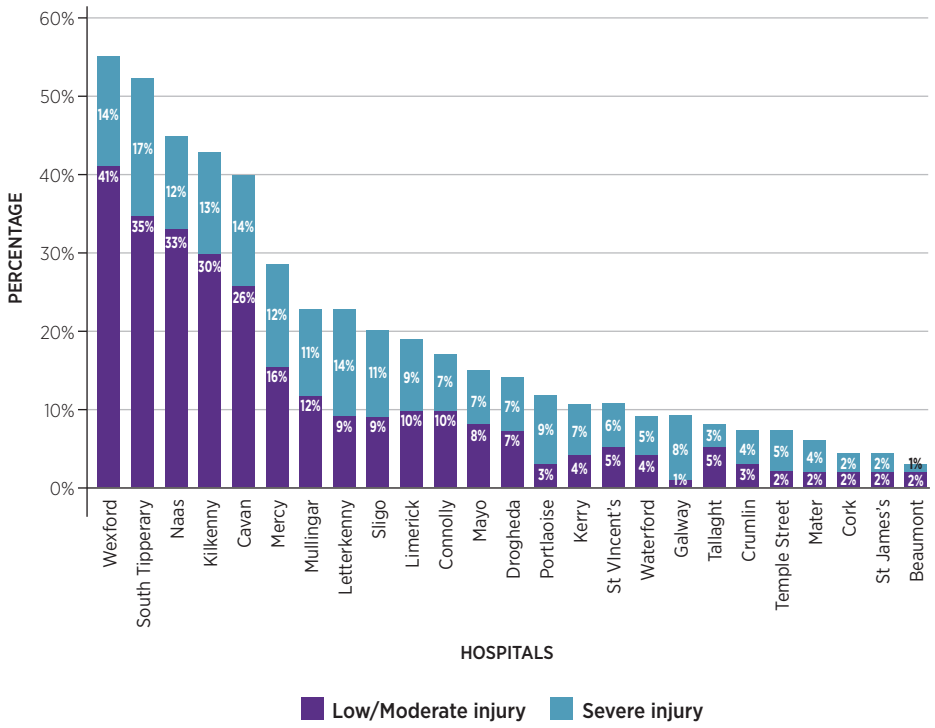


FIGURE 6.2: PERCENTAGE OF TRANSFERS OUT OF HOSPITAL (n=5787)*[6]

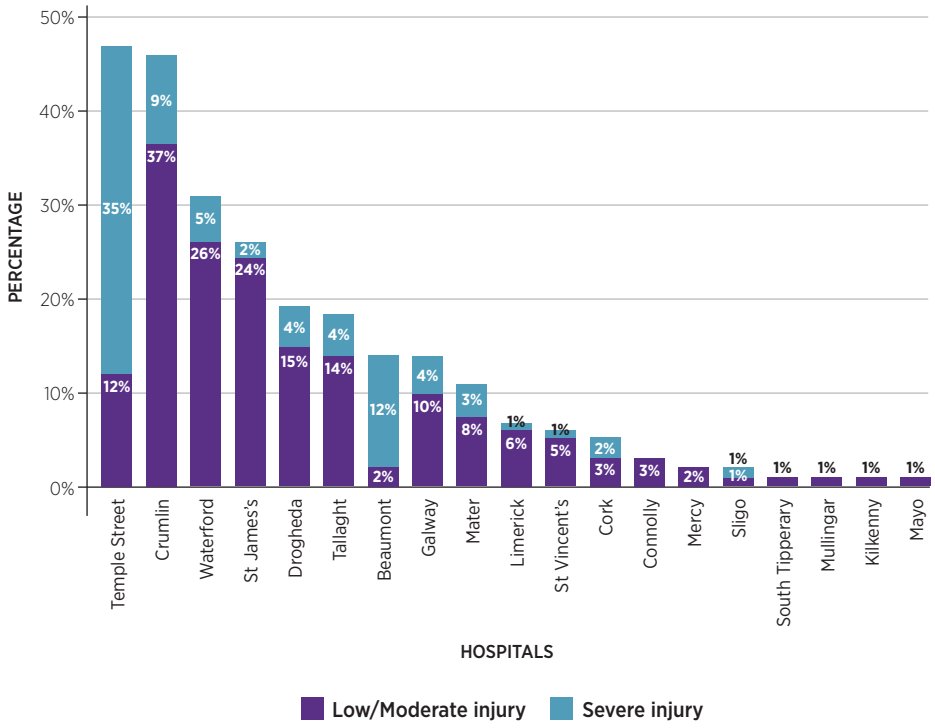


FIGURE 6.3: PERCENTAGE OF TRANSFERS IN BY HOSPITAL (n=5787)*[7]

* Please note: Percentages may not sum to 100% due to rounding and hospitals with less than 5 cases are excluded from hospital comparison graphs

[6] Hospitals with no patients transferred out are excluded from Figure 6.2

[7] Hospitals with no patients transferred in are excluded from Figure 6.3

GENDER AND TRANSFERS

Male major trauma patients are more likely to require transfer to another hospital (68%, n=741) (Figure 6.4).

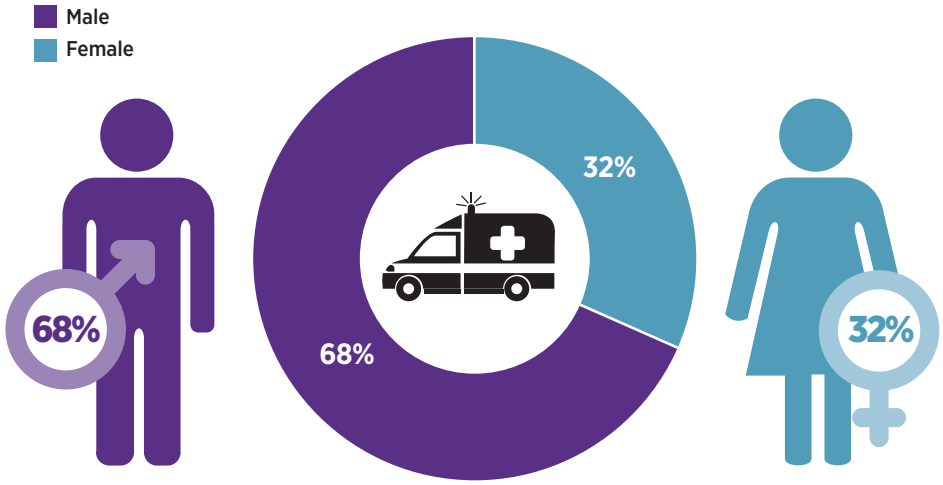


FIGURE 6.4: PERCENTAGE OF TRANSFERS BY GENDER (n=1082)*

* Please note: Percentages may not sum to 100% due to rounding.

AGE AND TRANSFERS

Figure 6.5 shows the percentage of patients within each age group who were transferred as a proportion of the total number of patients who were transferred (i.e. 1082). Figure 6.5A shows the percentage of patients within each age group who were transferred as a proportion of all patients within that age group. Younger patients are more likely to be transferred; for example, 40% (n=91) of children aged 0–14 years were transferred, compared with just 7% (n=48) of patients aged 85 years and over.

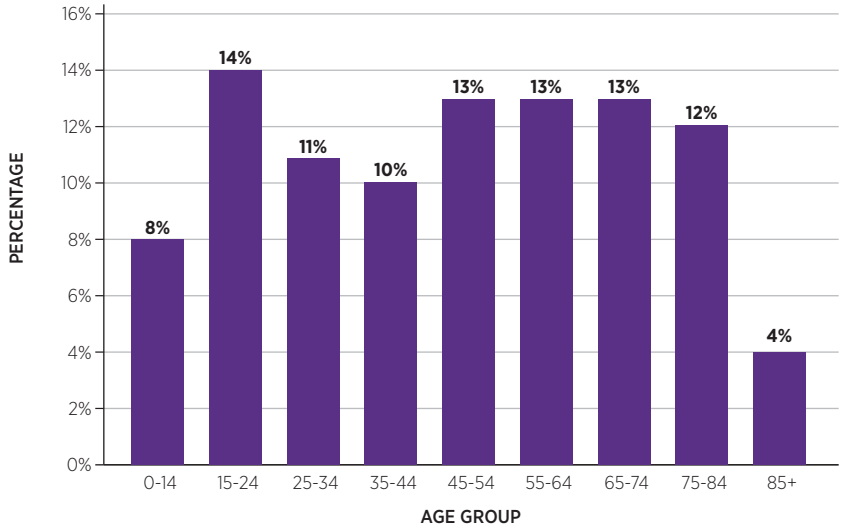


FIGURE 6.5: PERCENTAGE OF PATIENT TRANSFERS BY AGE GROUP (n=1082)*

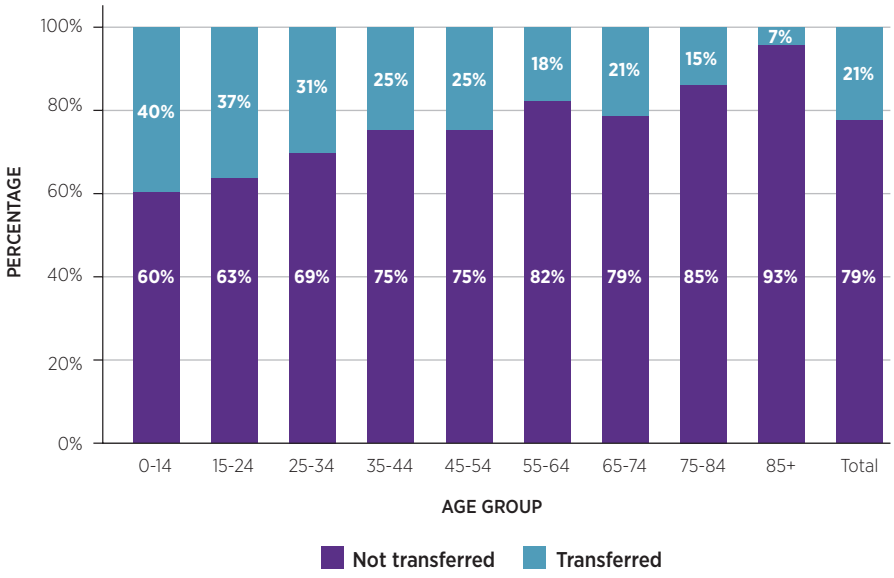


FIGURE 6.5A: PROPORTION OF EACH AGE BAND THAT WAS TRANSFERRED (n=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

ISS AND TRANSFERS

Major trauma patients who were severely injured (ISS >15) were more likely to be transferred (28%, n=454) than patients who had a low- or moderate-severity injury (Figure 6.6).

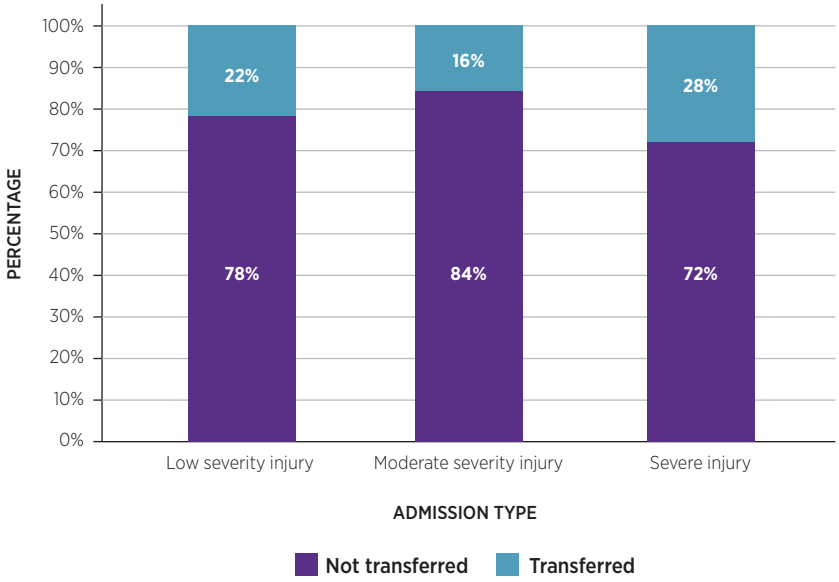


FIGURE 6.6: PERCENTAGE OF PATIENTS TRANSFERRED VERSUS NOT TRANSFERRED BY ISS (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

MECHANISM OF INJURY AND TRANSFERS

Major trauma patients who were involved in road trauma, falls of greater than 2 m and blows were more likely to be transferred, whereas those who had a fall of less than 2 m were less likely to be transferred (Figure 6.7).

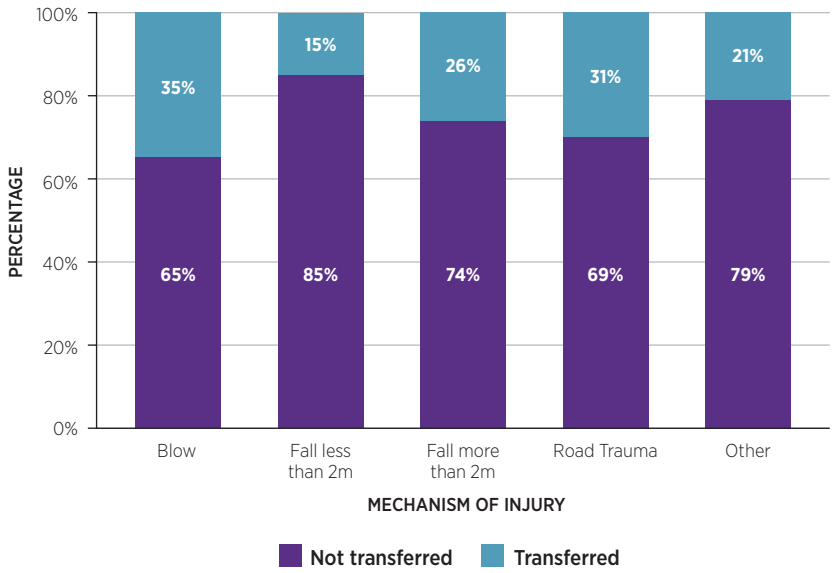


FIGURE 6.7: PERCENTAGE OF PATIENTS TRANSFERRED VERSUS NOT TRANSFERRED BY ISS (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

BODY REGION INJURED AND TRANSFERS

Major trauma patients who had a face injury (43%, n=94), a spine injury (29%, n=241) or a head injury (26%, n=289) were more likely to be transferred than patients who had injuries elsewhere on their bodies (Figure 6.8).

FIGURE 6.8: PERCENTAGE OF PATIENTS TRANSFERRED VERSUS NOT TRANSFERRED BY BODY REGION INJURED (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

LOCATION OF INJURY AND TRANSFERS

Major trauma patients who were injured in a public area or on the road, on a farm, or on an industrial site were more likely to be transferred than patients who were injured elsewhere (Figure 6.9).

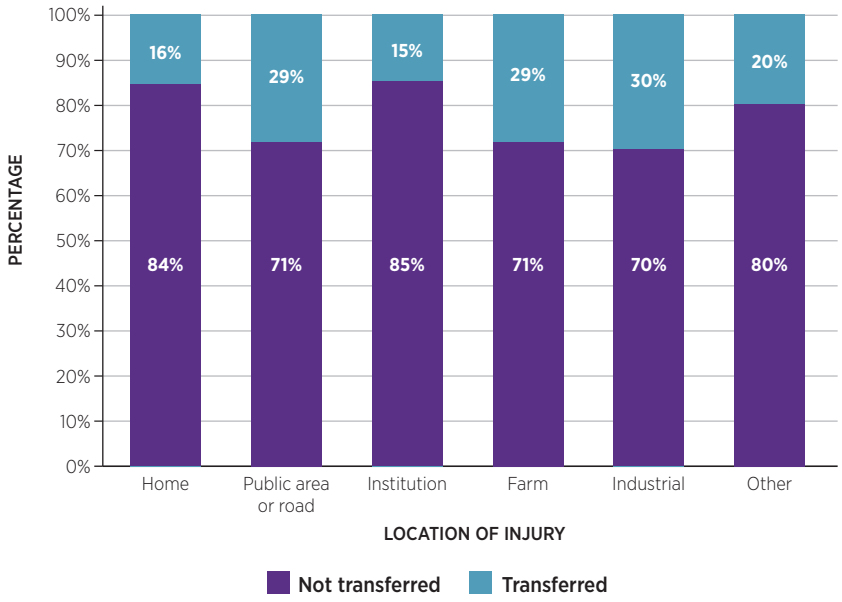


FIGURE 6.9: PERCENTAGE OF PATIENTS TRANSFERRED VERSUS NOT TRANSFERRED BY LOCATION OF INJURY (N=5061)*

REASON FOR TRANSFERS

Analysis shows that the most common reason for both transfers in (98%) and transfers out (98%) was for specialist care; the other 2% of transfers were repatriations or for reasons unknown.

* Please note: Percentages may not sum to 100% due to rounding.

CHAPTER 7

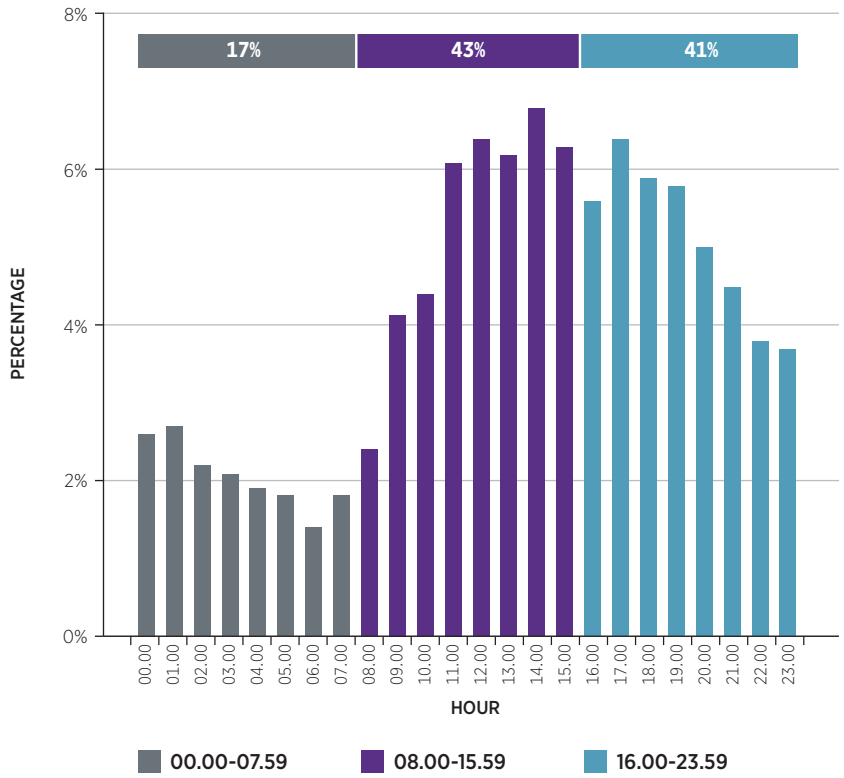
CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE

CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE

Reception, reconstruction and rehabilitation are key process measures in the MTA that contribute to patient outcomes.

