

MAJOR TRAUMA AUDIT

NATIONAL REPORT 2014-2015



REPORT PREPARED BY (WITH ASSISTANCE FROM MEMBERS OF THE MTA GOVERNANCE COMMITTEE)

Dr Conor Deasy

Clinical Lead
Major Trauma Audit

Tom Lawrence

System Analyst
The Trauma Audit & Research Network

Marina Cronin

Hospital Relations Manager
National Office of Clinical Audit

Aisling Connolly

Senior Administrator
National Office of Clinical Audit

Dr Una Geary

Clinical Lead, Quality and Safety Improvement Directorate
St James's Hospital

Rosie Quinn

Therapy Lead
Emergency Medicine Programme

Deborah McDaniel

Hospital Relations Coordinator
National Office of Clinical Audit

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) define 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.

Electronic copies of this report can be found at:

<https://www.noca.ie/publications>

Brief extracts from this publication may be reproduced provided the source is fully acknowledged.

Citation for this report:

National Office of Clinical Audit, (2016)

National Major Trauma Audit National Report 2014-2015.

Dublin: National Office of Clinical Audit.

ISSN 2009-9673 (Print)

ISSN 2009-9681 (Electronic)

This report was published on the 8th December 2016.

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. It has a mission 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

NOCA would particularly like to thank the valuable contribution of all participating hospitals, in particular the MTA coordinators and clinical leads. Without their continued support and input, this audit could not continue to produce meaningful analysis of trauma care in Ireland



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



The Quality Improvement Division 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 work in partnership with patients, families and all who work in the health system to innovate and improve the quality and safety of our care.

ACKNOWLEDGING SIGNIFICANT CONTRIBUTIONS FROM THE FOLLOWING:



NOCA would like to thank RCSI, The National Emergency Medicine Programme and The Pre-Hospital Emergency Care Council for supplying some imagery used throughout this report.

For more information
about this report, contact:

National Office of Clinical Audit, 2nd Floor,
Ardilaun House, 111 St Stephens Green, Dublin 2

Tel: + (353) 1 4028577
Email: mta@nocai.ie

DESIGNED BY
SWERVE

Major Trauma Audit

National Report

2014-2015

Dr Conor Deasy
Clinical Lead
Major Trauma Audit
National Office of Clinical Audit
2nd Floor, Ardilaun House
111 St. Stephen's Green
Dublin 2

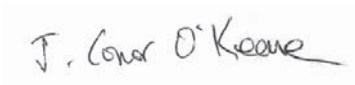
25th November 2016

Dear Dr Deasy,

Many thanks for your presentation of the Major Trauma Audit National Report to the NOCA Governance Board on 24th November 2016. The work of the MTA Governance Committee is to be commended.

On behalf of the NOCA Governance Board, I wish to congratulate your own and your colleagues continued efforts in supporting this valuable quality improvement initiative. We strongly welcome the recommendations in this report. Please accept this as formal endorsement from the NOCA Governance Board of this first Major Trauma Audit National Report.

Yours sincerely,



Professor Conor O' Keane FFPATH FRCPI
Chair National Office of Clinical Audit Governance Board

AOIFE'S STORY

In January 2015, Aoife, a 20 year old passenger in a car, was involved in a high speed head-on road traffic collision in the early hours of the morning. She had been seated in the rear of the car and was wearing a seat-belt. One person, sadly, died at the scene. The National Ambulance Service and the local Fire Services were called to the scene. On arrival, the paramedics found Aoife's condition to be unstable – she was showing signs of shock with low blood pressure. The ambulance team pre-alerted the emergency department, allowing them prepare for her reception and resuscitation, ensuring the necessary team, equipment and blood products were on hand.

In the Emergency Department, a trauma team made up of emergency medicine doctors, a surgeon, an anaesthetist and emergency nurses met Aoife. Aoife's condition was deteriorating and she required rapid specialist treatment to stabilise her condition. She was intubated and ventilated as she was in a comatose state. She was given intravenous fluids and blood in an attempt to stabilise her condition. With Aoife's condition apparently stabilising, a CT scan was quickly carried out. Following this assessment, it was evident that Aoife was going to need to get straight to the operating theatre if she was to be saved.

Aoife underwent emergency surgery to control bleeding caused by abdominal injuries. After surgery, she was admitted to the hospital intensive care unit for four days. She made a good recovery and was discharged home to her family after 14 days.

COMMENT

In many ways, Aoife was very fortunate. She received care at the scene of the accident from a pre-hospital team that recognised the severity of her injuries, prevented further harm and quickly got her to hospital where she was treated by a skilled and effective resuscitation team that recognised her need to get straight to theatre where there was a surgical team expertly skilled to stop the bleeding that threatened her life.

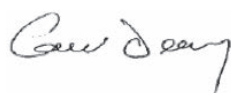
Aoife's condition continues to improve. The reason she is alive today and contributing to society is because she got the right care at the right time from roadside to recovery. Not everyone is this lucky. Major trauma is unlike other areas of healthcare; there are many more specialist clinicians and disciplines involved in the emergency treatment of a patient with multiple traumatic injuries each of whom plays a key role in ensuring patient's like Aoife survive, and survive without lifelong, life-limiting injuries.