PRESENTATION BY TIME OF DAY

There is very little variation in the rate of presentation of major trauma patients by day of week or month of year. However, 58% of patients arrive between 4.00pm and 8.00am, which is unchanged from the MTA National Report 2016 (Figure 7.1).



Patients with missing information on timepoint of admission (n=17) are excluded.

FIGURE 7.1: PRESENTATION BY TIME OF DAY (N=5044)*

* Please note: Percentages may not sum to 100% due to rounding.

PRE-ALERT

Pre-alert is a system whereby the ambulance service communicates to the receiving hospital that it is bringing a patient to the emergency department (ED), the nature of the patient's injuries, the patient's physiology, their expected requirements on arrival and the expected time of arrival.

Figure 7.2 includes analysis of the pre-alert to the initial hospital the patient is brought to having sustained traumatic injury. There continues to be a very low percentage of patients documented as having been pre-alerted (10%, n=462). Younger patients are more likely to be pre-alerted than older patients. (Figure 7.2).

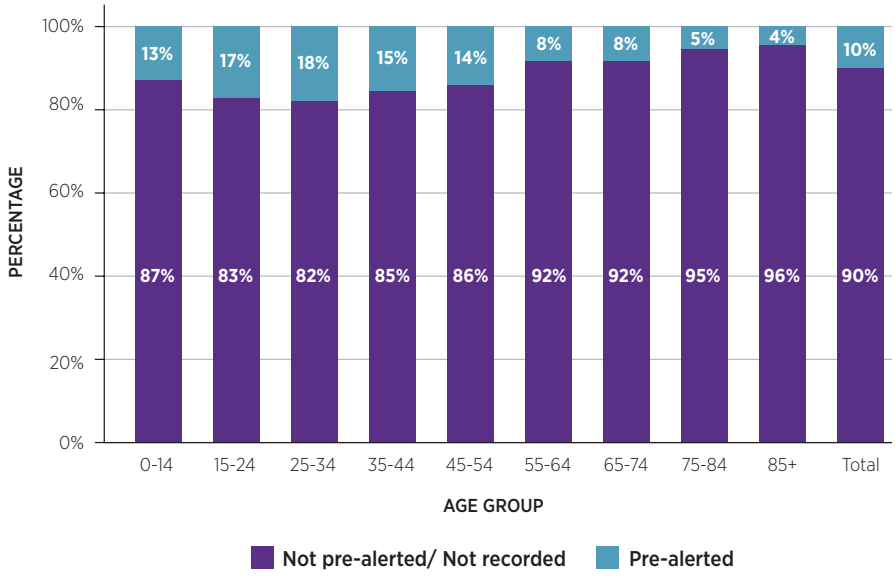


FIGURE 7.2: PRE-ALERTED BY AGE GROUP (n=4735)*

Figure 7.2 refers to direct admissions only.

* Please note: Percentages may not sum to 100% due to rounding.

RECEPTION BY A TRAUMA TEAM

Time to critical interventions and outcomes is improved when a trained trauma team is present on the arrival of a severely injured patient (Driscoll and Vincent, 1992). The National Health Service (NHS) Clinical Advisory Group (2010) recommended that trauma teams in MTCs should be led by a consultant and by a registrar with experience working at trauma units. In Ireland, the lack of clear national standards on what should constitute a trauma team or when such a team should be activated makes this challenging to measure. Currently, it is up to participating hospitals to define their trauma team and report whether this definition of a trauma team was activated.

The overall percentage of major trauma patients received by a trauma team at the first receiving hospital remains low, at 11% (n=495) (Table 7.1). Of those received by a trauma team, patients in the younger age groups were more likely to be received by a trauma team, with a steady decline in the likelihood of receipt by a trauma team as patient age increased (Figure 7.3).

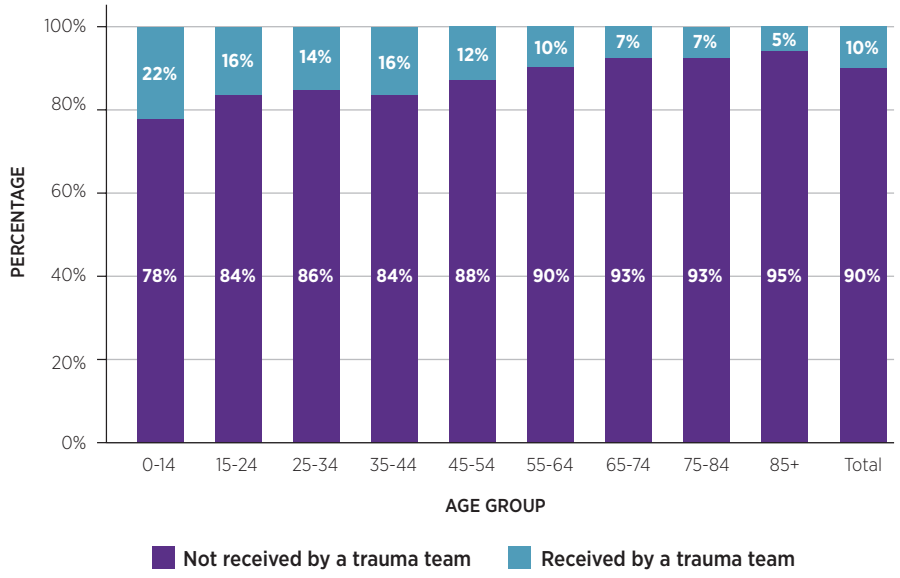


FIGURE 7.3: RECEPTION BY A TRAUMA TEAM BY AGE GROUP (n=4735)*

* Please note: Percentages may not sum to 100% due to rounding.

TABLE 7.1: RECEPTION BY A TRAUMA TEAM

	2017
All patients received by trauma team	11% (n=495/4735)
Received by a trauma team led by a consultant (at 30 minutes)	37% (n=184/495)
All severely injured patients (ISS >15) received by a trauma team	17% (n=257/1511[8])
Severely injured patients (ISS >15): trauma team led by a consultant	49% (n=126/257)

GRADE OF MOST SENIOR DOCTOR TREATING PATIENT ON ARRIVAL

Increasing age correlates with fewer patients being seen by a consultant and a greater likelihood of patients being seen by a doctor at Senior House Officer (SHO) grade (Figure 7.4).

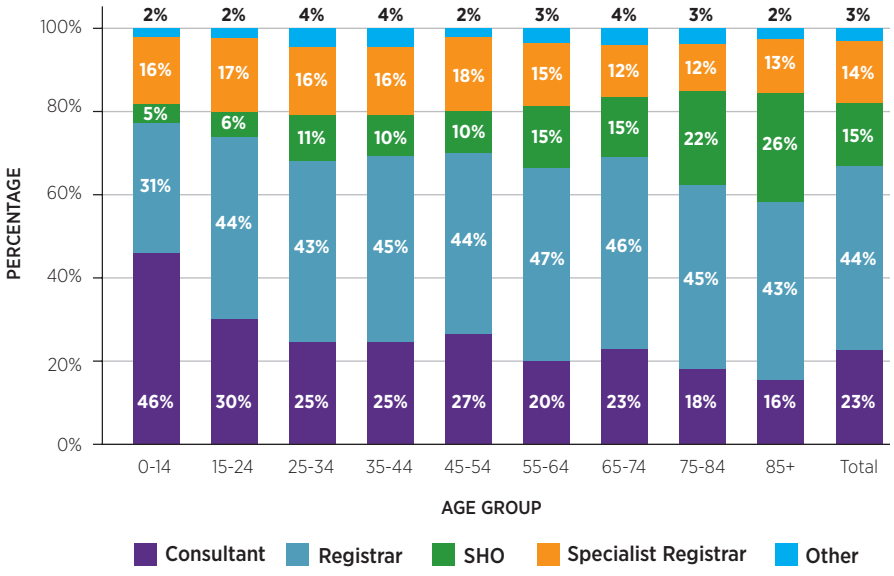


FIGURE 7.4: GRADE OF MOST SENIOR DOCTOR TREATING PATIENT ON ARRIVAL BY AGE GROUP (n=4735)*

* Please note: Percentages may not sum to 100% due to rounding.
[8] 1,628 is the total number of patients with an ISS higher than 15; data were not captured surrounding the presentation at the initial hospital for 117 patients.

TIME TO SEE PATIENTS ON ARRIVAL AT HOSPITALS

Patient outcomes are better when they are seen by senior clinicians in a timely manner. Currently only 9% (n=433) of major trauma patients are documented as having been reviewed by a consultant within thirty minutes of arrival to ED.

TABLE 7.2: MOST SENIOR DOCTOR SEEING THE PATIENT IN THE ED AND THOSE WITH AN ISS >15

	Most senior doctor seeing patient on arrival in the ED <30mins (n=4735)	Most senior doctor seeing patient in the ED after arrival (n=4735)	Most senior doctor seeing patient on arrival with ISS>15 in the ED <30mins (n=1511)	Most senior doctor seeing patient in the ED with ISS>15 after arrival (n=1511)
Consultant	433 (9%)	1081 (23%)	252 (17%)	493 (33%)
Associate specialist	0 (-)	7 (0%)	0 (-)	<5 (0%)
Specialist registrar	<5 (0%)	684 (14%)	0 (-)	236 (16%)
Registrar	285 (6%)	2086 (44%)	132 (9%)	584 (39%)
SHO	1091 (23%)	729 (15%)	411 (27%)	159 (11%)
Intern	244 (5%)	<5 (0%)	68 (5%)	0 (-)
Other (not recorded)	1 (0%)	16 (0%)	0 (-)	<5 (0%)
Detail not captured at timepoint	2670 (56%)	129 (3%)	648 (43%)	36 (2%)

According to Best Practice Tariff figures for major trauma patients in the UK, 92% of patients are seen by a Consultant on arrival in Major Trauma Centres and overall in the system, 63% of patients are seen by a Consultant led trauma team (Moran et al, 2018).

SURGERY

In 2017, 2264 surgeries were recorded out of all submissions (n=5787). Some patients will have multiple surgeries. Other patients may have surgery at more than one hospital and therefore will generate more than one submission. There were 1537 surgeries at the first hospital to which the patient was brought; a further 727 surgeries were performed at the hospital to which the patients were transferred. The most common type of surgery performed was limb surgery (57%, n=1282).

In recent years there has been a change in the treatment of major trauma patients in relation to some surgeries, for example abdominal surgery (3%, n=73) is becoming a more uncommon treatment as interventional radiologists are increasingly employed to address bleeding of the spleen, liver, pelvis, retroperitoneum and non-compressible vessels. The MTA will work towards reporting the detail of these procedures in future reports.

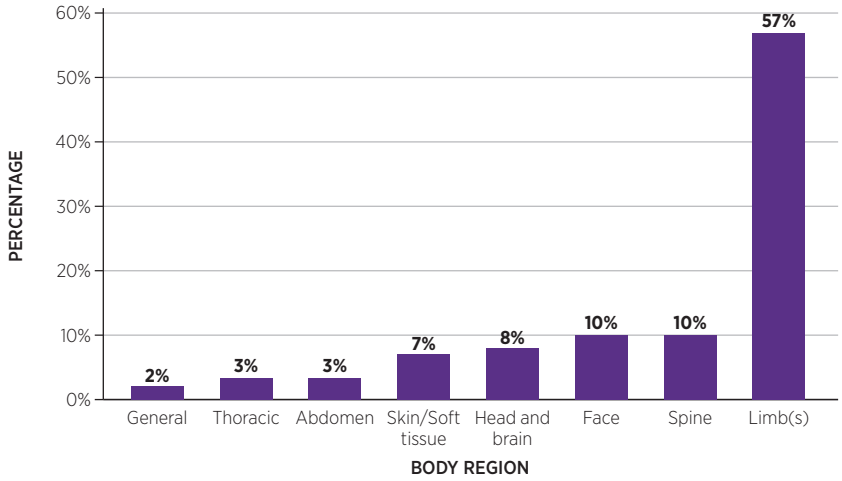


FIGURE 7.5: SURGICAL INTERVENTION BY BODY REGION (n=2264)*

* Please note: Percentages may not sum to 100% due to rounding.

Figure 7.6 shows the breakdown of ISS by the body region on which surgery was performed. Almost all of the patients who had head or brain surgery had an ISS >15 (99%, n=186).

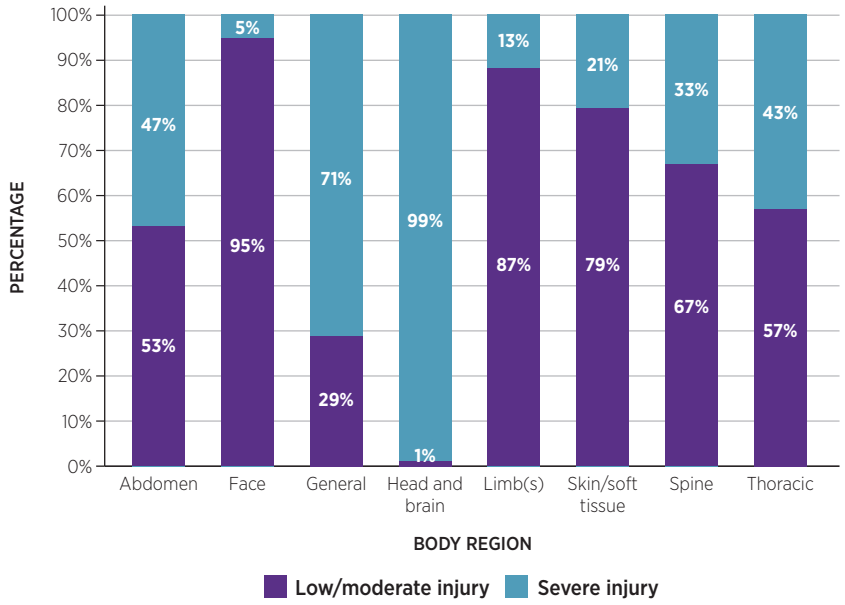


FIGURE 7.6: SURGICAL INTERVENTION BY BODY REGION AND ISS (n=2264)

Figure 7.7 shows the breakdown of gender by body region on which surgery was performed. Men are more likely to have surgery after trauma than women.

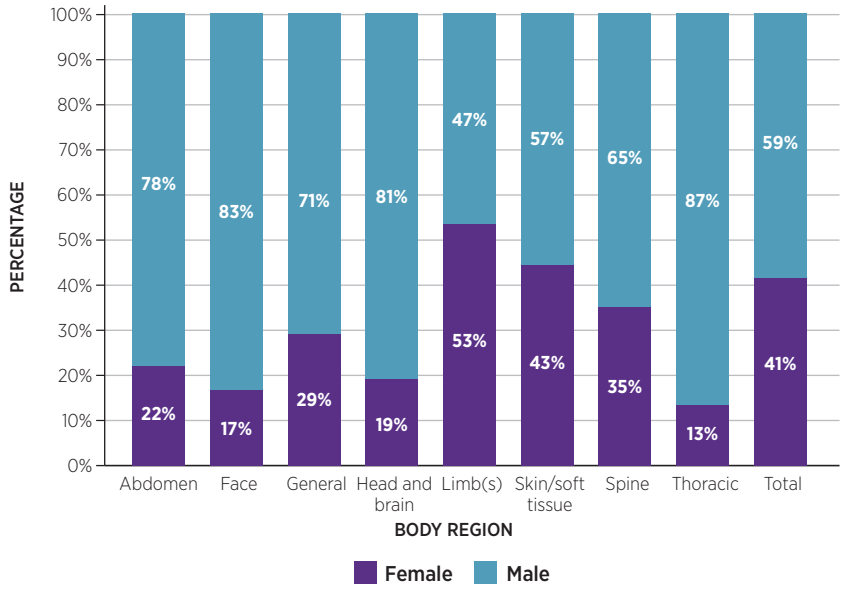


FIGURE 7.7: SURGICAL INTERVENTION BY BODY REGION AND GENDER (n=2264)*

* Please note: Percentages may not sum to 100% due to rounding.

HOSPITAL SYSTEMS PERFORMANCE

The TARN audit is underpinned by clinical standards and systems indicators, which are intended to provide opportunities for learning and quality improvement.

1. AIRWAY MANAGEMENT IN PATIENTS WITH GCS<9

International guidelines use a GCS of <9 as a criterion for the requirement of definitive airway management, i.e. endotracheal or tracheal intubation on arrival at an ED (Royal College of Surgeons of England, 1999).

In 2017, there were 157 patients with a recorded GCS of <9. Of these, 71% (n=112) were documented as being intubated in the ED and 6% (n=9) were documented intubated pre-hospital. Twenty-one per cent (n=33) had 'not known' recorded for their airway support status (Figure 7.8).

It is hoped that the roll-out of TraumaDoc, which captures the intubation process, will improve documentation and data capture in this important aspect of trauma care.

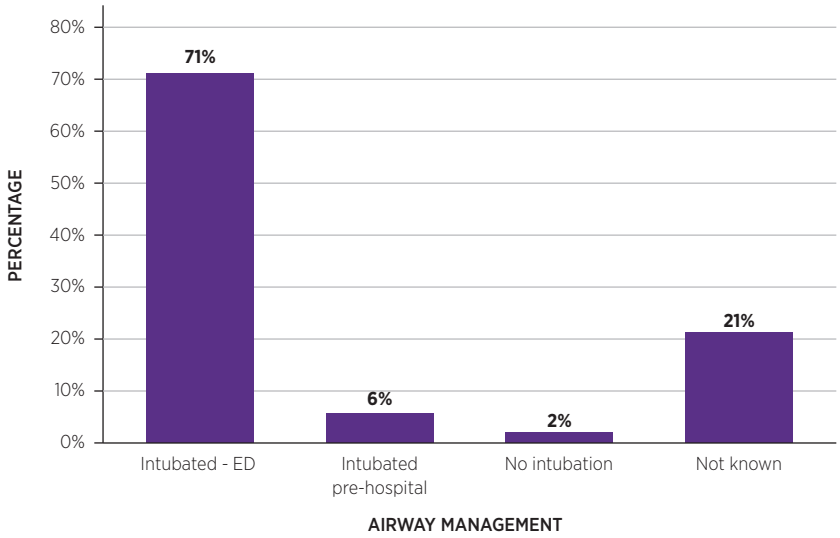


FIGURE 7.8: AIRWAY MANAGEMENT OF PATIENTS WITH A GCS <9 (n=157)*

* Please note: Percentages may not sum to 100% due to rounding.