FOREWORD

We are delighted to announce the first report for national Major Trauma Audit. This is a significant milestone for the development of trauma care in Ireland. This report which includes data from trauma-receiving hospitals, focuses on the audit between 2014 and 2015. The report is aimed at clinicians delivering care as well as all those interested in improving the standard of trauma care. It will also be of interest to a wider healthcare audience: hospital and Hospital Group Chief Executive Officers and Managers, Clinical Directors, those commissioning trauma services, patient groups and many others. The report includes clinical findings at national level as well as patient outcomes.

Significant challenges exist and improving outcomes for trauma patients must be our collective aim. The Major Trauma Audit Report of 2014-2015 draws our attention to high numbers of trauma patients going to hospitals that cannot provide necessary and definitive care. Strategic planning of a national trauma system is currently one of the Department of Health's priorities and the NOCA Major Trauma Audit Governance Committee welcomes this.

Finally it is important to acknowledge the commitment and collaboration of the hospital clinical teams who manage and deliver care, their managers and the hospital Major Trauma Audit Clinical Leads and Audit Coordinators, whose dedication and commitment was essential in realising and completing this report.



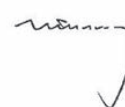
Dr Conor Deasy
Chair
Major Trauma Audit
Governance Committee
National Office of Clinical Audit



DR. CONOR DEASY



DR. COLM HENRY



Dr Colm Henry
National Clinical Advisor
and Group Lead for
Acute Hospitals
Health Services Executive

CONTENTS

EXECUTIVE SUMMARY	10
KEY RECOMMENDATIONS FROM THIS REPORT	11
INTRODUCTION	13
Background to Major Trauma Audit in Ireland	14
The stakeholders	15
Overview of this report	17
MTA METHODOLOGY	19
Data sources	20
Data elements	20
Data collection	21
Data quality	21
Data confidentiality	22
DATA QUALITY	23
Data for this MTA report	24
Quality assurance of TARN submissions	24
WHO WAS INJURED AND HOW WERE THEY INJURED?	27
Demographic profile of major trauma patients	28
Type of injury	30
Cause of injury	30
Place of injury	32
Severity of injury	33
The injuries sustained	34
Head injuries	35
THE PATIENT JOURNEY	37
Pre-hospital care	38
Transfer of patients	39
CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE	41
Reception of major trauma patients in hospital	42
Time to see patients on arrival to hospitals	43
Hospital systems performance	44
OUTCOME FOLLOWING MAJOR TRAUMA	49
Major trauma mortality	50
Risk-adjusted benchmarking: Case mix standardised rate of survival for Ireland	53
In summary	54
CONCLUSION: BUILDING ON PROGRESS TO DATE	55
REFERENCES	57
APPENDIX 1: HOSPITAL MTA CLINICAL LEADS AND AUDIT COORDINATORS	60
APPENDIX 2: MTA GOVERNANCE COMMITTEE	62
APPENDIX 3: TARN INCLUSION CRITERIA	64
APPENDIX 4: OVERVIEW OF CLINICAL GUIDELINES AND STANDARDS	66
APPENDIX 5: GLOSSARY OF TERMS AND DEFINITIONS	67

FIGURES

FIGURE 1:	Dissemination of MTA to trauma receiving hospitals	16
FIGURE 2:	Accreditation standard	25
FIGURE 3:	Cause of injury	30
FIGURE 4:	Injury severity score	33
FIGURE 5:	Paediatric patients (16 years or less): Injury severity score	33
FIGURE 6:	Older patients (65 years or older): Injury severity score	34
FIGURE 7:	Cause of injury in patients with severe TBI	36
FIGURE 8:	Day and time of arrival to hospital	42
FIGURE 9:	Major trauma deaths / Age	50
FIGURE 10:	Major trauma deaths / Cause of injury	51
FIGURE 11:	Major trauma deaths / ISS	51

TABLES

TABLE 1:	ISS Classification	20
TABLE 2:	Commencement of MTA	22
TABLE 3:	Data analysis for MTA report	24
TABLE 4:	Gender of major trauma patients	28
TABLE 5:	Age of major trauma patients	28
TABLE 6:	Median ISS per age group	28
TABLE 7:	Comorbidities for patients aged over 65 years of age	28
TABLE 8:	Breakdown of road trauma	31
TABLE 9:	Median ISS per mechanism of road trauma	31
TABLE 10:	Injuries sustained by major trauma patients	34
TABLE 11:	Severe head injuries	35
TABLE 12:	Mode of pre-hospital care	38
TABLE 13:	Most senior pre-hospital health care professional	38
TABLE 14:	Care pathway of major trauma patients with severe head injury	39
TABLE 15:	Reception by a trauma team	43
TABLE 16:	Most senior doctor seeing the patient in the ED	44
TABLE 17:	Most senior doctor seeing patients with an ISS > 15	44
TABLE 18:	Patients with GCS < 9 have definitive airway management	44
TABLE 19:	Survival of shocked patients	45
TABLE 20:	Time to CT for head injury patients with GCS < 13	45
TABLE 21:	ICU LOS (Days) for all major trauma patients	45
TABLE 22:	ICU LOS (Days) for severely injured patients (ISS >15)	46
TABLE 23:	ICU LOS (Days) for major trauma patients with severe TBI	46
TABLE 24:	Hospital LOS (Days) for all major trauma patients	46
TABLE 25:	Hospital LOS (Days) for severely injured patients (ISS >15)	46
TABLE 26:	ISS / Age of major trauma patients who die	52
TABLE 27:	Characteristics of major trauma patients who die following injury	52

EXECUTIVE SUMMARY

Major Trauma Audit (MTA) was established in the National Office of Clinical Audit (NOCA) in 2013. It specifically focuses on the care provided to the more severely injured patients in our healthcare system. NOCA has engaged the internationally recognised Trauma Audit and Research Network (TARN) to provide its methodological approach for MTA in Ireland. Eligible trauma receiving hospitals were identified by NOCA with the HSE National Emergency Medicine Programme. NOCA now has 26 trauma receiving hospitals participating in MTA. This has occurred on a phased basis since October 2013 to January 2016.