TRAUMADOC

One of the key recommendations of the Major Trauma Audit National Report 2014–2015 was that "a standardised approach to the documentation of major trauma should be incorporated into current pre-hospital and in-hospital documentation" and that "one of the key factors underpinning the success of an integrated trauma system is high-quality data" (NOCA, 2016). As a quality improvement project, our aim was to develop and implement a comprehensive trauma proforma to facilitate improved documentation and prompt the delivery of time-critical actions.

TraumaDoc captures relevant data from the ambulance pre-alert, pre-hospital care, arrival in the ED, primary survey, secondary survey, interventions, diagnostics, medications, allergies, and past medical history. Co-designed with the end-users, it includes a series of body maps and tick boxes to ensure the production of efficient and accurate clinical documentation. This unique proforma follows the Advance Trauma Life Support (ATLS) principles in relation to trauma care and is underpinned by the standards set out in the Major Trauma Audit. These include: the use of TXA (tranexamic acid); ensuring that the most senior doctor reviews patients with an Injury Severity Score (ISS) >15; and ensuring that patients with a Glasgow Coma Scale (GCS) <9 have definitive airway management, etc. Prior to the implementation of TraumaDoc, a review of our trauma clinical documentation revealed poor records, thus presenting challenges to accurate TARN (Trauma Audit & Research Network) data capture. Analysis of data documentation post-introduction of our Trauma Proforma has indicated an improvement in data capture. Documentation of team members increased from 15% to 100%. One hundred per cent of patients received TXA when indicated, and GCS was documented in 100% of cases. Time to definitive airway management was complete in 100% of cases.

The proforma is in use in St James's Hospital, Cork University Hospital, St Vincent's University Hospital and the Mater Misericordiae University Hospital.

TraumaDoc became the first Irish quality improvement project to win the UK TARN Improvements in Care Award 2018. It also received the NOCA 'Quality Improvement Champion' Award in 2018. An article on TraumaDoc has been published in the peer-reviewed medical journal, Trauma. In October 2018, TraumaDoc was endorsed by the Irish Association for Emergency Medicine (IAEM) as the national trauma proforma, and it is currently being rolled out to all trauma-receiving emergency departments in Ireland.

Dr Shane Broderick and Alison Reynolds

2. MANAGEMENT OF SHOCKED PATIENTS

Patients with blunt trauma admitted with a systolic blood pressure of less than 110 mmHg have a significantly increased risk of mortality (Hasler et al., 2011). The crude survival rate does not attempt to adjust for differences in age, gender, comorbidities, etc. which contribute to survival. A total of 549 shocked patients were recorded in 2017, representing 11% of all MTA patients. Of those, 91% (n=499) survived and 9% (n=50) died (Figure 7.9).

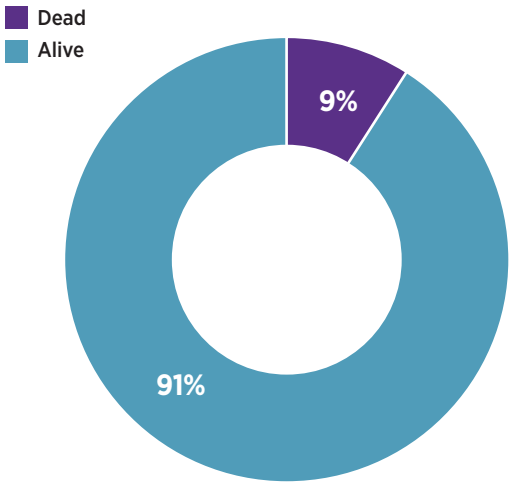


FIGURE 7.9: SURVIVAL OF SHOCKED PATIENTS (n=549)*

* Please note: Percentages may not sum to 100% due to rounding.

3. TIME TO CT FOR HEAD INJURY PATIENTS TO INITIAL TREATING HOSPITAL

Head injury patients with an initial GCS of <13 should have a CT head scan within one hour of admission to hospital (NICE, 2014). In 2017, of the 298 patients who required a CT (having head injuries and an initial GCS of <13), 41% (n=122) received it within one hour (Figure 7.10)[7]. This is based on the patients presentation to the initial treating hospital. The median time to CT scan was 1.2 hours (interquartile range (IQR) 0.7–2.2 hours).

Although there is considerable variance demonstrated at hospital level, rapid access pathways have been established in some hospitals and appear to facilitate more patients meeting this target (Figure 7.10A).

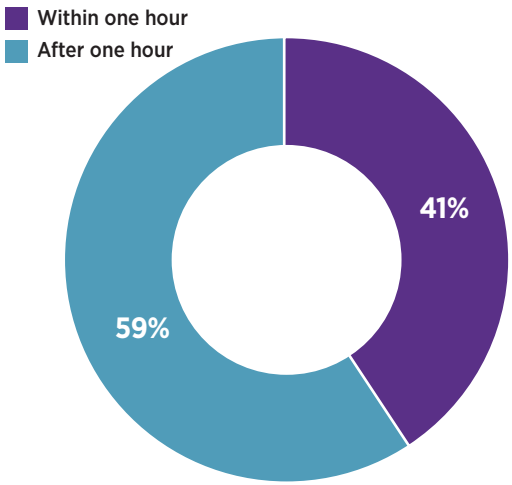


FIGURE 7.10: PERCENTAGE OF PATIENTS TO RECEIVE A CT SCAN WITHIN ONE HOUR (n=298)*[9]

According to Best Practice Tariff figures for major trauma patients in the UK, 92% of patients with head injury and GCS<13 who are seen in a Major Trauma Centre have a CT scan within 30 minutes of arrival (Moran et al, 2018).

* Please note: Percentages may not sum to 100% due to rounding.
[9] 14 patients did not have time to CT recorded

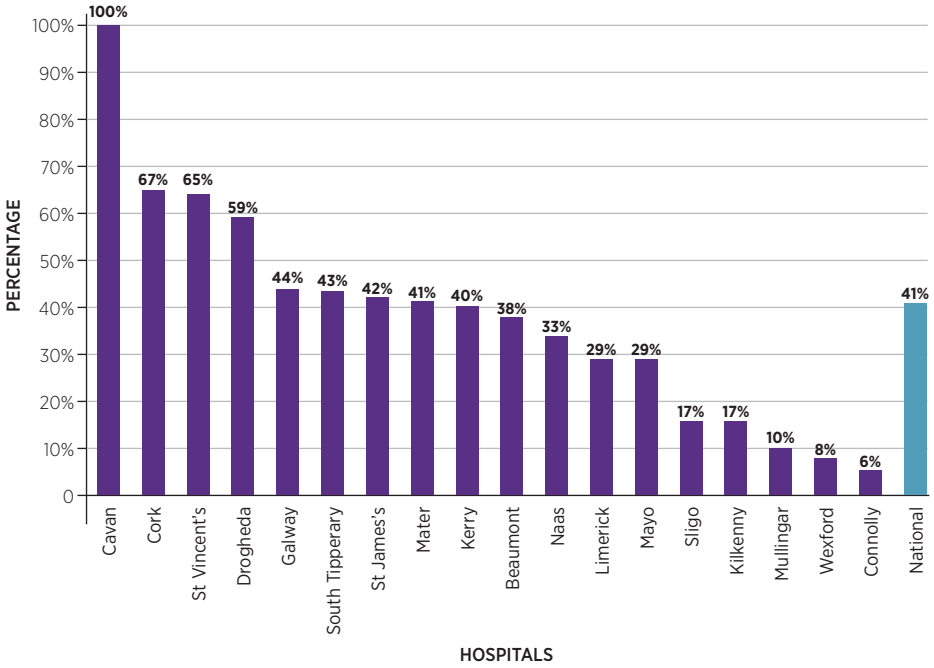


FIGURE 7.10A: PROPORTION OF ELIGIBLE PATIENTS RECEIVING CT SCAN WITHIN ONE HOUR WITH A GCS <13 BY HOSPITAL (n=298)*

* Please note: Percentages may not sum to 100% due to rounding and hospitals with less than 5 cases are excluded from hospital comparison graphs

4. INTENSIVE CARE UNIT ADMISSION

Patients sustaining major trauma are admitted to a critical care service for many reasons, including ongoing resuscitation, organ support and/or closer monitoring. Critical care encompasses both intensive care and high dependency care. In practice, level 2 is high dependency (HDU) and level 3 is intensive care (ICU) level of critical care (National Standards for Adult Critical Care Services, 2011). The length of stay (LOS) in an ICU can be influenced by the availability of ICU beds, the needs of the patient and/or the availability of step-down beds.

Table 7.3 shows that 17% (n=840) of MTA submissions were admitted to an ICU, with a median LOS in the unit of three days for all submissions. Some patients generate multiple MTA submissions during their patient journey, as they are transferred between hospitals. The MTA should be used to inform national ICU bed capacity requirements.

Figure 7.11 shows the median ICU LOS by hospital. There is variation in median length of ICU stay at hospital level, as illustrated by Figure 7.11. Demand for ICU beds varies, as some hospitals offer a national services . Figure 7.11A shows the number of ICU bed days occupied by hospital in 2017, which ranges from 12 days to 1,670 days.

TABLE 7.3: ICU LENGTH OF STAY (LOS)

	ICU LOS FOR ALL MTA PATIENTS	ICU LOS FOR MTA PATIENTS (ISS>15)	ICU LOS FOR MTA PATIENTS WITH SEVERE TBI
N	880	540	196
Median (IQR)	3 (1-7)	4 (1-9)	4 (1-11)
ICU bed days	5187	3898	1403

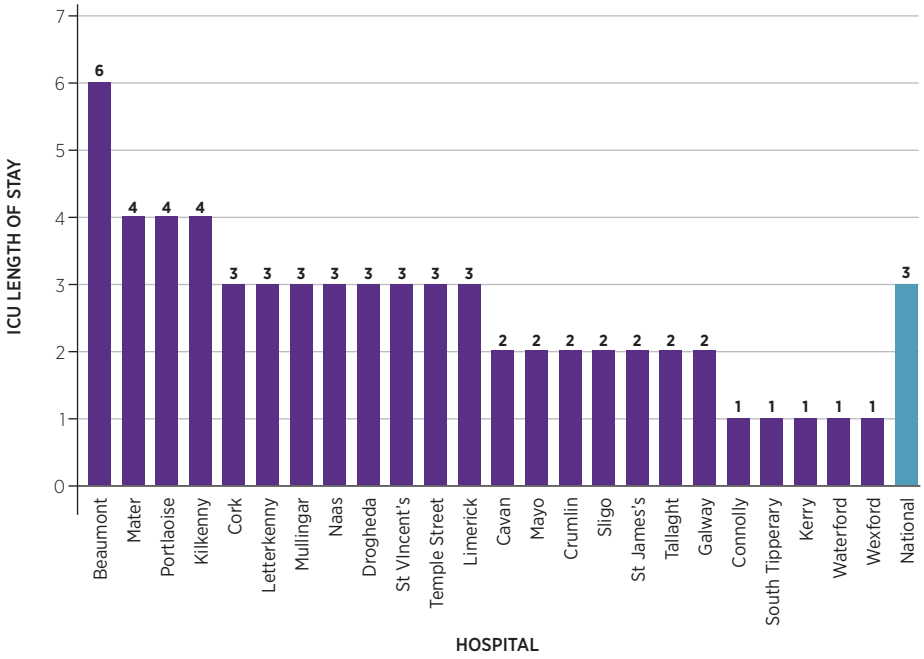


FIGURE 7.11: MEDIAN ICU LOS BY HOSPITAL (n=880)*

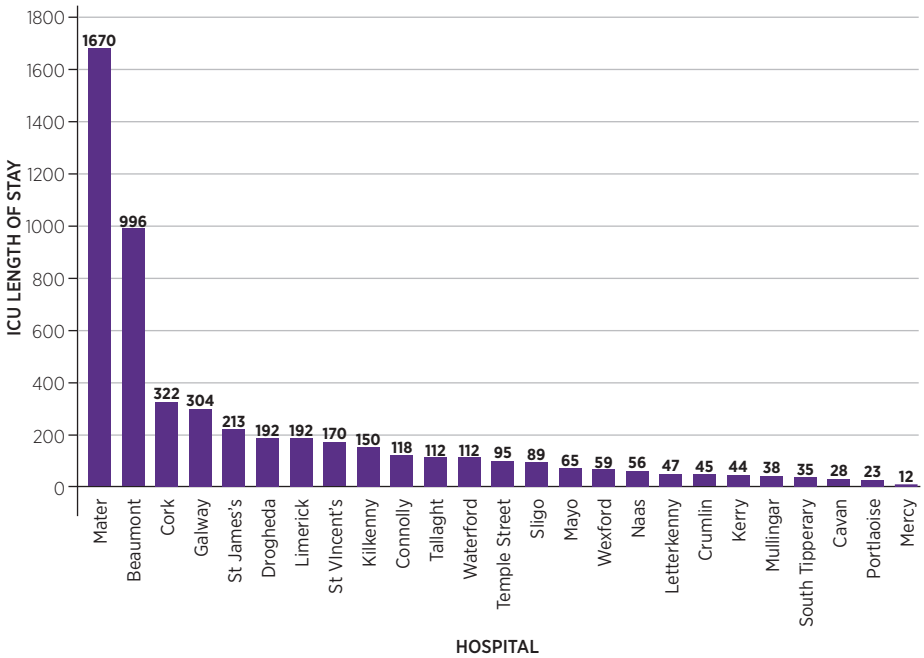


FIGURE 7.11A: TOTAL NUMBER OF ICU BED DAYS OCCUPIED PER HOSPITAL*

* Please note: Percentages may not sum to 100% due to rounding and hospitals with less than 5 cases are excluded from hospital comparison graphs

5. HOSPITAL LENGTH OF STAY

Hospital LOS for trauma patients is dependent on the nature and severity of the injuries sustained, the baseline health of the patient, the efficiency of the hospital in delivering care and the ability of the hospital to discharge the patient to an appropriate setting when they have recovered. Access to rehabilitation, step-down facilities, and home and community supports influence the LOS at the acute hospital for severely injured patients. The median LOS for all major trauma patients was nine days (Table 7.4). Figure 7.12 shows the median LOS for major trauma patients by age group, and demonstrates that the LOS increases with age. There is variation in median LOS at hospital level, as illustrated by Figure 7.12A. Capacity and demand vary considerably at hospital level. Figure 7.12B shows the number of bed days occupied by hospital, which ranges from 127 days to 9,701 days in 2017. A total of 82,930 hospital bed days were occupied by major trauma patients in 2017.

TABLE 7.4: HOSPITAL LENGTH OF STAY (LOS) FOR MAJOR TRAUMA PATIENTS

Median LOS for all major trauma patients	(IQR) 9 (5–18)
Median LOS for major trauma patients with an ISS >15	(IQR) 10 (5–22)

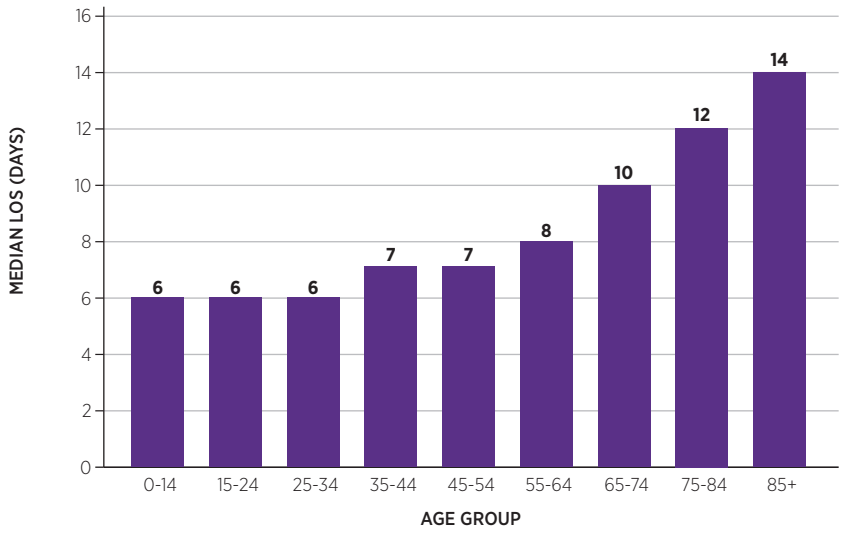


FIGURE 7.12: HOSPITAL LOS BY AGE GROUP (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

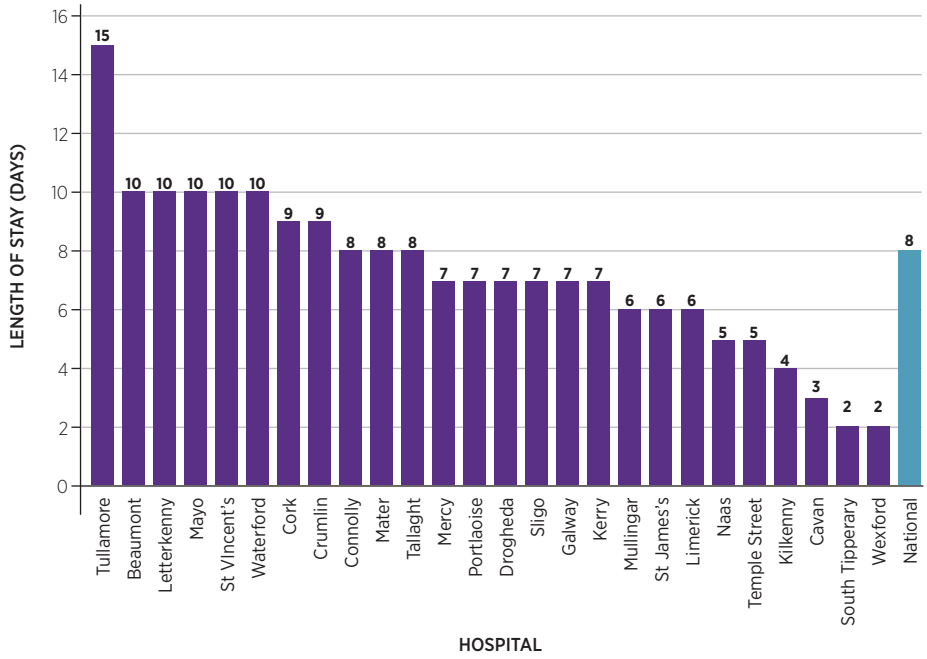


FIGURE 7.12A: MEDIAN LOS BY HOSPITAL (n=5787)*

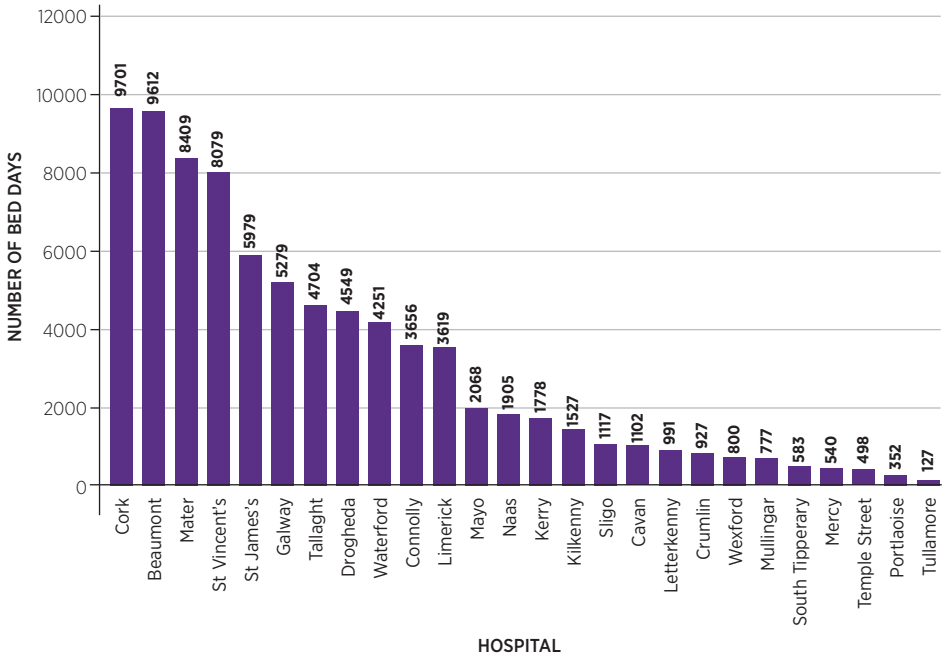


FIGURE 7.12B: TOTAL NUMBER OF BED DAYS OCCUPIED PER HOSPITAL*

* Please note: Percentages may not sum to 100% due to rounding.

CHAPTER 8
OUTCOMES

CHAPTER 8

OUTCOMES

This chapter will describe the outcomes of major trauma patients in terms of mortality, discharge destination and case-mix-standardised rate of survival.

MORTALITY

Mortality is a crude measure of quality of care in major trauma patients; quality of survival and return to independent living is a far more patient centred measure. NOCA MTA is working towards developing these outcome measures. That said, in 2017, 5% (n=269) of patients were recorded as having died during their hospital admission.

MORTALITY AND AGE

In 2017, there were 269 patients who died from their injuries after arrival at hospital. The highest proportion of deaths occurred in patients who were aged 75 years and older (Figure 8.1).

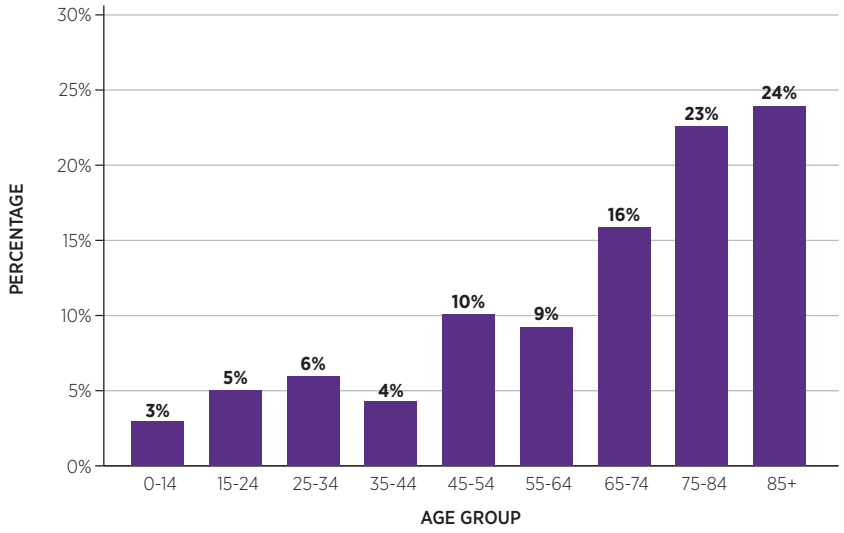


FIGURE 8.1: MORTALITY BY AGE GROUP (n=269)*

* Please note: Percentages may not sum to 100% due to rounding.

MORTALITY BY GENDER AND AGE

In Figure 8.2, the percentage of deaths by age band and gender is shown. The highest percentage of deaths continues to occur in males.

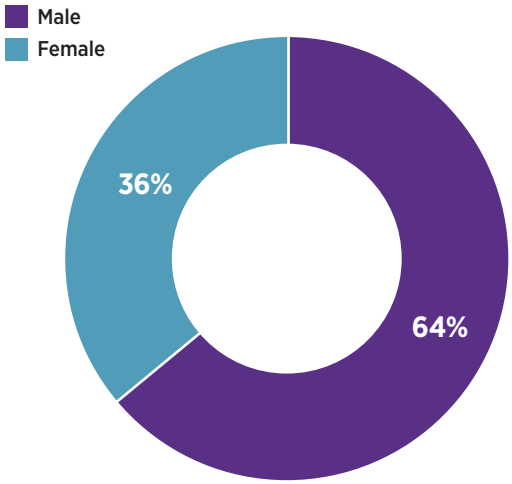


FIGURE 8.2: MORTALITY BY GENDER (n=269)*

* Please note: Percentages may not sum to 100% due to rounding.

MORTALITY BY MECHANISM OF INJURY

The highest proportion of deaths continues to be attributable to falls less than 2 m (57%) (Figure 8.3). Figure 8.3A shows that the leading causes of mortality in major trauma patients in the younger age groups are 'other' (which may refer to asphyxiation, drowning, or amputation) and road trauma. As age increases, the predominant mechanism of injury for those who died in 2017 was low falls.

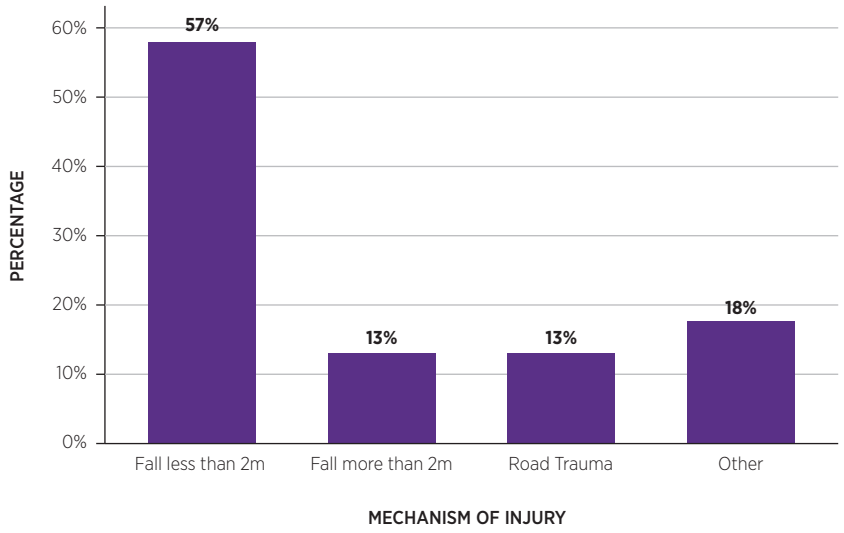


FIGURE 8.3: MORTALITY BY MECHANISM OF INJURY (n=269)*

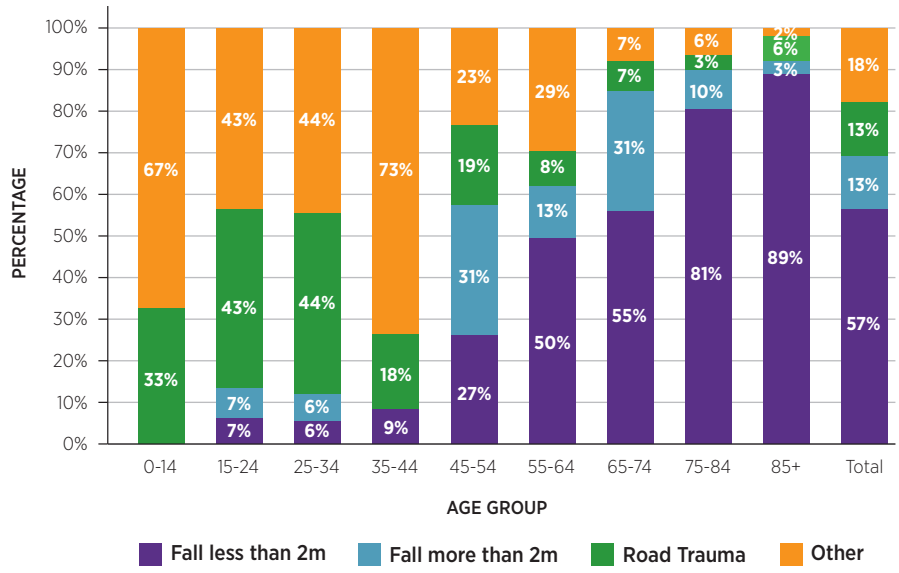


FIGURE 8.3A: MORTALITY BY MECHANISM OF INJURY AND AGE GROUP (n=269)*

* Please note: Percentages may not sum to 100% due to rounding.

MORTALITY BY ISS

Of those patients who died in 2017, 76% (n=205) had an ISS of greater than 15, indicating severe injury (Figure 8.4).

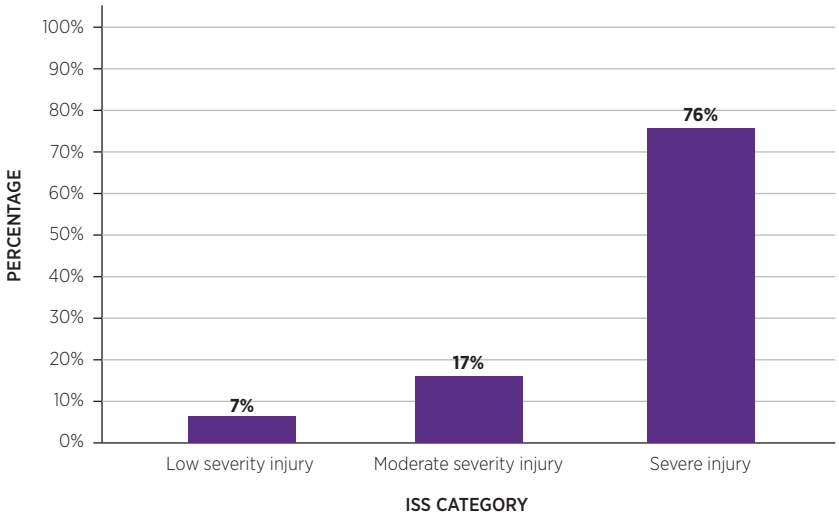


FIGURE 8.4: MORTALITY BY ISS CATEGORY (n=269)*

* Please note: Percentages may not sum to 100% due to rounding.

MORTALITY BY BODY REGION INJURED

Figure 8.5 shows that head injuries were the predominant cause of death in 52% of all major trauma patients who died in 2017.

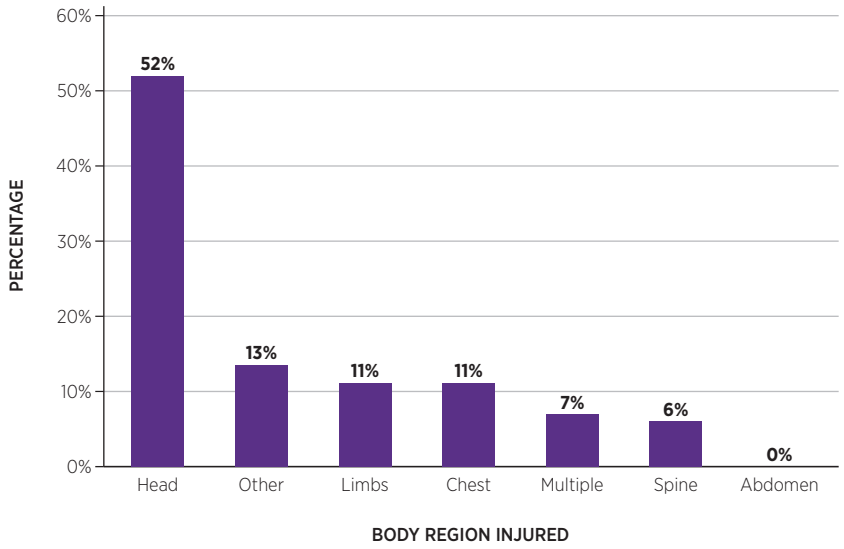


FIGURE 8.5: MORTALITY BY BODY REGION MOST SEVERLY INJURED (n=269)*

* Please note: Percentages may not sum to 100% due to rounding.

DISCHARGE DESTINATION

Figure 8.6 shows that 60% (n=3015) of major trauma patients were discharged directly home from hospital. Thirteen per cent (n=658) were discharged to a nursing home, an increase of 2% from the *MTA National Report 2016*, and 9% (n=436) were discharged to a rehabilitation setting.

Younger patients were more likely to be discharged home, whereas a higher proportion of older patients were discharged to either a rehabilitation setting or long-term care (Figure 8.6A).

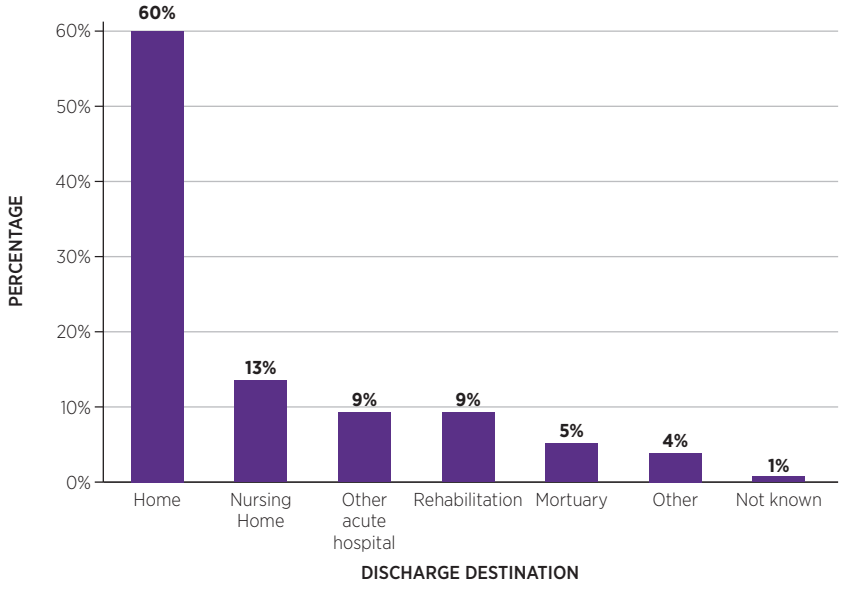


FIGURE 8.6: DISCHARGE DESTINATION (N=5061)*

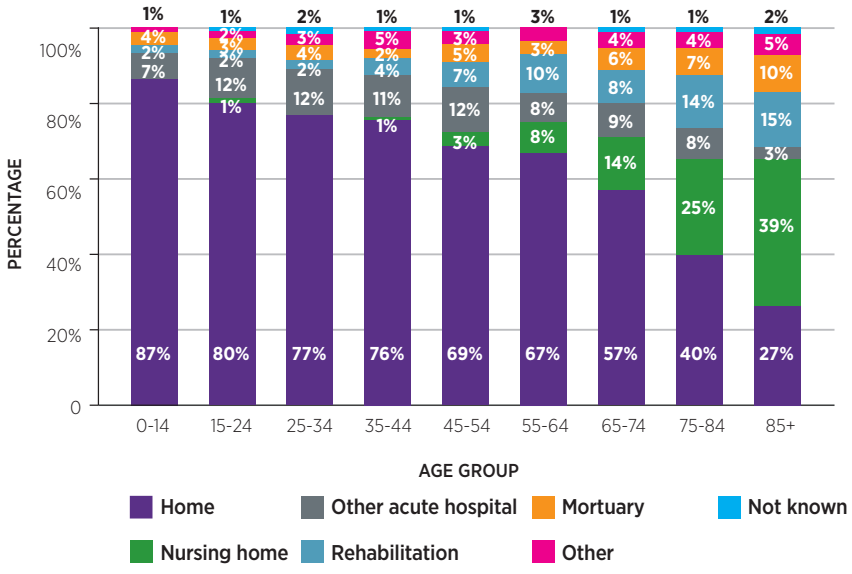


FIGURE 8.6A: DISCHARGE DESTINATION BY AGE GROUP (N=5061)*

* Please note: Percentages may not sum to 100% due to rounding.

RISK-ADJUSTED BENCHMARKING: CASE-MIX-STANDARDISED RATE OF SURVIVAL FOR IRELAND, 2017

Risk adjustment is a process that allows data to be compared by adjusting for confounding factors (i.e. age, gender, severity of injury, pre-existing comorbidities and GCS) that influence the outcome. Within TARN, this is done at an individual patient level as well as at a hospital level. From approved TARN submissions, a risk-adjusted survival rate was calculated for Ireland for 2017. This was based on all approved submissions from participating hospitals and was adjusted for case mix. This risk-adjusted survival rate is referred to as the Ws value.

Ireland's Ws value of 1.15 (95% CI, 0.53–1.78) (Table 8.1) means that for every 100 major trauma patients treated in Ireland, there are 1.15 more survivors than the TARN statistical model predicts (Bouamra et al., 2015).