This first report presents findings from MTA in 2014 and 2015. At this time, there were 24 trauma receiving hospitals participating in MTA, but this has since increased to 26 hospitals in 2016. This could not have happened without the support of the dedicated hospital Clinical Leads and MTA Coordinators. MTA has been welcomed by both clinicians and hospital management teams alike. The purpose of this report is to provide patients, families, the public and the wider health system with an account of national MTA.

Most major trauma patients incurred their injuries following 'low falls' (falls of <2metres) followed by road traffic collisions. With regard to planning and resourcing of trauma services:

- **6% of major trauma patients were from the young population (< 16 years), 54% of major trauma patients were from the working age population (16-64 years) and 40% of major trauma patients are from the older population (≥65 years)**
- **58% of major trauma patients arrive to the emergency department after 4pm, with no significant difference in day of week presentation**
- **35% of major trauma patients had multiple injuries and 23% of major trauma patients had severe head injuries**
- **13% of major trauma patients were admitted to an intensive care unit and 60% of patients with severe traumatic brain injuries were admitted to a neurosurgery unit**
- **30% of patients had to be transferred to another hospital for on-going care as their care needs could not be provided by the initial receiving hospital.**

There is an evolving and maturing culture of clinical audit in Irish healthcare. Clinicians contribute to and learn from MTA findings. Data on patients with 'unexpected' outcomes, be that a patient who survived though expected to die based on the severity of injuries, or a patient who died though expected to live, is now interrogated at hospital level by clinicians and trauma governance teams to improve patient care. MTA is not mandatory at this time. Overall data completeness for 2014-2015 is 61%. The staggered nature in which hospitals commenced MTA, together with challenges around retention of MTA coordinators meant that some hospitals were unable to submit data for the whole calendar year. The requirement to track patients through the multiple hospital transfers is challenging and leads to 16% missing outcomes data. As a result, the measure of unexpected survivors and unexpected deaths in Ireland (Ws value) should not therefore be over interpreted.

Outstanding improvements have been seen in England with the reconfiguration of trauma services in 2012. It is timely that the Department of Health Strategic Advisory Group on development of trauma networks has been established to advise on how such a trauma system might be developed in Ireland. It is also timely that MTA has been established to help inform the design of a trauma system and monitor the effects of changes in how care is delivered; all the constituents that contribute to the outcome for a patient are monitored through MTA. Indeed, the public and service providers can be assured that it is now possible to robustly monitor equity of access to timely trauma expertise, processes and outcomes.

MAJOR TRAUMA AUDIT NATIONAL REPORT 2014-2015

KEY RECOMMENDATIONS

INTRODUCTION

- MTA should be used to quality assure and improve major trauma care in Ireland

DATA QUALITY

- A standardised approach to the documentation of major trauma should be incorporated into current pre-hospital and in-hospital documentation. This should be considered in the future development of an electronic health record. This will improve data quality for MTA
- The role of the MTA Coordinator is critical to hospital participation in MTA. Recruitment and retention of hospital MTA Coordinators will improve data completeness

WHO WAS INJURED AND HOW WERE THEY INJURED?

- Health services need to take account of the changing demographic of trauma patients; specifically MTA highlights a high incidence of older patients sustaining major trauma
- Injury prevention programmes should consider methods of reducing injury across the trauma spectrum, especially the high burden of injury associated with low falls

THE PATIENT JOURNEY

- More information from the pre-hospital patient care pathway will identify good practice and areas where treatment strategies may be enhanced. NOCA should work with TARN and with the pre-hospital ambulance services to improve the collection of pre-hospital data
- Equity of access to expertise in trauma care is required to maximise patient outcomes

CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE

- Clear national guidance is required to support hospitals in developing trauma teams which have been shown to improve timeliness to critical interventions and patient outcomes
- MTA should be used to inform ICU bed capacity requirements

OUTCOME FOLLOWING MAJOR TRAUMA

- Functional and quality of life patient outcomes should be incorporated into MTA

INTRODUCTION



INTRODUCTION

BACKGROUND TO MAJOR TRAUMA AUDIT IN IRELAND

Trauma care is complex and challenging. People sustain multiple injuries requiring urgent medical attention. Many critical decisions are made during the early phases of trauma care. Initial resuscitation and on-going care involves multiple specialist teams and disciplines. Each and every part of this journey impacts on whether the patient lives or dies and what injuries they will live with for the rest of their lives.

The care of critically ill patients with severe injuries requires a multi-disciplinary, multi-institutional, coordinated and integrated system of trauma care. One of the key factors underpinning the success of an integrated trauma system is high-quality data to facilitate local, regional and national quality assurance and improvement initiatives. Promoting and facilitating this is the aim of the Major Trauma Audit (MTA) in Ireland. MTA was established in the National Office of Clinical Audit (NOCA) in 2013. NOCA has engaged the internationally recognised Trauma Audit and Research Network (TARN) to provide its 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 MTA. This has occurred on a phased basis since October 2013. The core purpose of NOCA and its establishment of national clinical audits such as MTA, is to provide continual learning to our health system through evidence based audit methodologies that will ultimately improve clinical outcomes for patients in Ireland.