TABLE 8.1: CASE-MIX-STANDARDISED RATE OF SURVIVAL FOR IRELAND, 2017

PS Band	n	Survivors	Expected Survivors	W	TARN Fraction	Ws	95% CI
95 - 100	3304	3282	3259.36	0.69	0.67	0.46	
90 - 95	705	672	654.99	2.41	0.16	0.37	
80 - 90	429	387	369.23	4.14	0.08	0.35	
65 - 80	176	139	129.64	5.32	0.04	0.20	
45 - 65	96	54	53.67	0.35	0.02	0.01	
25 - 45	67	12	23.93	-17.80	0.02	-0.28	
0 - 25	42	7	5.80	2.87	0.01	0.04	
Total	**4819**	**4553**	**4496.62**	**1.17**		**1.15**	**(0.53-1.78)**

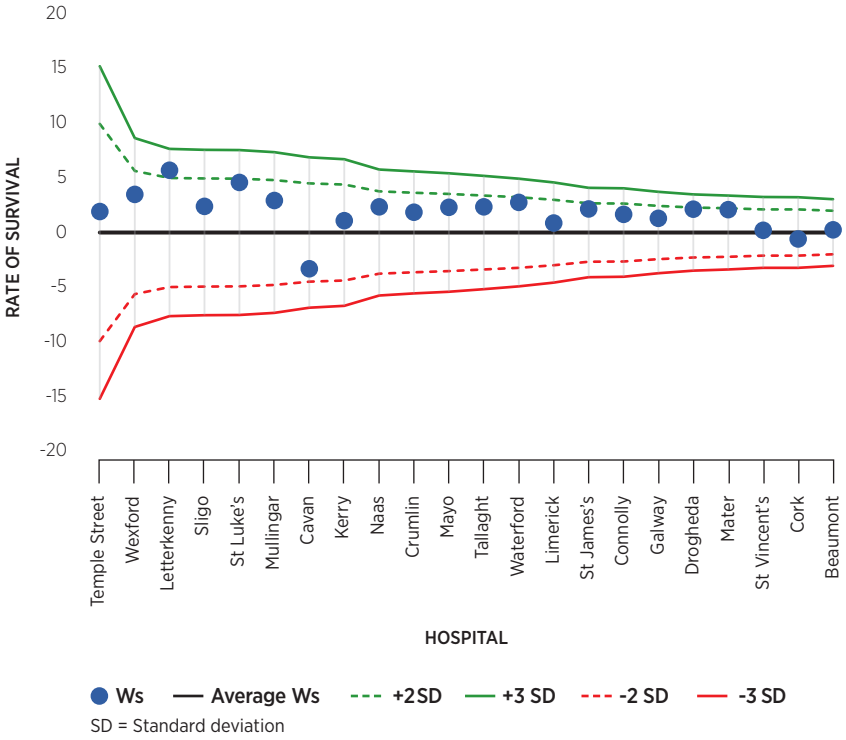
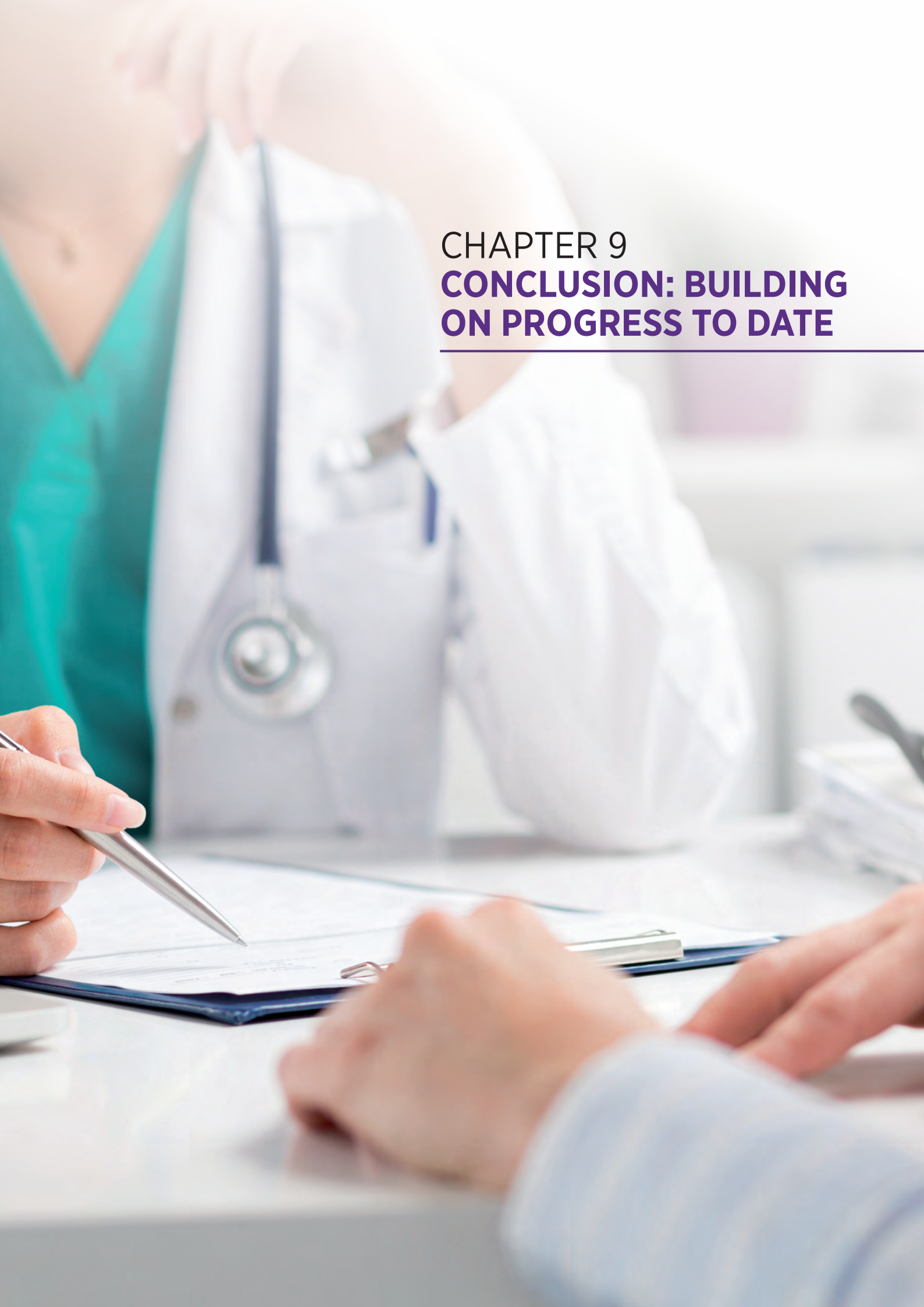


FIGURE 8.7: IRISH HOSPITALS' WS SCORES, 2017

Note: Patients who died at or were discharged from a hospital are eligible for Ws calculations. Patients who were transferred out from a hospital and not readmitted are included in the receiving (final) hospital's Ws.

The hospital Ws score is calculated where there are more than 50 approved TARN submissions for that hospital, but becomes more reliable as more cases are added. In 2017, 22 hospitals with more than 50 approved submissions were included. The number of discharges ranged from 9 to 601 per hospital, with 14 hospitals having less than 200 approved submissions (Figure 8.7). The chart shows the individual hospitals position in relation to the average Ws score e.g. whether the hospital is +2 SD (two standard deviations above) or – 3SD (minus three standard deviations below).

Risk-adjusted survival does not take account of the potential high personal and societal costs when patients are delayed or prevented from returning to their pre-trauma functional status or quality of life. Functional and quality-of-life patient outcomes should be incorporated into the MTA. In Victoria, Australia, a structured telephone questionnaire is used to measure functional and quality-of-life outcomes at 6, 12 and 24 months post-discharge. Information about functional ability and health-related quality of life is collected during the interviews (State of Victoria, Department of Health and Human Services, 2016). Similarly TARN was commissioned by National Health Service Executive (NHSE) in 2014 to run a 12 month pilot in all of the major trauma centres in England. This involved providing an in-hospital questionnaire given to the patient and then a questionnaire is posted out at six months post injury. NOCA is working towards developing a methodology for capturing functional and quality of life patient centred outcomes.



CHAPTER 9
CONCLUSION: BUILDING ON PROGRESS TO DATE

CHAPTER 9

CONCLUSION: BUILDING ON PROGRESS TO DATE

Robust MTA data are now available that allow national and international comparisons to be made regarding the quality of trauma care being delivered across hospitals in Ireland. As we move towards an inclusive, integrated trauma system where patients will bypass certain hospitals to be treated at hospitals with the necessary services, it is vital that quality data exist to assure the public that the extra distance and inconvenience is associated with better outcomes and improved safety.

The TARN report *Major Trauma in Older People* (2017) highlights the changing face of major trauma, from the young person with an injury involving high energy transfer to the older person with an injury involving low energy transfer. The impact of the ageing population is reflected in the increased complexity of comorbidities seen through the 10-year age bands, and in the prevalence of low falls as the mechanism of injury. Some would argue that trauma has now become a 'new disease' and is very different from its origins as a surgical disease. Orthopaedic surgeons are now required to manage fractures in a more fragile population, and the low rate of laparotomy use among general surgeons highlights the challenge of skill retention as well as the role of the interventional radiologist in stopping bleeding. There is a need for a multidisciplinary approach to trauma, including trauma physicians and allied health specialists, in order to bring about optimal outcomes for injured patients, in particular older patients with complex medical needs, and to achieve an efficient hospital length of stay.

There is an urgent requirement for a population-based injury prevention strategy around low falls, particularly in the home. How can we improve home safety in order to reduce this burden of injury? What cultural and societal initiatives are required to allow older people to avoid injury due to low falls, and would these be acceptable to older people and their families? How can we optimise the roll-out and effectiveness of interventions being delivered through 'falls clinics', including polypharmacy avoidance? Road trauma brought with it horrific images of carnage, death and destruction that motivated the engineering, policing and societal initiatives that have paid dividends in injury prevention. Low falls are perhaps more notable for their insidious nature and their lack of dramatic imagery, but they are having a devastating impact on older persons' lives. The MTA will seek out opportunities to collaborate with healthcare partners such as the Government-led Healthy Ireland (hi) programme and the HSE AFFINITY National Falls and Bone Health Project (2018–2023) in an effort to reduce the number one cause of major trauma in Ireland.

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APPENDICES

APPENDIX 1: INCLUSION CRITERIA

The decision to include a patient should be based on the following 3 points:
1. ALL TRAUMA PATIENTS IRRESPECTIVE OF AGE
2. WHO FULFIL ONE OF THE FOLLOWING LENGTH OF STAY CRITERIA

DIRECT ADMISSIONS	PATIENTS TRANSFERRED IN
Trauma admissions whose length of stay is 3 days or more OR Trauma patients admitted to a High Dependency Area regardless of length of stay OR Deaths of trauma patients occurring in the hospital including the Emergency Department (even if the cause of death is medical) OR Trauma patients transferred to other hospital for specialist care or for an ICU/HDU bed.	Trauma patients transferred into your hospital for specialist care or ICU/HDU bed whose combined hospital stay at both sites is 3 days or more OR Trauma admissions to a ICU/HDU area regardless of length of stay OR Trauma patients who die from their injuries (even if the cause of death is medical) *Patients transferred in for rehabilitation only should not be submitted to TARN.*

3. AND WHOSE ISOLATED INJURIES MEET THE FOLLOWING CRITERIA

BODY REGION OR SPECIFIC INJURY	INCLUDED – IN ISOLATION (EXCEPT WHERE SPECIFIED)	EXCLUDED – IN ISOLATION (EXCEPT WHERE SPECIFIED)
HEAD	All brain or skull injuries	LOC or injuries to scalp
THORAX	All internal injuries	
ABDOMEN	All internal injuries	
SPINE	Cord injury, fracture, dislocation or nerve root injury.	Spinal strain or sprain.
FACE	Fractures documented as: Significantly Displaced, open, compound or comminuted. All Lefort fractures All panfacial fractures. All Orbital Blowout fractures	Fractures documented as Closed and simple or stable.
NECK	Any Organ or vascular injury or hyoid fracture	Nerve Injuries Skin Injuries
FEMORAL FRACTURE	All Shaft, Distal, Head or Subtrochanteric fractures, **regardless of Age.** Isolated Neck of Femur or Inter/ Greater trochanteric fractures **<65 years old**	Isolated Neck of femur or Inter/Greater trochanteric fractures ≥ **65 years.**
FOOT OR HAND: JOINT OR BONE	Crush or amputation only.	Any fractures &/or dislocations, even if Open &/or multiple
FINGER OR TOE	None	All injuries to digits, even if Open fractures, amputation or crush &/or multiple injuries.

BODY REGION OR SPECIFIC INJURY	INCLUDED – IN ISOLATION (EXCEPT WHERE SPECIFIED)	EXCLUDED – IN ISOLATION (EXCEPT WHERE SPECIFIED)
LIMB – BELOW KNEE (EXCEPT FEET/TOES)	Any Open injury. Any 2 limb fractures &/or dislocations.	Any Closed unilateral injury fractures, (including multiple closed fractures & or dislocations or the same limb)
LIMB – BELOW KNEE (EXCEPT FEET/TOES)	Any Open injury. Any 2 limb fractures &/or dislocations.	Any Closed unilateral injury fractures, (including multiple closed fractures & or dislocations or the same limb)
PELVIS	All isolated fractures to Ischium, Sacrum, Coccyx, Ileum, acetabulum. Multiple pubic rami fractures. Single pubic rami fracture <65 years old. Any fracture involving SIJ or Symphysis pubis.	Single pubic rami fracture >65 years old.
NERVE	Any injury to sciatic, facial, femoral or cranial nerve.	All other nerve injuries, single or multiple.
VESSEL	All injuries to femoral, neck, facial, cranial, thoracic or abdominal vessels. Transection or major disruption of any other vessel.	Intimal tear or superficial laceration or perforation to any limb vessel.
SKIN	Laceration or penetrating skin injuries with blood loss >20% (1000mls) Major degloving injury. (>50% body region)	Simple skin lacerations or penetrating injuries with blood loss < 20% (1000mls); single or multiple. Contusions or abrasions: single or multiple. Minor degloving injury. (<50% body region)
BURN	Any full thickness burn or Partial/superficial burn >10% body surface area	Partial or superficial burn <10% body surface area.
INHALATION	All included	
FROSTBITE	Severe frostbite	Superficial frostbite
ASPHYXIA	All	None
DROWNING	All	None
EXPLOSION	All	None
HYPOTHERMIA	Accompanied by another TARN eligible injury	Hypothermia in isolation
ELECTRICAL	All	None

ANATOMICAL INJURY DESCRIPTIONS

INJURY DETAIL

Injury detail is of **paramount importance to any TARN submission**, therefore all injuries sustained by a patient must be recorded on every submission.

Information relating to injuries should be obtained from the following sources: clinician's notes, nursing notes, radiology reports, operative notes, discharge summaries and post mortem reports.

Guidelines to help with injury documentation, record:

- Length, depth or grade of lacerations (especially to internal organs)
- Depth, size and location of haemorrhages and contusions (especially in the brain)
- Open or closed fractures
- Stability & site of fractures (e.g. comminuted/displaced shaft/proximal/distal fracture)
- Articular (joint) involvement (e.g. intra-articular, extra-articular)
- Blood loss
- Vessel damage
- Location & number of rib fractures
- Compression or effacement of ventricles/brain stem cisterns
- Neurology associated with spinal cord injuries
- Instability, blood loss, joint involvement or vascular damage associated with pelvic fractures
- Cardiac arrest associated with asphyxia or drowning

UNCONFIRMED INJURIES

Injuries should only be recorded when the diagnosis is confirmed.
Never record possible, probable or suspected injuries.

RADIOLOGY REPORTS AND POST-MORTEMS

The user should paste a radiology report into the relevant imaging section of any electronic data collection and reporting (EDCR) submission.

When a report is pasted into an EDCR submission, it will automatically appear on the AIS coding section, thus ensuring that the TARN coder has all the information in front of them before assigning AIS codes.

Post mortem results should be used whenever available even if this results in a delay in dispatching your submission.

All injury coding using AIS is done centrally at TARN, but users can see every AIS code issued by TARN by clicking into the AIS coding section once a submission has been approved.

Accurate and detailed injury descriptions will enable a more precise Injury Severity Score and therefore a more accurate Probability of Survival calculation.

ABBREVIATED INJURY SCALE (AIS)

BACKGROUND INFORMATION

A.I.S. was first published in 1969 by the Association for the Advancement of Automotive Medicine (A.A.A.M.). The latest edition (AIS2005) is now available from the AAAM website: www.AAAM..org at cost of $250 per dictionary.

STRUCTURE

- Based on anatomical injury.
- A single AIS score for each injury.
- More than 1500 injuries listed.
- Scores range from 1 to 6, the higher the score the more severe the injury.
- The intervals between the scores are not always consistent e.g. the difference between AIS3 and AIS4 is not necessarily the same as the difference between AIS1 and AIS2.

EXAMPLE AIS CODES

INJURY	NUMERICAL IDENTIFIER	AIS	SEVERITY
Fracture 1 rib	450201	1	Minor
Fractured 2 ribs	450202	2	Moderate
Haemopneumothorax	442205	3	Serious
Bilateral lung lacerations	441450	4	Severe
Bilateral flail chest	450214	5	Critical
Massive chest crush	413000	6	Maximum

CODING STRUCTURE EXPLAINED

BODY REGION	TYPE OF ANATOMICAL STRUCTURE	SPECIFIC ANATOMICAL STRUCTURE	SPECIFIC ANATOMICAL STRUCTURE	LEVEL	LEVEL
4	5	0	2	0	2

AIS
2

All existing codes on the TARN database that were coded with AIS98 (previous version of Dictionary) were successfully mapped to corresponding AIS2005 codes, so continuing comparisons can be made.