AIM OF MTA

The aim of MTA is to monitor care and drive quality improvement to achieve the best possible clinical outcomes for trauma patients in Ireland.

OBJECTIVES OF MTA

- To provide a national baseline of current trauma care, clinical practice and performance.
- To allow hospitals compare their performance to other hospitals nationally and internationally.
- To promote reflective clinical practice and to encourage peer performance review at hospital and national level.
- To monitor the care of complex patients; their pathway through the current system of care, their access to investigations and treatments and their outcomes.
- To provide high quality data to enable peer reviewed research and to drive clinical change.

THE STAKEHOLDERS

Trauma receiving hospitals

To participate in MTA, participating hospitals are required to identify:

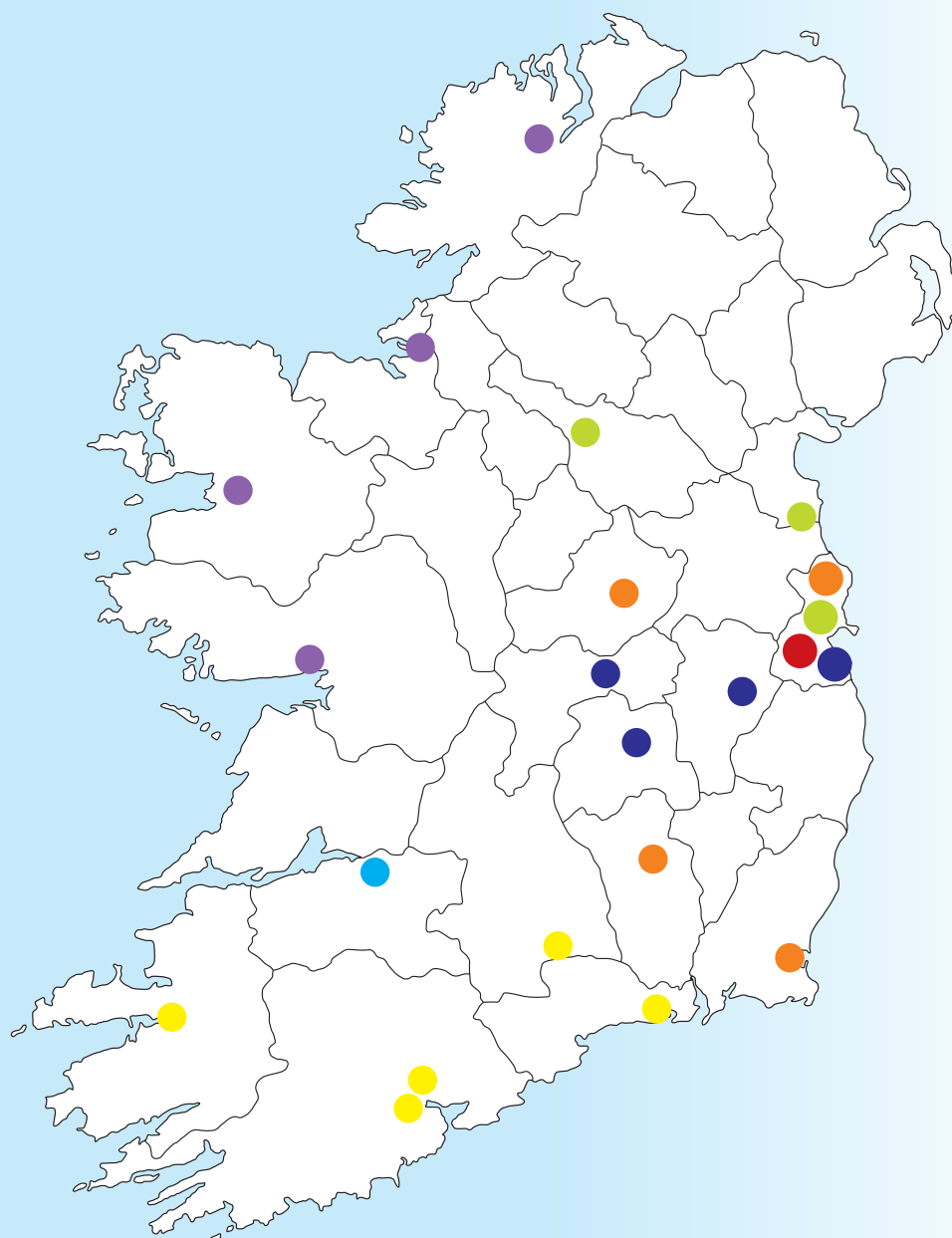
- MTA Clinical Lead (Consultant level from a trauma-related specialty)
- MTA Coordinator
- Commitment that the hospital Clinical Governance / Quality and Safety committees support MTA

Appendix 1 contains a list of hospital MTA Clinical Lead and Audit Coordinators. Considerable commitment from hospitals is required to ensure the sustainability of MTA. Despite challenging times, NOCA has found engagement and willingness to participate positive, due to the combined leadership of clinicians and hospital management teams. Recruitment of hospitals to MTA occurred on a phased basis from October 2013 to January 2016 until implementation was achieved in 26 hospitals.