APPENDIX 2: MTA GOVERNANCE COMMITTEE

ROLE	NAME
Dr Conor Deasy	Clinical Lead and Chair National Board for Ireland of the College of Emergency Medicine
Ms Louise Brent	NOCA Irish Hip Fracture Database and Major Trauma Audit Manager
Dr Tomás Breslin	Irish Association for Emergency Medicine
Ms Ann Calvert	Emergency Medicine Nursing Interest Group
Mr Darach Crimmins	Royal College of Surgeons in Ireland – Neurosurgery Programme
Ms Marina Cronin	NOCA Head of Quality & Development
Mr Vincent Daly	National Ambulance Service
Ms Rachael Doyle	HSE National Clinical Programme for Older People
Ms Anna Duffy	MTA Audit Coordinator Representative
Mr Gordon Dunne	Senior Accountable Health Manager
Ms Jacqueline Egan	Pre-Hospital Emergency Care Council
Ms Orlaith Ferguson	Public Representative – Sage Advocacy
Dr Joan Fitzgerald	Royal College of Physicians of Ireland – Pathology
Dr Una Geary	National Emergency Medicine Programme Lead
Ms Nora Hourigan	Hospital HIPE Manager
Mr Dara Kavanagh	Royal College of Surgeons in Ireland – General Surgery
Dr Ciara Martin	Paediatric Emergency Medicine
Mr Morgan McMonagle	Royal College of Surgeons in Ireland – Irish Association of Vascular Surgeons
Dr Peter MacMahon	Royal College of Surgeons in Ireland – Faculty of Radiologists
Dr Caroline Mason Mohan	Royal College of Physicians of Ireland – Public Health
Dr Jacinta McElligott	Royal College of Physicians of Ireland – Rehabilitation Medicine
Dr Jeanne Moriarty	Joint Faculty of Intensive Care Medicine of Ireland Nominee – Critical Care
Dr Gerry Lane	Irish Committee for Emergency Medicine Training Chair/Nominee
Dr George Little	National Emergency Medicine Programme Nominee for MTA
Mr Brendan O'Daly	Irish Institute of Trauma and Orthopaedic Surgery – Trauma and Orthopaedic Programme
Ms Rosie Quinn	Therapy Representative
Ms Geraldine Shaw	HSE Office of Nursing and Midwifery Services
Ms Collette Tully	NOCA Executive Director

APPENDIX 3: FREQUENCY TABLES

Figure 4.1: Percentage of MTA patients by gender (N=5061)

	N	%
Female	2120	41.9%
Male	2941	58.1%
Total	5061	100%

Figure 4.1A: Percentage of MTA patients by gender and age group (N=5061)

	FEMALE		MALE		TOTAL	
	N	%	N	%	N	%
0–14	78	34.5%	148	65.5%	226	100.0%
15–24	77	18.8%	333	81.2%	410	100.0%
25–34	83	21.3%	306	78.7%	389	100.0%
35–44	95	20.9%	359	79.1%	454	100.0%
45–54	167	29.8%	394	70.2%	561	100.0%
55–64	375	47.6%	413	52.4%	788	100.0%
65–74	296	42.8%	395	57.2%	691	100.0%
75–84	516	57.7%	378	42.3%	894	100.0%
85+	433	66.8%	215	33.2%	648	100.0%
Total	2120	41.9%	2941	58.1%	5061	100.0%

Figure 4.2 CCI score of MTA patients (N=5061)

	N	%
No significant pre-existing comorbidities	2357	46.6%
Mild comorbidities (1–5)	1939	38.3%
Moderate comorbidities (6–10)	576	11.4%
Severe comorbidities (>10)	150	3.0%
Not recorded	39	0.8%
Total	5061	100%

Figure 4.2A: CCI score of MTA patients by age group (N=5061)

AGE GROUP	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
No Pre-existing comorbidities	200	88.5%	335	81.7%	282	72.5%	285	62.8%	299	53.3%
Mild comorbidities (1–5)	15	6.6%	71	17.3%	94	24.2%	147	32.4%	206	36.7%
Moderate comorbidities (6–10)	<5	0.9%	<5	0.2%	6	1.5%	15	3.3%	26	4.6%
Severe comorbidities (>10)	0	0.0%	0	0.0%	<5	0.5%	7	1.5%	23	4.1%
Not recorded	9	4.0%	3	0.7%	5	1.3%	0	0.0%	7	1.2%
Total	226	100.0%	410	100.0%	389	100.0%	454	100.0%	561	100.0%
AGE GROUP	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
No Pre-existing comorbidities	367	46.6%	239	34.6%	223	24.9%	127	19.6%	2357	46.6%
Mild comorbidities (1–5)	318	40.4%	314	45.4%	446	49.9%	328	50.6%	1939	38.3%
Moderate comorbidities (6–10)	71	9.0%	106	15.3%	182	20.4%	167	25.8%	576	11.4%
Severe comorbidities (>10)	27	3.4%	28	4.1%	40	4.5%	23	3.5%	150	3.0%
Not recorded	5	0.6%	<5	0.6%	<5	0.3%	<5	0.5%	39	0.8%
Total	788	100.0%	691	100.0%	894	100.0%	648	100.0%	5061	100.0%

Figure 4.3: Mechanism of injury (N=5061)

	N	%
Blow(s)	463	9.1%
Burn	75	1.5%
Crush	40	0.8%
Fall less than 2 m	2861	56.5%
Fall more than 2 m	578	11.4%
Other	122	2.5%
Stabbing	64	1.3%
Vehicle incident/collision	858	17.0%
Total	5061	100.00%

Figure 4.3A: Mechanism of injury by age group (N=5061)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Blow(s)	27	11.9%	114	27.8%	103	26.5%	84	18.5%	49	8.7%
Fall less than 2 m	86	38.1%	66	16.1%	62	15.9%	100	22.0%	243	43.3%
Fall more than 2 m	23	10.2%	42	10.2%	51	13.1%	69	15.2%	110	19.6%
Road trauma	45	19.9%	144	35.1%	131	33.7%	145	31.9%	125	22.3%
Other	45	19.9%	44	10.7%	42	10.8%	56	12.3%	34	6.1%
Total	226	100.0%	410	100.0%	389	100.0%	454	100.0%	561	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Blow(s)	51	6.5%	21	3.0%	11	1.2%	3	0.5%	463	9.1%
Fall less than 2 m	497	63.1%	468	67.7%	745	83.3%	594	91.7%	2861	56.5%
Fall more than 2 m	106	13.5%	100	14.5%	57	6.4%	20	3.1%	578	11.4%
Road trauma	104	13.2%	74	10.7%	64	7.2%	26	4.0%	858	17.0%
Other	30	3.8%	28	4.1%	17	1.9%	5	0.8%	301	5.9%
Total	788	100.0%	691	100.0%	894	100.0%	648	100.0%	5061	100.0%

Figure 4.4: Injuries sustained by body region (N=7481)

	N	%
All head injuries	**1357**	**18.1%**
Severe head injuries	1155	85.1%
Isolated severe head injuries	624	54.0%
Severe head injuries and other associated injuries	531	46.0%
All face injuries	**624**	**8.3%**
Severe face injuries	10	1.6%
Isolated severe face injuries	5	50.0%
Severe face injuries and other associated injuries	5	50.0%
All limb injuries	**1869**	**25.0%**
Severe limb injuries	1126	60.3%
Isolated severe limb injuries	920	81.7%
Severe limb injuries and other associated injuries	206	18.3%
All spinal injuries	**1289**	**17.2%**
Severe spinal injuries	646	50.1%
Isolated severe spinal injuries	396	61.3%
Severe spinal injuries and other associated injuries	250	38.7%
All pelvic injuries	**630**	**8.4%**
Severe pelvic injuries	110	17.5%
Isolated severe pelvic injuries	42	38.2%
Severe pelvic injuries and other associated injuries	68	61.8%
All chest and abdominal injuries	**1442**	**19.3%**
Severe chest and abdominal injuries	1018	70.6%
Isolated severe chest and abdominal injuries	377	37.0%
Severe chest and abdominal injuries and other associated injuries	641	63.0%
All other injuries	**270**	**3.6%**
Severe other injuries	92	34.1%
Isolated other injuries	76	82.6%
Severe other injuries and other associated injuries	16	17.4%

Figure 4.5: Percentage of patient by ISS (N=5061)

INJURY SEVERITY	N	%
Low-severity injury	1298	25.6%
Moderate-severity injury	2135	42.2%
Severe injury	1628	32.2%
Total	5061	100.0%

Figure 4.5A: Injury severity by age group (N=5061)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Low-severity injury	44	19.5%	119	29.0%	125	32.1%	132	29.1%	114	20.3%
Moderate-severity injury	104	46.0%	130	31.7%	134	34.4%	177	39.0%	220	39.2%
Severe injury	78	34.5%	161	39.3%	130	33.4%	145	31.9%	227	40.5%
Total	226	100.0%	410	100.0%	389	100.0%	454	100.0%	561	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Low-severity injury	155	19.7%	184	26.6%	251	28.1%	174	26.9%	1298	25.6%
Moderate-severity injury	443	56.2%	284	41.1%	368	41.2%	275	42.4%	2135	42.2%
Severe injury	190	24.1%	223	32.3%	275	30.8%	199	30.7%	1628	32.2%
Total	788	100.0%	691	100.0%	894	100.0%	648	100.0%	5061	100.0%

Figure 4.6: Place of injury (N=5061)

	N	%
Home	2535	50.1%
Public area or road	1809	35.7%
Institution	226	4.5%
Farm	177	3.5%
Industrial	113	2.2%
Other	201	4.0%
Total	5061	100.0%

Figure 4.6A: Place of injury by age group (N=5061)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Home	122	54.0%	64	15.6%	65	16.7%	113	24.9%	222	39.6%
Public area or road	78	34.5%	305	74.4%	260	66.8%	262	57.7%	246	43.9%
Institution	10	4.4%	<5	1.0%	<5	1.0%	10	2.2%	10	1.8%
Farm	10	4.4%	7	1.7%	12	3.1%	20	4.4%	23	4.1%
Industrial	0	0.0%	9	2.2%	16	4.1%	28	6.2%	27	4.8%
Other	6	2.7%	21	5.1%	32	8.2%	21	4.6%	33	5.9%
Total	226	100.0%	410	100.0%	389	100.0%	454	100.0%	561	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Home	410	52.0%	427	61.8%	616	68.9%	496	76.5%	2535	50.1%
Public area or road	243	30.8%	170	24.6%	180	20.1%	65	10.0%	1809	35.7%
Institution	22	2.8%	27	3.9%	62	6.9%	77	11.9%	226	4.5%
Farm	47	6.0%	37	5.4%	18	2.0%	<5	0.5%	177	3.5%
Industrial	26	3.3%	<5	0.7%	<5	0.1%	<5	0.2%	113	2.2%
Other	40	5.1%	25	3.6%	17	1.9%	6	0.9%	201	4.0%
Total	788	100.0%	691	100.0%	894	100.0%	648	100.0%	5061	100.0%

Figure 4.6B: Place of injury by ISS (N=5061)

	Home		Public Area or road		Institution		Farm		Industrial		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Low- severity injury	666	26.3%	462	25.5%	46	20.4%	41	23.2%	28	24.8%	1243	25.6%
Moderate- severity injury	1143	45.1%	685	37.9%	111	49.1%	78	44.1%	48	42.5%	2065	42.5%
Severe injury	726	28.6%	662	36.6%	69	30.5%	58	32.8%	37	32.7%	1552	31.9%
Total	2535	100.0%	1809	100.0%	226	100.0%	177	100.0%	113	100.0%	4860	100.0%

Figure 4.7: Injuries sustained at home by gender (n=2535)

	N	%
Female	1356	53.5
Male	1179	46.5
Total	2535	100.0

Figure 4.8: Injuries sustained at home by mechanism of injury (n=2535)

	N	%
Fall less than 2 m	1944	76.7%
Fall more than 2 m	361	14.2%
Blow(s)	68	2.7%
Burn	62	2.4%
Stabbing	26	1.0%
Other	74	2.9%
Total	2535	100.0%

Figure 4.9: CCI score of patients injured at home by age (n=2513)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Mild comorbidities	<5	4.4%	29	45.3%	28	43.8%	59	52.2%	102	46.4%
Moderate comorbidities	<5	0.9%	<5	0.0%	<5	4.7%	<5	3.5%	17	7.7%
Severe comorbidities	<5	0.0%	<5	0.0%	<5	1.6%	<5	3.5%	11	5.0%
No significant pre-existing comorbidities	108	94.7%	35	54.7%	32	50.0%	46	40.7%	90	40.9%
Total	114	100.0%	64	100.0%	64	100.0%	113	100.0%	220	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Mild comorbidities	185	45.5%	196	46.2%	319	52.0%	256	51.9%	1179	46.9%
Moderate comorbidities	39	9.6%	70	16.5%	130	21.2%	118	23.9%	382	15.2%
Severe comorbidities	15	3.7%	23	5.4%	30	4.9%	18	3.7%	102	4.1%
No significant pre-existing comorbidities	168	41.3%	135	31.8%	135	22.0%	101	20.5%	850	33.8%
Total	407	100.0%	424	100.0%	614	100.0%	493	100.0%	2513	100.0%

* Please note: 'not recorded' is included in the 'no significant pre-existing comorbidities' category.

Figure 4.10: Injuries sustained at home by ISS and age group (n=2535)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Low severity injury	30	24.6%	13	20.3%	26	40.0%	28	24.8%	43	19.4%
Moderate severity injury	58	47.5%	13	20.3%	18	27.7%	51	45.1%	94	42.3%
Severe injury	34	27.9%	38	59.4%	21	32.3%	34	30.1%	85	38.3%
Total	122	100.0%	64	100.0%	65	100.0%	113	100.0%	222	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Low severity injury	84	20.5%	118	27.6%	185	30.0%	139	28.0%	666	26.3%
Moderate severity injury	245	59.8%	193	45.2%	258	41.9%	213	42.9%	1143	45.1%
Severe injury	81	19.8%	116	27.2%	173	28.1%	144	29.0%	726	28.6%
Total	410	100.0%	427	100.0%	616	100.0%	496	100.0%	2535	100.0%

Figure 4.11: Injuries sustained at home by mortality (n=2535)

	N	%
Dead	174	6.9%
Alive	2361	93.1%
Total	2535	100.0%

Figure 4.12: Type of road trauma (n=858)

	N	%
Car	423	49.3%
Cyclist	175	20.4%
Pedestrian	147	17.1%
Motorcycle	102	11.9%
Not known	11	1.3%
Total	858	100.0%

Figure 4.12A: Type of road trauma by ISS (n=858)

	Car		Cyclist		Pedestrian		Motorcycle		Total	
	N	%	N	%	N	%	N	%	N	%
Low severity injury	97	22.9%	36	20.6%	20	13.6%	24	23.5%	177	20.9%
Moderate severity injury	158	37.4%	76	43.4%	50	34.0%	38	37.3%	322	38.0%
Severe injury	168	39.7%	63	36.0%	77	52.4%	40	39.2%	348	41.1%
Total	423	100.0%	175	100.0%	147	100.0%	102	100.0%	847	100.0%

* Patients with missing information on mechanism of road trauma (n=11) are excluded.

Figure 4.13: Severe head injury patients by AIS classification (AIS ≥3) (n=1130), further classified into TBI severity by GCS

	N	%
GCS <8	180	15.9%
GCS 9–12	132	11.7%
GCS 13–15	818	72.4%
Total	1130	100.0%

* 25 cases missing on GCS – excluded

Figure 4.13A: TBI severity by GCS score, by age group for patients with severe head injuries (AIS ≥3) (n=1130)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Severe TBI	15	22.7%	32	28.8%	24	28.9%	13	14.4%	29	20.0%
Moderate TBI	5	7.6%	15	13.5%	13	15.7%	10	11.1%	32	22.1%
Mild TBI	46	69.7%	64	57.7%	46	55.4%	67	74.4%	84	57.9%
Total	66	100.0%	111	100.0%	83	100.0%	90	100.0%	145	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Severe TBI	16	13.4%	25	15.7%	18	8.6%	8	5.4%	180	15.9%
Moderate TBI	13	10.9%	10	6.3%	21	10.0%	13	8.8%	132	11.7%
Mild TBI	90	75.6%	124	78.0%	171	81.4%	126	85.7%	818	72.4%
Total	119	100.0%	159	100.0%	210	100.0%	147	100.0%	1130	100.0%

Figure 4.13B: Cause of injury in patients with severe TBI (AIS ≥3) (n=180)

	N	%
Fall less than 2 m	56	31.1%
Fall more than 2 m	40	22.2%
Road trauma	56	31.1%
Other	28	15.6%
Total	180	100.0%

Figure 4.13C: Mortality of MTA patients with severe head injury by AIS classification and age group (n=1155)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Dead	5	7.5%	9	8.0%	7	8.4%	<5	2.2%	19	13.0%
Alive	62	92.5%	103	92.0%	76	91.6%	90	97.8%	127	87.0%
Total	67	100.0%	112	100.0%	83	100.0%	92	100.0%	146	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Dead	16	13.3%	23	14.2%	36	16.4%	31	20.3%	148	12.8%
Alive	104	86.7%	139	85.8%	184	83.6%	122	79.7%	1007	87.2%
Total	120	100.0%	162	100.0%	220	100.0%	153	100.0%	1155	100.0%

Figure 5.1 Mode of arrival at hospital (n=4735)

	N	%
Ambulance	3430	72.4%
Ambulance and helicopter	38	0.8%
Car	948	20.0%
Helicopter	39	0.8%
Walk	155	3.3%
Other	125	2.6%
Total	4735	100.0%

Figure 5.2: Most senior pre-hospital healthcare professional (n=3507)

	N	%
Paramedic	1891	53.9%
Advanced paramedic	1104	31.5%
Not known	494	14.1%
Doctor	17	0.5%
Other	1	0.0%
Total	3507	100.0%

Figure 5.3: Care pathway of patients with severe head injury by AIS (n=1153)

	N	%
Direct admission to neurosurgical unit	178	15.4%
Not transferred to neurosurgical unit	723	62.7%
Transfer to neurosurgical unit	252	21.9%
Total	1153	100%

Figure 5.3A: Patients with severe TBI and admissions to a neurosurgical unit (AIS ≥3 and GCS <9) (n=179)

	N	%
Direct admission to neurosurgical unit	23	12.8%
Not transferred to neurosurgical unit	82	45.8%
Transfer to neurosurgical unit	74	41.3%
Total	179	100%

Figure 6.1 Percentage of patients transferred to another hospital (N=5061)

	N	%
Not transferred	3979	78.6%
Transferred	1082	21.4%
Total	5061	100.0%

Figure 6.2: Percentage of transfers out by hospital (n=5787)

	Low or moderate severity injury		Severe injury		Total transfers		Total Submissions
Beaumont Hospital	13	2.4%	<5	0.6%	16	3.0%	533
Cavan General Hospital	35	25.9%	19	14.1%	54	40.0%	135
Connolly Hospital	26	9.5%	18	6.6%	44	16.1%	274
Cork University Hospital	12	2.0%	11	1.8%	23	3.8%	601
Letterkenny University Hospital	5	8.8%	8	14.0%	13	22.8%	57
Mater Misericordiae University Hospital	8	1.6%	19	3.8%	27	5.4%	499
Mayo University Hospital	13	8.1%	11	6.8%	24	14.9%	161
Mercy University Hospital	8	16.3%	6	12.2%	14	28.6%	49
Midland Regional Hospital, Tullamore	0	0.0%	0	0.0%	0	0.0%	9
Midland Regional Hospital, Portlaoise	<5	3.1%	<5	9.4%	<5	12.5%	32
Naas General Hospital	48	32.9%	18	12.3%	66	45.2%	146
Our Lady of Lourdes Hospital, Drogheda	28	6.9%	29	7.1%	57	14.0%	406
Our Lady's Children's Hospital, Crumlin	<5	2.9%	<5	4.4%	5	7.4%	68
Regional Hospital Mullingar	12	12.4%	11	11.3%	23	23.7%	97
Sligo University Hospital	10	9.2%	12	11.0%	22	20.2%	109
South Tipperary General Hospital	28	35.4%	13	16.5%	41	51.9%	79
St James's Hospital	7	1.8%	8	2.0%	15	3.8%	395
St Luke's General Hospital	32	29.9%	14	13.1%	46	43.0%	107
St Vincent's University Hospital	19	4.8%	22	5.6%	41	10.4%	395
Temple Street Children's University Hospital	<5	1.5%	<5	4.6%	<5	6.2%	65
Tallaght University Hospital	17	4.7%	11	3.1%	28	7.8%	360
University Hospital Galway and Merlin Park University Hospital	<5	0.6%	28	8.1%	30	8.7%	344
University Hospital Kerry	7	4.4%	11	7.0%	18	11.4%	158
University Hospital Limerick	34	9.7%	30	8.5%	64	18.2%	352
University Hospital Waterford	11	4.4%	12	4.8%	23	9.2%	251
Wexford General Hospital	43	41.0%	15	14.3%	58	55.2%	105
Total	422	7.3%	338	5.8%	760	13.1%	5787