Trauma Audit and Research Network

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 has been integral to the reconfiguration of trauma care delivery in England 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, supplemented by NOCA is designed to assist hospitals and clinicians learn and continuously improve care delivered to major trauma patients.

FIGURE 1: DISSEMINATION OF MTA TO TRAUMA RECEIVING HOSPITALS



NOTE: Dublin Hospitals have been displayed collectively by hospital group.

Saolta University Healthcare Group

Galway University Hospitals
Letterkenny University Hospital
Mayo University Hospital
Sligo University Hospital

RCSI Hospital Group

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, Dublin
Tallaght Hospital (Adult)

Ireland East Hospital Group

Mater Misericordiae University Hospital
Midland Regional Hospital Mullingar
St. Luke's General Hospital, Kilkenny
St. Vincent's University Hospital
Wexford General Hospital

National Children's Hospital Group

Our Lady's Children's Hospital Crumlin
Tallaght Hospital (Paediatrics)
Temple Street, Children's University Hospital

UL Hospital Group

University Hospital Limerick

South West Hospital Group

Cork University Hospital
Mercy University Hospital
South Tipperary General Hospital
University Hospital Waterford
University Hospital Kerry

The National Office of Clinical Audit

NOCA was established in 2012 through a collaborative agreement between the HSE Quality Improvement Division (previously called the Quality & Patient Safety Division) and the Royal College of Surgeons in Ireland. The primary purpose of NOCA is to establish sustainable clinical audit programmes at national level which will ultimately improve outcomes for patients in hospitals in Ireland. Current national audits in development or implementation phase include:

- Major Trauma Audit (MTA)
- Irish National Orthopaedic Register (INOR)
- National Audit of Hospital Mortality (NAHM)
- National Intensive Care Audit (ICU Audit)
- Irish Audit of Surgical Mortality (IASM) (This audit is currently on hold pending the implementation of the Patient safety and health information legislation)
- Irish Hip Fracture Database (IHFD)

NOCA also provides assisted governance to clinical audits coming from the National Perinatal Epidemiology Centre (NPEC).

MTA Governance Committee

NOCA has supported the establishment of a multidisciplinary governance committee for MTA. This governance committee facilitates MTA implementation and ensures the outputs are appropriately interpreted. Membership both current and past, of the MTA Governance Committee is presented in Appendix 2.

OVERVIEW OF THIS REPORT

This is the first report of MTA in Ireland. There is an evolving and maturing culture of clinical audit in Irish healthcare. Hospitals are encouraged to take part and learn from audit findings. The purpose of this report is to provide patients, families, the public and the wider health system with an account of the national MTA.

MTA should be used to quality assure and improve major trauma care in Ireland.

MTA METHODOLOGY



MTA METHODOLOGY

DATA SOURCES

MTA collects information on seriously injured patients treated in trauma receiving hospitals throughout Ireland. Data is collated from across the patient journey from injury to recovery including pre-hospital records, hospital clinical records including radiology and surgical operation reports, hospital administration information systems and the Hospital-In-Patient-Enquiry (HIPE) information system. All data is verified, triangulated and anonymised by the MTA Coordinators in the hospitals and directly entered onto the secure TARN portal for injury coding and analysis.

DATA ELEMENTS

There are specific TARN audit inclusion criteria, which define what patients are included in the audit (Appendix 3). TARN focuses on the more severely injured trauma patients, those who have potential life changing or life threatening injury. Injured patients who die in advance of reaching hospital are not included. MTA reports on the patient's pathway in relation to evidence based clinical standards in trauma care (Appendix 4).

When auditing the management of major trauma, it is important to have a method for grading the severity of trauma sustained by a patient. Otherwise it would not be possible to objectively distinguish a patient who died, who might have been saved with better care processes, from a patient whose injuries were such that death was inevitable. Each injury is therefore coded using an internationally agreed standardised coding system for trauma where each specific and individual injury is coded using the Abbreviated Injury Scale (AIS) dictionary produced by the Association for the Advancement of Automotive Medicine (AAAM, 2005). Each injury is scored between one and six based on its severity. An AIS score of one represents a minor injury; whereas an AIS score of six represents an injury which is not survivable. This contributes to the overall Injury Severity Score (ISS) for that patient, which is rated on a scale from 0 to 75. Examples are presented in Table 1.

TABLE 1: 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 large blood loss Severe injuries to multiple body regions

The ISS score, in conjunction with other physiological parameters including age, Glasgow Coma Score (GCS) (a measure of level of consciousness) and comorbidities (pre-existing medical conditions) are used to calculate a probability of survival (PS) for each injured patient. This is the probability of a patient surviving until discharge or 30 days. For example, if a patient has a calculated risk adjusted probability of survival of 80%, this means that for every 100 patients with that severity of injury, age, co-morbidity profile, gender and GCS, 80 are expected to survive and 20 die. This calculation is based on the historical records of tens of thousands of trauma patients whose injuries and outcomes have previously been captured on the TARN database.

If a patient has a probability of survival of 75% or more and dies, this prompts a review of the case to see if elements of care might have contributed to the outcome. Often, no issues are identified which is reassuring to the care providers and suggests that this was a patient who was amongst the 25% of patients with this level of injury where death occurs. The aggregation of unexpected survivors and deaths creates the hospitals 'Ws value' – the number of excess survivors or deaths per 100 trauma patients.

DATA COLLECTION

Data collection is carried out by local MTA Coordinators with guidance and support from a MTA Clinical Lead from a trauma related specialty. While all trauma receiving hospitals are eligible to participate, the appointment of local MTA Coordinators has varied between sites. Hospital challenges around the appointment of a dedicated MTA Coordinator have led to variation in recruitment and participation of hospitals to MTA. The dates which hospitals commenced MTA through NOCA is presented in Table 2.

DATA QUALITY

Data quality is fundamental to robust audit.

- All MTA Coordinators attend accredited TARN training prior to commencement of data collection facilitated by NOCA.
- Specific instruction on data quality is provided in the NOCA Handbook (NOCA 2015).
- NOCA, working with TARN, have adapted the dataset to fit within the Irish context and nomenclature.
- On completion of data entry for all individual submissions, the user i.e. hospital MTA Coordinator runs an electronic validation of the submission. The validation procedure checks to ensure no mandatory fields have been missed and that data entry is logical.
- Data quality is constantly evaluated at hospital level by the MTA Coordinator through generation of 'data quality' reports which identify:
 - Key missing or incorrect fields from individual submissions
 - Measures of data capture of the clinical audit.
- TARN provides on-going on-line and telephone support for data collection.
- Furthermore, TARN provides both technical and statistical expertise in coding and analysis of processes and outcomes.

DATA CONFIDENTIALITY

The Data Protection Acts 1988 & 2003 provide the legislative basis for the approach of the Office of the Data Protection Commissioner with regard to personal data across all sectors of society including the health service. MTA adheres strictly to this; all identifiable data is de-identified at hospital level before being reviewed by either TARN or NOCA.

TABLE 2: COMMENCEMENT OF MTA

HOSPITAL GROUP	HOSPITAL	COMMENCEMENT OF MTA
RCSI Hospital Group	Beaumont Hospital	October, 2013
	Connolly Hospital	April, 2014
	Cavan General Hospital	October, 2013
	Our Lady of Lourdes Hospital, Drogheda	October, 2013
Ireland East Hospital Group	St. Vincent's University Hospital	October, 2013
	Mater Misericordiae University Hospital	April, 2014
	Wexford General Hospital	April, 2014
	St. Luke's General Hospital, Kilkenny	April, 2014
	Midland Regional Hospital Mullingar	April, 2014
Dublin Midlands Hospital Group	St. James's Hospital	January, 2016
	Tallaght Hospital (Adult ED)	October, 2013
	Naas General Hospital	October, 2013
	Midland Regional Hospital Tullamore	April, 2014
	Midland Regional Hospital Portlaoise	April, 2014
Children's Hospital Group	Our Lady's Children's Hospital Crumlin	September, 2015
	Temple Street Children's University Hospital	October, 2013
	Tallaght Hospital (Children's Emergency Department)	October, 2013
South/South West Hospital Group	University Hospital Waterford	April, 2014
	Cork University Hospital	October, 2013
	University Hospital Kerry	April, 2014
	Mercy University Hospital	January, 2016
	South Tipperary General Hospital	October, 2013
UL Hospitals Group	University Hospital Limerick	April, 2014
Saolta University Health Care Group	University Hospital Galway	January, 2015
	Letterkenny University Hospital	October, 2013
	Sligo University Hospital	October, 2013
	Mayo University Hospital	January, 2015

DATA QUALITY



DATA QUALITY

DATA FOR THIS MTA REPORT

This initial report focuses on data collection between 1st January 2014 to 31st December 2015. Data for this report was downloaded from TARN on 27th July, 2016. The final dataset used for this report includes 7019 submissions.

TABLE 3: DATA ANALYSIS FOR MTA REPORT

ISS CLASSIFICATION	2014	2015
Participating hospitals	22	24
All TARN submissions	3687	3332
Individual Patients	3228	2957
Direct Admissions	2954	273

QUALITY ASSURANCE OF TARN SUBMISSIONS

TARN also provides output measures of data completeness and accreditation as a means to access the quality of MTA data.

DATA COMPLETENESS FOR THIS REPORT

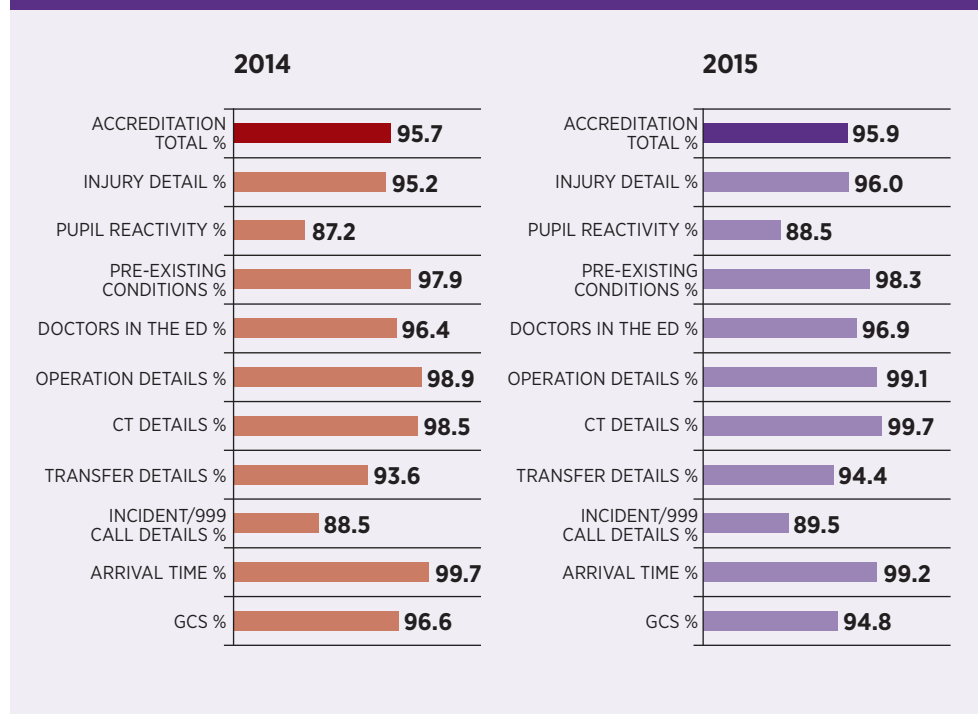
Data completeness i.e. the number of approved submissions as a measure of the expected submissions, provides a measure of data capture for MTA. Hospital Inpatient Enquiry (HIPE) data establishes a baseline of expected submissions for MTA. This is done by application of the TARN inclusion criteria to the HIPE data, thereby estimating the likely number of patients who would be eligible for inclusion in major trauma audit. This is a crude methodology however it is important in motivating complete data capture at hospitals ensuring hospitals contribute all cases, not just the cases with very good or very poor outcomes.