Figure 6.3: Percentage of transfers in by hospital (n=5787)

	Low or moderate severity injury		Severe injury		Total transfers		Total Submissions
Beaumont Hospital	13	2.4%	65	12.2%	78	14.6%	533
Cavan General Hospital	0	0.0%	0	0.0%	0	0.0%	135
Connolly Hospital	7	2.6%	<5	0.4%	8	2.9%	274
Cork University Hospital	19	3.2%	10	1.7%	29	4.8%	601
Letterkenny University Hospital	0	0.0%	0	0.0%	0	0.0%	57
Mater Misericordiae University Hospital	41	8.2%	15	3.0%	56	11.2%	499
Mayo University Hospital	<5	0.6%	0	0.0%	<5	0.6%	161
Mercy University Hospital	<5	2.0%	0	0.0%	<5	2.0%	49
Midland Regional Hospital, Tullamore	0	0.0%	0	0.0%	0	0.0%	9
Midland Regional Hospital, Portlaoise	0	0.0%	0	0.0%	0	0.0%	32
Naas General Hospital	0	0.0%	0	0.0%	0	0.0%	146
Our Lady of Lourdes Hospital, Drogheda	59	14.5%	16	3.9%	75	18.5%	406
Our Lady's Children's Hospital, Crumlin	25	36.8%	6	8.8%	31	45.6%	68
Regional Hospital Mullingar	<5	1.0%	0	0.0%	<5	1.0%	97
Sligo University Hospital	<5	0.9%	<5	0.9%	<5	1.8%	109
South Tipperary General Hospital	<5	1.3%	0	0.0%	<5	1.3%	79
St James's Hospital	96	24.3%	6	1.5%	102	25.8%	395
St Luke's General Hospital	<5	0.9%	0	0.0%	<5	0.9%	107
St Vincent's University Hospital	18	4.6%	<5	1.0%	22	5.6%	395
Temple Street Children's University Hospital	8	12.3%	23	35.4%	31	47.7%	65
Tallaght University Hospital	51	14.2%	14	3.9%	65	18.1%	360
University Hospital Galway and Merlin Park University Hospital	34	9.9%	13	3.8%	47	13.7%	344
University Hospital Kerry	0	0.0%	0	0.0%	0	0.0%	158
University Hospital Limerick	20	5.7%	<5	0.9%	23	6.5%	352
University Hospital Waterford	64	25.5%	13	5.2%	77	30.7%	251
Wexford General Hospital	0	0.0%	0	0.0%	0	0.0%	105
Total	461	8.0%	190	3.3%	651	11.2%	5787

Figure 6.4: Percentage of transfers by gender (n=1082)

	Transferred N	%
Female	341	31.5%
Male	741	68.5%
Total	1082	100.0%

Figure 6.5: Percentage of patient transfers by age group (n=1082)

	Transferred	
	N	%
0–14	91	8.4%
15–24	151	14.0%
25–34	120	11.1%
35–44	112	10.4%
45–54	138	12.8%
55–64	144	13.3%
65–74	145	13.4%
75–84	133	12.3%
85+	48	4.4%
Total	1082	100.0%

Figure 6.5A: Proportion of each age band that was transferred (n=5,061)

	Direct admission		Transfer		Total	
	N	%	N	%	N	%
0-14	135	59.7%	91	40.3%	226	100.0%
15-24	259	63.2%	151	36.8%	410	100.0%
25-34	269	69.2%	120	30.8%	389	100.0%
35-44	342	75.3%	112	24.7%	454	100.0%
45-54	423	75.4%	138	24.6%	561	100.0%
55-64	644	81.7%	144	18.3%	788	100.0%
65-74	546	79.0%	145	21.0%	691	100.0%
75-84	761	85.1%	133	14.9%	894	100.0%
85+	600	92.6%	48	7.4%	648	100.0%
Total	3979	78.6%	1082	21.4%	5061	100.0%

Figure 6.6: Percentage of patients transferred versus not transferred by ISS (N=5061)

	Not transferred		Transferred		Total	
	N	%	N	%	N	%
Low-severity injury	1012	78.0%	286	22.0%	1298	100.0%
Moderate-severity injury	1793	84.0%	342	16.0%	2135	100.0%
Severe injury	1174	72.1%	454	27.9%	1628	100.0%
Total	3979	78.6%	1082	21.4%	5061	100.0%

Figure 6.7: Percentage of patients transferred versus not transferred by mechanism of injury (N=5061)

	Not transferred		Transferred		Total	
	N	%	N	%	N	%
Blow	301	65.0%	162	35.0%	463	100.0%
Fall less than 2 m	2419	84.6%	442	15.4%	2861	100.0%
Fall more than 2 m	426	73.7%	152	26.3%	578	100.0%
Road trauma	595	69.3%	263	30.7%	858	100.0%
Other	238	79.1%	63	20.9%	301	100.0%
Total	3979	78.6%	1082	21.4%	5061	100.0%

Figure 6.8: Percentage of patients transferred versus not transferred by body region injured (N=5061)

	Not transferred		Transferred		Total	
	N	%	N	%	N	%
Abdomen	100	80.0%	25	20.0%	125	100.0%
Chest	694	90.4%	74	9.6%	768	100.0%
Face	127	57.5%	94	42.5%	221	100.0%
Head	803	73.5%	289	26.5%	1092	100.0%
Limbs	1222	83.8%	236	16.2%	1458	100.0%
Multiple	346	78.5%	95	21.5%	441	100.0%
Other	111	79.9%	28	20.1%	139	100.0%
Spine	576	70.5%	241	29.5%	817	100.0%
Total	3979	78.6%	1082	21.4%	5061	100.0%

Figure 6.9: Percentage of patients transferred versus not transferred by location of injury (N=5061)

	Not transferred		Transferred		Total	
	N	%	N	%	N	%
Home	2129	84.0%	406	16.0%	2535	100.0%
Public area or road	1293	71.5%	516	28.5%	1809	100.0%
Institution	192	85.0%	34	15.0%	226	100.0%
Farm	125	70.6%	52	29.4%	177	100.0%
Industrial	79	69.9%	34	30.1%	113	100.0%
Other	161	80.1%	40	19.9%	201	100.0%
Total	3979	78.6%	1082	21.4%	5061	100.0%

Figure 7.1: Presentation by time of day (N=5044)

TIME OF DAY	N	%
00.00	129	2.6%
01.00	135	2.7%
02.00	121	2.4%
03.00	110	2.2%
04.00	97	1.9%
05.00	89	1.8%
06.00	70	1.4%
07.00	93	1.8%
00.00–07.59	**844**	**16.7%**
08.00	119	2.4%
09.00	205	4.1%
10.00	222	4.4%
11.00	309	6.1%
12.00	325	6.4%
13.00	314	6.2%
14.00	341	6.8%
15.00	316	6.3%
08.00–15.59	**2148**	**42.6%**
16.00	280	5.6%
17.00	324	6.4%
18.00	296	5.9%
19.00	294	5.8%
20.00	250	5.0%
21.00	229	4.5%
22.00	193	3.8%
23.00	186	3.7%
16.00–23.59	**2052**	**40.7%**
Total	**5044**	**100.00%**

Figure 7.2 Pre-alerted by age group (n=4735)

	Not pre-alerted		Not recorded		Pre-alerted		Total
	N	%	N	%	N	%	N
0–14	144	73.8%	25	12.8%	26	13.3%	195
15–24	214	58.6%	89	24.4%	62	17.0%	365
25–34	223	62.1%	70	19.5%	66	18.4%	359
35–44	259	61.5%	99	23.5%	63	15.0%	421
45–54	346	65.2%	112	21.1%	73	13.7%	531
55–64	548	72.9%	147	19.5%	57	7.6%	752
65–74	488	75.8%	103	16.0%	53	8.2%	644
75–84	664	79.0%	138	16.4%	39	4.6%	841
85+	534	85.2%	70	11.2%	23	3.7%	627
Total	3420	72.2%	853	18.0%	462	9.8%	4735

Figure 7.3: Reception by a trauma team by age group (n=4735)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Not received by a trauma team	152	77.9%	308	84.4%	307	85.5%	355	84.3%	467	87.9%
Received by a trauma team	43	22.1%	57	15.6%	52	14.5%	66	15.7%	64	12.1%
Total	195	100.0%	365	100.0%	359	100.0%	421	100.0%	531	100.0%
	55-64		65-74		75-84		85+		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Not received by a trauma team	678	90.2%	596	92.5%	784	93.2%	593	94.6%	4240	89.5%
Received by a trauma team	74	9.8%	48	7.5%	57	6.8%	34	5.4%	495	10.5%
Total	752	100.0%	644	100.0%	841	100.0%	627	100.0%	4735	100.0%

Figure 7.4: Grade of most senior doctor treating patient on arrival by age group (n=4735)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Associate Specialist	<5	0.0%	<5	0.3%	<5	0.0%	<5	0.0%	<5	0.0%
Consultant	90	46.2%	110	30.1%	89	24.8%	103	24.5%	141	26.6%
Intern	<5	0.0%	<5	0.0%	<5	0.0%	<5	0.0%	<5	0.0%
Registrar	61	31.3%	160	43.8%	155	43.2%	188	44.7%	233	43.9%
SHO	9	4.6%	23	6.3%	41	11.4%	43	10.2%	52	9.8%
Specialist Registrar	<5	15.9%	62	17.0%	57	15.9%	68	16.2%	95	17.9%
Other	<5	0.0%	<5	0.3%	5	1.4%	5	1.2%	<5	0.6%
Detail not captured	<5	2.1%	8	2.2%	12	3.3%	14	3.3%	7	1.3%
Total	195	100.0%	365	100.0%	359	100.0%	421	100.0%	531	100.0%
	55-64		65-74		75-84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Associate Specialist	<5	0.1%	<5	0.3%	<5	0.1%	<5	0.3%	7	0.1%
Consultant	150	19.9%	149	23.1%	151	18.0%	98	15.6%	1081	22.8%
Intern	<5	0.1%	<5	0.2%	<5	0.1%	<5	0.0%	3	0.1%
Registrar	350	46.5%	297	46.1%	374	44.5%	268	42.7%	2086	44.1%
SHO	114	15.2%	94	14.6%	188	22.4%	165	26.3%	729	15.4%
Specialist Registrar	114	15.2%	78	12.1%	97	11.5%	82	13.1%	684	14.4%
Other	<5	0.0%	<5	0.0%	<5	0.2%	<5	0.0%	6	0.3%
Detail not captured	22	2.9%	23	3.6%	27	3.2%	12	1.9%	129	2.7%
Total	752	100.0%	644	100.0%	841	100.0%	627	100.0%	4735	100.0%

Figure 7.5: Surgical intervention by body region (n=2264)

	N	%
Abdomen	73	3%
Face	217	10%
General	56	2%
Head & Brain	188	8%
Limbs	1282	57%
Skin/Soft Tissue	161	7%
Spine	226	10%
Thoracic	61	3%
Total	2264	100%

Figure 7.6: Surgical intervention by body region and ISS (n=2264)

	Low/moderate injury		Severe injury		Total	
	N	%	N	%	N	%
Abdomen	39	53.4%	34	46.6%	73	100.0%
Face	207	95.4%	10	4.6%	217	100.0%
General	16	28.6%	40	71.4%	56	100.0%
Head and brain	<5	1.1%	186	98.9%	188	100.0%
Limb(s)	1116	87.1%	166	12.9%	1282	100.0%
Skin/soft tissue	127	78.9%	34	21.1%	161	100.0%
Spine	152	67.3%	74	32.7%	226	100.0%
Thoracic	35	57.4%	26	42.6%	61	100.0%
Total	1694	74.8%	570	25.2%	2264	100.0%

Figure 7.7: Surgical intervention by body region and gender (n=2264)

	Female		Male		Total	
	N	%	N	%	N	%
Abdomen	16	21.9%	57	78.1%	73	100.0%
Face	37	17.1%	180	82.9%	217	100.0%
General	16	28.6%	40	71.4%	56	100.0%
Head and brain	35	18.6%	153	81.4%	188	100.0%
Limb(s)	677	52.8%	605	47.2%	1282	100.0%
Skin/soft tissue	69	42.9%	92	57.1%	161	100.0%
Spine	79	35.0%	147	65.0%	226	100.0%
Thoracic	8	13.1%	53	86.9%	61	100.0%
Total	937	41.4%	1327	58.6%	2264	100.0%

Figure 7.8: Airway management of patients with a GCS <9 (n=157)

	N	%
No intubation	<5	1.9%
Intubated – ED	112	71.3%
Intubated – pre-hospital	9	5.7%
Not known	33	21.0%
Total	157	100.0%

Figure 7.9: Survival of shocked patients (n=549)

	N	%
Dead	50	9.1%
Alive	499	90.9%
Total	549	100.0%

Figure 7.10: Percentage of patients to receive a CT scan within one hour with a GCS<13 (n=298)

	N	%
Within one hour	122	40.9%
After one hour	176	59.1%
Total	298	100.0%

Figure 7.10A: Proportion of patients to receive a Time to CT scan within one hour for patients with a GCS <13 by hospital (n=298)

	Within an hour		After one hour		Total	
	N	%	N	%	N	%
Beaumont Hospital	15	37.5%	25	62.5%	40	100.0%
Cavan General Hospital	13	100.0%	0	0.0%	13	100.0%
Connolly Hospital	<5	5.9%	16	94.1%	17	100.0%
Cork University Hospital	18	66.7%	9	33.3%	27	100.0%
Letterkenny University Hospital	<5	0.0%	<5	100.0%	<5	100.0%
Mater Misericordiae University Hospital	11	40.7%	16	59.3%	27	100.0%
Mayo University Hospital	<5	28.6%	5	71.4%	7	100.0%
Midland Regional Hospital Portlaoise	0	0.0%	<5	100.0%	<5	100.0%
Naas General Hospital	<5	33.3%	<5	66.7%	6	100.0%
Our Lady of Lourdes Hospital, Drogheda	13	59.1%	9	40.9%	22	100.0%
Regional Hospital Mullingar	<5	10.0%	9	90.0%	10	100.0%
Sligo University Hospital	<5	16.7%	5	83.3%	6	100.0%
South Tipperary General Hospital	<5	42.9%	<5	57.1%	7	100.0%
St James's Hospital	8	42.1%	11	57.9%	19	100.0%
St Luke's General Hospital, Kilkenny	<5	16.7%	5	83.3%	6	100.0%
St Vincent's University Hospital	13	65.0%	7	35.0%	20	100.0%
Temple Street Children's University Hospital	<5	75.0%	<5	25.0%	<5	100.0%
Tallaght Hospital	<5	0.0%	5	100.0%	5	100.0%
University Hospital Galway & Merlin Park University Hospital	8	44.4%	10	55.6%	18	100.0%
University Hospital Kerry	<5	40.0%	<5	60.0%	5	100.0%
University Hospital Limerick	5	29.4%	12	70.6%	17	100.0%
University Hospital Waterford	<5	25.0%	<5	75.0%	<5	100.0%
Wexford General Hospital	<5	8.3%	11	91.7%	12	100.0%
Total	122	40.9%	176	59.1%	298	100.0%

Figure 7.11 Median ICU LOS by hospital (n=880)

	Median	N
Beaumont Hospital	6	130
Cavan General Hospital	2	7
Connolly Hospital	1	26
Cork University Hospital	3	53
Letterkenny University Hospital	3	9
Mater Misericordiae University Hospital	4	224
Mayo University Hospital	2	22
Mercy University Hospital	-	<5
Midland Regional Hospital, Portlaoise	4	5
Naas General Hospital	3	11
Our Lady of Lourdes Hospital, Drogheda	3	38
Our Lady's Children's Hospital, Crumlin	2	15
Regional Hospital Mullingar	3	10
Sligo University Hospital	2	16
South Tipperary General Hospital	1	18
St James's Hospital	2	32
St Luke's General Hospital	4	18
St Vincent's University Hospital	3	29
Temple Street Children's University Hospital	3	23
Tallaght University Hospital	2	30
University Hospital Galway and Merlin Park University Hospital	2	70
University Hospital Kerry	1	17
University Hospital Limerick	3	31
University Hospital Waterford	1	29
Wexford General Hospital	1	14
National	3	880

Figure 7.12: Hospital LOS by age group (N=5061)

	Median	N
0–14	6	226
15–24	6	410
25–34	6	389
35–44	7	454
45–54	7	561
55–64	8	788
65–74	10	691
75–84	12	894
85+	14	648
Total	9	5061

Figure 7.12A: Median LOS by hospital (n=5787)

	Median	N
Beaumont Hospital	10	533
Cavan General Hospital	3	135
Connolly Hospital	8	274
Cork University Hospital	9	601
Letterkenny University Hospital	10	57
Mater Misericordiae University Hospital	8	499
Mayo University Hospital	10	161
Mercy University Hospital	7	49
Midland Regional Hospital, Tullamore	15	9
Midland Regional Hospital, Portlaoise	7	32
Naas General Hospital	5	146
Our Lady of Lourdes Hospital, Drogheda	7	406
Our Lady's Children's Hospital, Crumlin	9	68
Regional Hospital Mullingar	6	97
Sligo University Hospital	7	109
South Tipperary General Hospital	2	79
St James's Hospital	6	395
St Luke's General Hospital	4	107
St Vincent's University Hospital	10	395
Temple Street Children's University Hospital	5	65
Tallaght University Hospital	8	360
University Hospital Galway and Merlin Park University Hospital	7	344
University Hospital Kerry	7	158
University Hospital Limerick	6	352
University Hospital Waterford	10	251
Wexford General Hospital	2	105
National	8	5787

Figure 8.1: Mortality by age group (n=269)

	N	%
0–14	9	3.3%
15–24	14	5.2%
25–34	16	5.9%
35–44	11	4.1%
45–54	26	9.7%
55–64	24	8.9%
65–74	42	15.6%
75–84	62	23.0%
85+	65	24.2%
Total	269	100.0%