Taking account of a crude adjustment for non-participating hospitals across both years, data completeness was 67% in 2014 and 55% in 2015. The staggered nature in which hospitals commenced trauma audit (Table 1) explains this level of data completeness. The data set for 2015 is less complete. This may be explained by challenges around retention of MTA coordinators, with some hospitals unable to submit data for the whole year. Incomplete data capture is a limitation of this report and audit findings must be interpreted in this light. As MTA matures and becomes embedded in the Irish health system, data capture will improve.

DATA ACCREDITATION FOR THIS REPORT

A second aspect of data quality is completion of key data fields across the TARN data set. TARN applies a standard of 95% data quality. Approved TARN submissions from Ireland for both 2014 and 2015 achieved this overall standard (Figure 2).

FIGURE 2: ACCREDITATION STANDARD



Most key data elements are effectively captured, with some areas highlighted for improvement as follows;

- Incident time/ 999 call detail - this is captured in the pre-hospital patient care report (PCR) form. NOCA is working with the pre-hospital services to improve this aspect of data capture.
- Pupil reactivity for head injuries - NOCA supports MTA Coordinators in finding ways to ensure all important data elements are collected. Trauma receiving hospitals have been encouraged to use a standardised approach to trauma documentation. This can act as a prompt to ensure the necessary information is collected.

A standardised approach to the documentation of major trauma should be incorporated into current pre-hospital and in-hospital documentation. This should be considered in the future development of an electronic health record. This will improve data quality for MTA.

DATA CAVEATS FOR THIS REPORT

This is the first report from the national MTA. Findings have been presented to describe the range of traumatic injuries, care processes and outcomes. Hospitals have not been named. In the future, as this audit matures, it is envisaged that hospitals will be identifiable. MTA is a live audit with on-going update by hospitals onto the TARN portal. While all reasonable efforts have been made to ensure accuracy of this dataset, there may be minor discrepancies with other reports published by local sources.

The role of the MTA Coordinator is critical to hospital participation in MTA. Recruitment and retention of hospital MTA Coordinators will improve data completeness.

**WHO WAS
INJURED AND
HOW WERE
THEY INJURED?**



WHO WAS INJURED AND HOW WERE THEY INJURED?

DEMOGRAPHIC PROFILE OF MAJOR TRAUMA PATIENTS

The gender distribution of major trauma patients did not vary in 2014 and 2015. The greater burden of trauma is borne by males and this is consistent with global data.

TABLE 4: GENDER OF MAJOR TRAUMA PATIENTS

	2014	2015
Male	1897 (59%)	1684 (57%)
Female	1331 (41%)	1273 (43%)

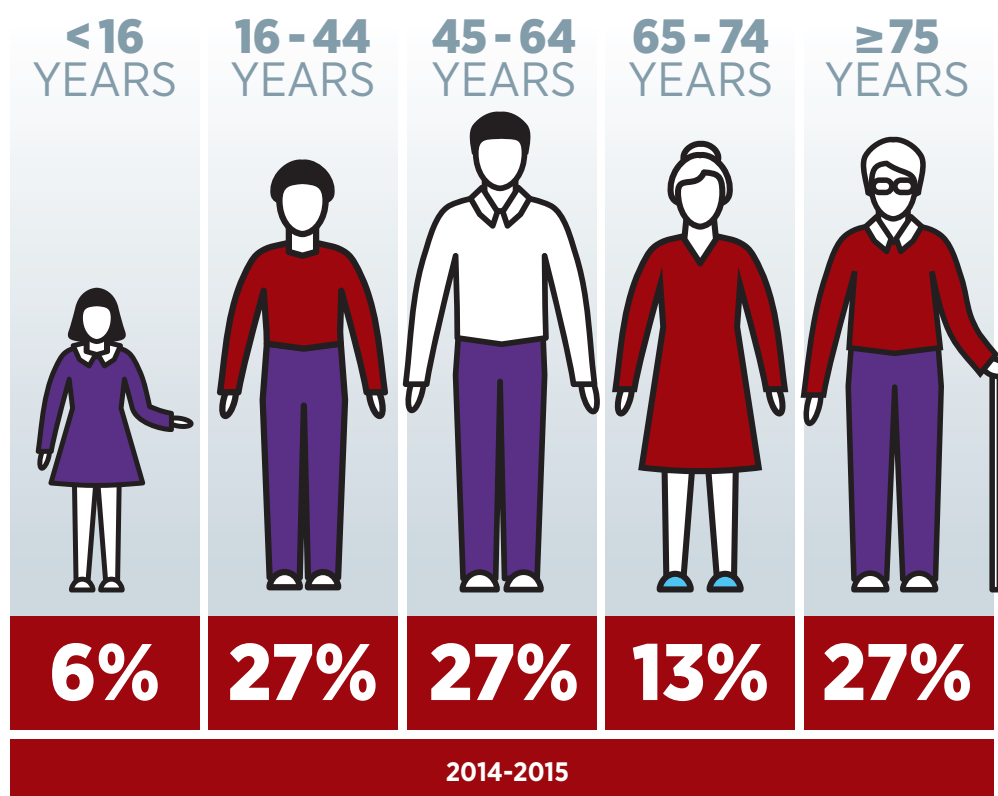
The median age of major trauma patients was;