Figure 8.2: Mortality by gender (n=269)

	Total	
	N	%
Female	98	36%
Male	171	64%
Total	269	100%

Figure 8.3: Mortality by mechanism of injury (n=269)

	N	%
Fall less than 2 m	153	56.9%
Fall more than 2 m	34	12.6%
Road trauma	34	12.6%
Other	48	17.8%
Total	269	100.00%

Figure 8.3A: Mortality by mechanism of injury and age group (n=269)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Fall less than 2m	0	0.0%	1	7.1%	1	6.3%	1	9.1%	7	26.9%
Fall more than 2m	0	0.0%	1	7.1%	1	6.3%	0	0.0%	8	30.8%
Road trauma	3	33.3%	6	42.9%	7	43.8%	2	18.2%	5	19.2%
Other	6	66.6%	6	42.8%	7	43.9%	8	72.7%	6	23.0%
Total	9	100.0%	14	100.0%	16	100.0%	11	100.0%	26	100.0%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Fall less than 2m	12	50.0%	23	54.8%	50	80.6%	58	89.2%	153	56.9%
Fall more than 2m	3	12.5%	13	31.0%	6	9.7%	2	3.1%	34	12.6%
Road trauma	2	8.3%	3	7.1%	2	3.2%	4	6.2%	34	12.6%
Other	7	29.2%	3	7.2%	4	6.4%	1	1.5%	48	17.8%
Total	24	100.0%	42	100.0%	62	100.0%	65	100.0%	269	100.0%

Figure 8.4: Mortality by ISS category (n=269)

	N	%
Low-severity injury	18	6.7
Moderate-severity injury	46	17.1
Severe injury	205	76.2
Total	269	100

Figure 8.5: Mortality by body region most severely injured (n=269)

	N	%
Chest	29	10.8%
Head	140	52.0%
Limbs	30	11.2%
Multiple	18	6.7%
Other	36	13.4%
Spine	16	5.9%
Total	269	100.0%

Figure 8.6: Discharge destination (N=5061)

	N	%
Home	3015	59.5%
Nursing home	658	13.0%
Other acute hospital	449	8.9%
Rehabilitation	436	8.6%
Mortuary	269	5.3%
Other	181	3.6%
Not known	53	1.0%
Total	5061	100

Figure 8.6A: Discharge destination by age group (N=5061)

	0-14		15–24		25–34		35–44		45–54	
	N	%	N	%	N	%	N	%	N	%
Home	196	87%	328	80%	300	77%	344	76%	388	69%
Nursing Home	0	0%	2	1%	0	0%	3	1%	19	3%
Other Acute hospital	15	7%	47	12%	48	12%	51	11%	66	12%
Rehabilitation	4	2%	9	2%	8	2%	19	4%	38	7%
Mortuary	9	4%	14	3%	16	4%	11	2%	26	5%
Other	2	1%	7	2%	11	3%	22	5%	19	3%
Not Known	0	0%	3	1%	6	2%	4	1%	5	1%
Total	226	100%	410	100%	389	100%	454	100%	561	100%
	55–64		65–74		75–84		85+		Total	
	N	%	N	%	N	%	N	%	N	%
Home	531	67%	397	57%	359	40%	172	27%	3015	60%
Nursing Home	62	8%	95	14%	226	25%	251	39%	658	13%
Other Acute hospital	62	8%	65	9%	74	8%	21	3%	449	9%
Rehabilitation	82	10%	58	8%	124	14%	94	15%	436	9%
Mortuary	24	3%	42	6%	62	7%	65	10%	269	5%
Other	24	3%	27	4%	39	4%	30	5%	181	4%
Not Known	3	0%	7	1%	10	1%	15	2%	53	1%
Total	788	100%	691	100%	894	100%	648	100%	5061	100%

APPENDIX 4: TRAUMADOC

IRISH ASSOCIATION FOR EMERGENCY MEDICINE

TRAUMADOC©

TARN

NCCA National Office of Clinical Audit

PATIENT NAME: AGE: WEIGHT: MRN:

DATE	INCIDENT	ARRIVAL TIME	ASSESSMENT TIME

Admitting Team

Emergency Ambulance Call / Pre Alert

Date: Time: **A**ge: **S**ex:

History:

Injury:

Condition: A: B: RR O2 sats C: BP HR D: GCS /15 BM E: Temp

ETA: Pupils: **R** Size Reactive ☐ Sluggish ☐ Not ☐

L Size Reactive ☐ Sluggish ☐ Not ☐

Additional Information:

Signature:

Trauma Team Activated **Y** **N** Cardiothoracics ☐ Anaes. ☐ Gen Surg. ☐ Ortho. ☐ Vasc. ☐ ENT ☐

Time Activated ☐ Neurosurg ☐ Radiology ☐ IR ☐ OBGYN ☐ Plastics ☐ MaxFax ☐ Paeds. ☐

Summary of Pre-Hospital Care

Time of Incident: Incident Location:

Trapped at Scene: < / > 30 mins

Time of Arrival on Scene: Time of Departure from Scene:

Identify Patient: **Pre-Hospital team:** P ☐ AP ☐ PHEM doctor ☐

Mechanism:

Injury:

Signs: Time 1 ☐ Treatment / Trends Time 2 ☐

RR:	
SpO_2:	
HR:	
BP:	
Temp:	
GCS:	/15 **E** /4 **V** /5 **M** /6

Pupils: **R** Size Reactive ☐ Sluggish ☐ Not ☐ **L** Size Reactive ☐ Sluggish ☐ Not ☐

Allergies:

Medication:

Anticoagulants / Anti-platelets Y ☐ N ☐ Bisphosphonates Y ☐ N ☐ Alcohol Y ☐ N ☐

Background / PMHx:

Other:

Trauma Lead: Grade: IMCN:

Consultant Present: Y ☐ N ☐ Present < 30 Minutes: Y ☐ N ☐

Time:	Name:	Grade:	Discipline:	Advance trauma course:
Contacted / Arrived				
Contacted / Arrived				
Contacted / Arrived				
Contacted / Arrived				

PRINT NAME: SIGNED:

1.

PATIENT NAME: AGE: MRN:

PRIMARY SURVEY

MAJOR EXTERNAL HAEMORRAGE

Massive Transfusion Protocol:	Y N Time	Tourniquet 1:	Y N	Time on / Time off
Transexamic Acid:	Y N Time	Tourniquet 2:	Y N	Time on / Time off
Direct Pressure	Y N Time	Pelvic Binder:	Y N	Time on / Time off
Anticoagulants/ Antiplatelets	Y N	Consider reversal guidance.		

AIRWAY WITH C-SPINE PROTECTION

C-Spine:	Airway: Patent / Obstructed		Supraglottic Airway
Collar / Blocks / Tape	100% O2 NRB	Time	Size
Vacc. matress ☐	NPA	Time Size	Time
Sandbags ☐	OPA	Time Size	

Pre-Intubation: RSI Checklist Y N ETT Time: Intubator 1: Intubator 2:

Pupils: R Size Reactivity Size: View Grade: 1 / 2 / 3 / 4

L Size Reactivity Tied at: cm*(at teeth)* ETCO2:

Drugs: O2 sats:

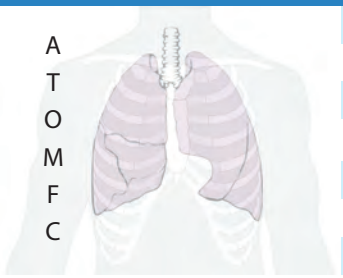
BREATHING

Neck:

Trachea:

Veins:

RR:			
Sa O^2			
$ETCO^2$			



Thoracostomy: R:

L:

Chest Drain 1: Time Size Blood / Air

Volume:

Chest Drain 2: Time Size Blood / Air

Volume:

CIRCULATION

Time:			
HR:			
BP:			

Cap Refill: Secs

Fast Response Y N

Transient Response Y N

No Response Y N

E-FAST: Y N

Free Fluid Y N

Abdomen:

Soft ☐ Distended ☐

Bruising (E) ☐ Tender (T) ☐

IVC: 1 / IO Time

IVC: 2 / IO Time Warmed IV Fluids: Y N

Prescribe Blood: Y N

Bloods Sent: G+H Y N G+X Y N

Coagulation profile Y N Fibrinogen Y N

NGT Y N OGT Y N

Note: Antihypertensives / Antiarrythmics may mask physiological response

DISABILITY

Pupils: Right:	Size	Reaction	GCS	/15	Capillary blood glucose
Left:	Size	Reaction	E	/4	
Limb Movement:	RUL	RLL	V	/5	
	LUL	LLL	M	/6	

Act. spinal injury Y N Susp. spinal injury Y N Priapism Y N Total: /15

EXPOSURE:

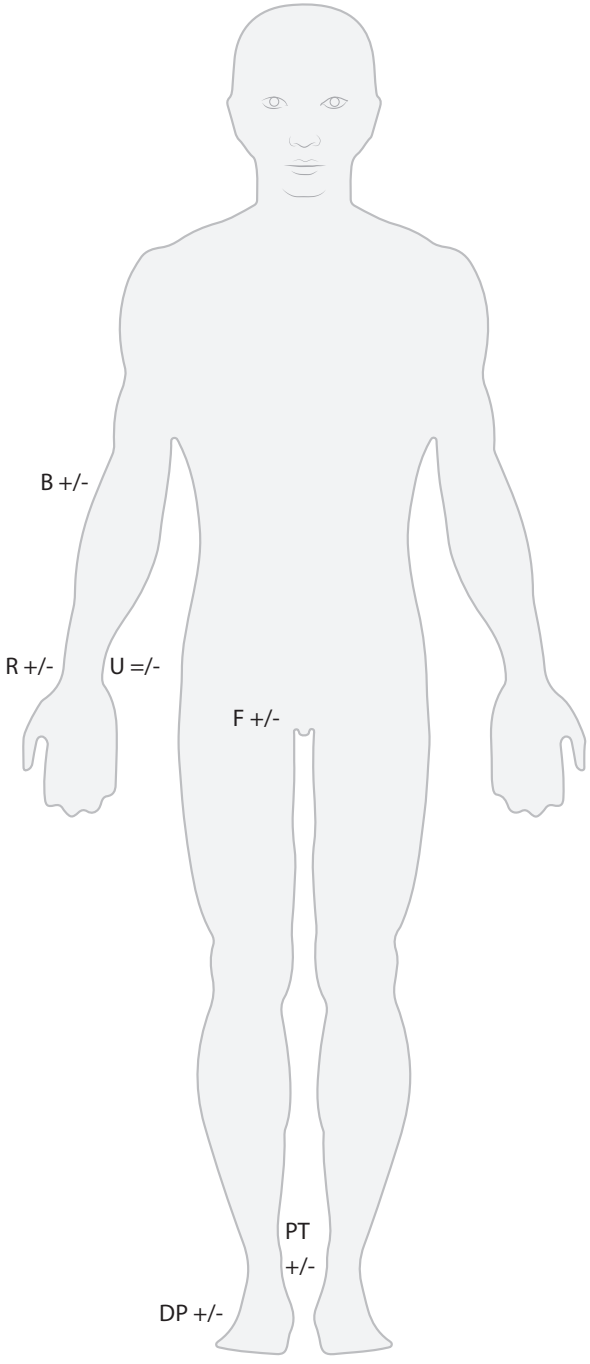
Temperature: Rewarming: Y N Warming Blanket: Y N

PRINT NAME: SIGNED:

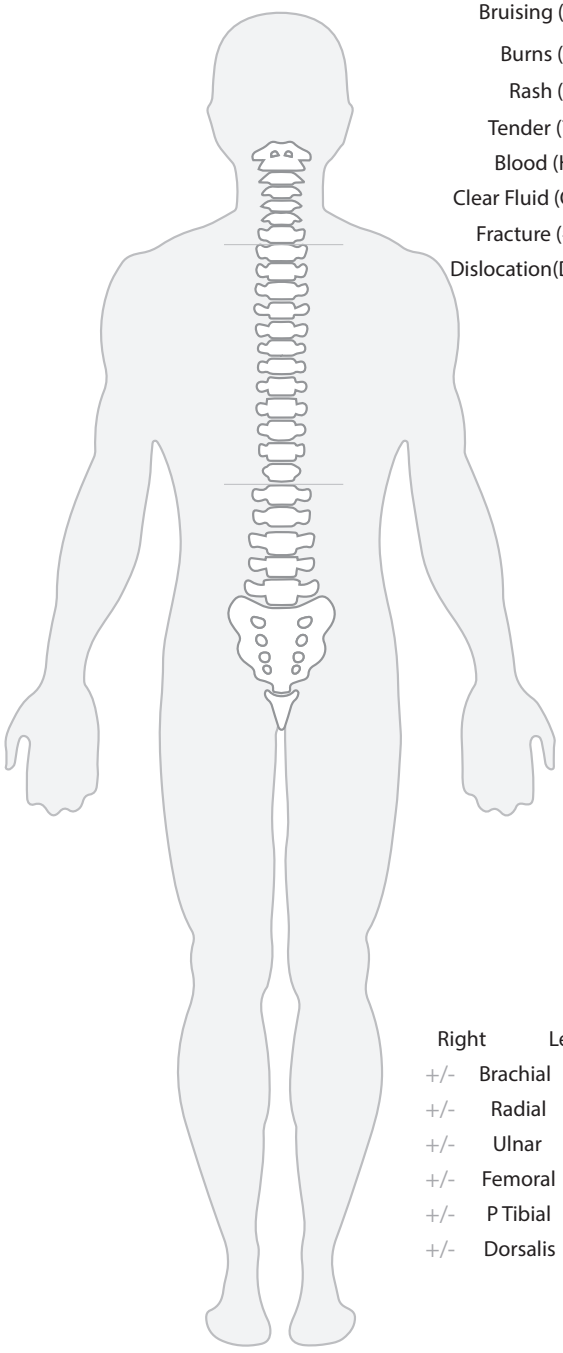
2.

PATIENT NAME: AGE: MRN:

Laceration (L):
Abrasion (A):
Bruising (E):
Burns (B):
Rash (R):
Tender (T):
Blood (H):
Clear Fluid (C):
Fracture (#):
Dislocation(D):



FRONT



BACK

Right		Left
+/-	Brachial	+/-
+/-	Radial	+/-
+/-	Ulnar	+/-
+/-	Femoral	+/-
+/-	P Tibial	+/-
+/-	Dorsalis	+/-

PRINT NAME: SIGNED:

3.

PATIENT NAME: AGE: MRN:

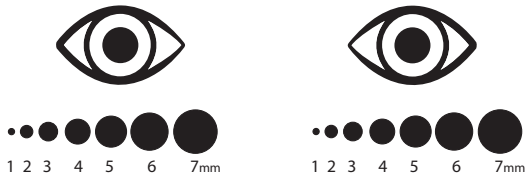
SECONDARY SURVEY Completed / Deferred

Consider medical cause for Fall / Trauma

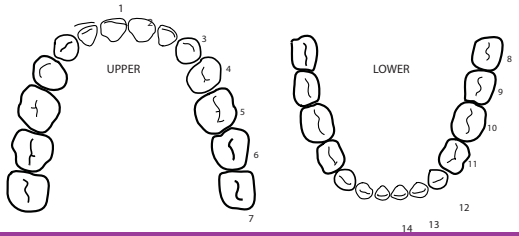
Please Check Compartments

EYES

Right: /6 V/A Left: /6 V/A



MOUTH



EARS

Right: Left:

TM Assessment:

Right: Left:

PELVIS

Urinary Catheter insertion:

Blood Meatus: Y N

Urinalysis:

Toxicology:

HCG:

CNS	Tone	Power	Co-ord	Sens	Reflexes
RUL					
LUL					
RLL					
LLL					

PLANTARS

RIGHT ↑ ↓ LEFT ↑ ↓

LOG ROLL

C-Spine:

T-Spine:

L-Spine:

ASIA score:

PR:

Tone:

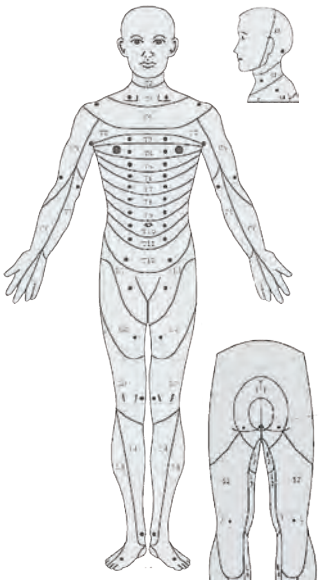
Sensation:

Blood PR:

Tertiary Survey to be completed by Admitting team

PRINT NAME: SIGNED:

ASIA Classification of spinal cord injury



Total: Max 56 56

Light Touch Score: /112 Pin Prick Score: /112

Total: Max 56 56

	R	L	
C5			Elbow Flexors
C6			Wrist Extensors
C7			Elbow Extensors
C8			Finger Flexors
T1			Finger Abductors
L2			Hip Flexors
L3			Knee Extensors
L4			Ankle Dorsiflexors
L5			Long Toe Extensors
S1			Ankle Plantar Flexors

Total: Max 50 50

Motor
Key Muscles

0 = Total paralysis
1 = palpable / visible contraction
2 = active movement
3 = active movement + gravity
4 = active movement + resistance
5 = active movement full resistance
NT = not testable

Sensory: Right Left

Motor: Right Left

PATIENT NAME: AGE: MRN:

PRIMARY SURVEY ADJUNCTS

INSERT BLOOD GAS HERE

	Request	Time	Verbal Report
X-Ray			
X-Ray			
X-Ray			
X-Ray			
CT			
CT			
CT			
CT			
CT			
CT			
Other			
Other			
ECG			

Blood Gas	Time 1:	Time 2:	Time 3:	Time 4:
pH				
k+				
Hb				
Lactate				
Ca2+				
BE				

Time	Medication	Dose	Route	Rate	Signature	MCRN	Given	Time
	Tranexamic acid	1g	IV	10 Min				
	Tranexamic acid	1g	IV	8 Hrs				
	Tetanus Toxoid	0.5ml	IM					
	Antibiotic							
	Antibiotic							
	Antibiotic							
	Analgesia							
	Analgesia							
	Analgesia							
	Fluids							
	Fluids							
	Fluids							
	Other							
	Other							
	Other							
	Other							
	Other							
	Other							
	Other							

PRINT NAME: SIGNED:

5.

PATIENT NAME: AGE: MRN:

Notes

PRINT NAME: SIGNED:

Emergency Department St James's Hospital. Medical Illustration Unit, St James's Hospital. 6.

NOTES

National Office of Clinical Audit

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