- 57 years (IQR 35-75 years) in 2014
- 58 years (IQR 37-76years) in 2015.

The age breakdown of major trauma patients is presented in Table 5.

TABLE 5: AGE OF MAJOR TRAUMA PATIENTS

	< 16 Years	16-44 Years	44-64 Years	65-74 Years	≥75 Years
2014	198 (6%)	910 (28%)	879 (27%)	402 (12%)	839 (26%)
2015	201 (7%)	758 (26%)	811 (27%)	374 (13%)	813 (27%)



6% of major trauma patients were from the young population (<16 years)
54% of major trauma patients were from the working age population (16-64 years)
40% of major trauma patients are from the older population (≥ 65 years)¹

The median ISS per age group for all major trauma patients is presented in Table 6

TABLE 6: MEDIAN ISS PER AGE GROUP

	< 16 Years	16-44 Years	44-64 Years	65-74 Years	≥75 Years
Median ISS (IQR)	9 (9-16)	10 (9-20)	9 (9-17)	9 (8-17)	9 (5-16)

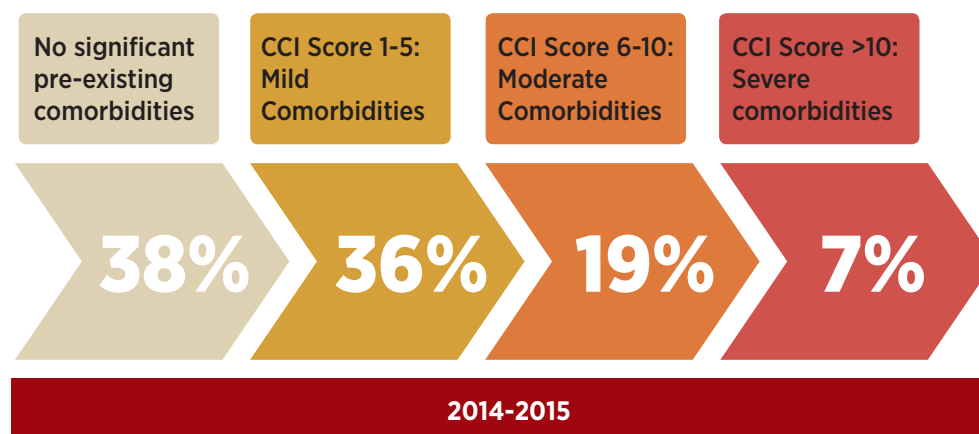
PRE-EXISTING MEDICAL CONDITIONS

A patient who has chronic medical conditions has a different risk profile to that of a patient without such conditions if major trauma is sustained; it is necessary to account for this in reviewing outcomes such as survival. The Charlson Comorbidity Index (CCI) was developed to predict one-year mortality risk (Charlson, 1987). It has been adapted and validated for predicting the outcome and risk of death for many comorbid diseases. The CCI is used in statistical adjustment for comorbidities in TARN. Older patients will generally have a greater burden of significant pre-existing comorbidities.

TABLE 7: COMORBIDITIES OF PATIENTS AGED OVER 65 YEARS OF AGE

	2014	2015
No significant pre-existing comorbidities	464 (38%)	445 (38%)
Mild comorbidities	436 (35%)	425 (36%)
Moderate comorbidities	233 (19%)	229 (19%)
Severe comorbidities	91 (7%)	74 (6%)

Missing comorbidity data: 2014-17; 2015-2014



¹ <https://data.oecd.org/pop/working-age-population.htm>

TYPE OF INJURY

Traumatic injuries are commonly classified into blunt or penetrating, based on the cause of injury.

- The vast majority of injuries were in the blunt trauma category; 3114 (96%) patients in 2014, and 2890 (98%) in 2015 sustained blunt trauma.
- Penetrating injuries such as knife or gunshot wounds were sustained by 114 (4%) patients in 2014 and 67 (2%) in 2015.

This is similar to the UK findings (National Audit Office, 2010).

CAUSE OF INJURY

The cause of injury is presented in Figure 3. This shows that falls of less than 2 metres (m) termed 'low falls' were the most frequent cause of injury, accounting for over 50% of major trauma patients. This was followed by road traffic collisions, accounting for 662 (21%) of patients in 2014 and 607 (21%) in 2015. A breakdown of road trauma is detailed in Table 8.

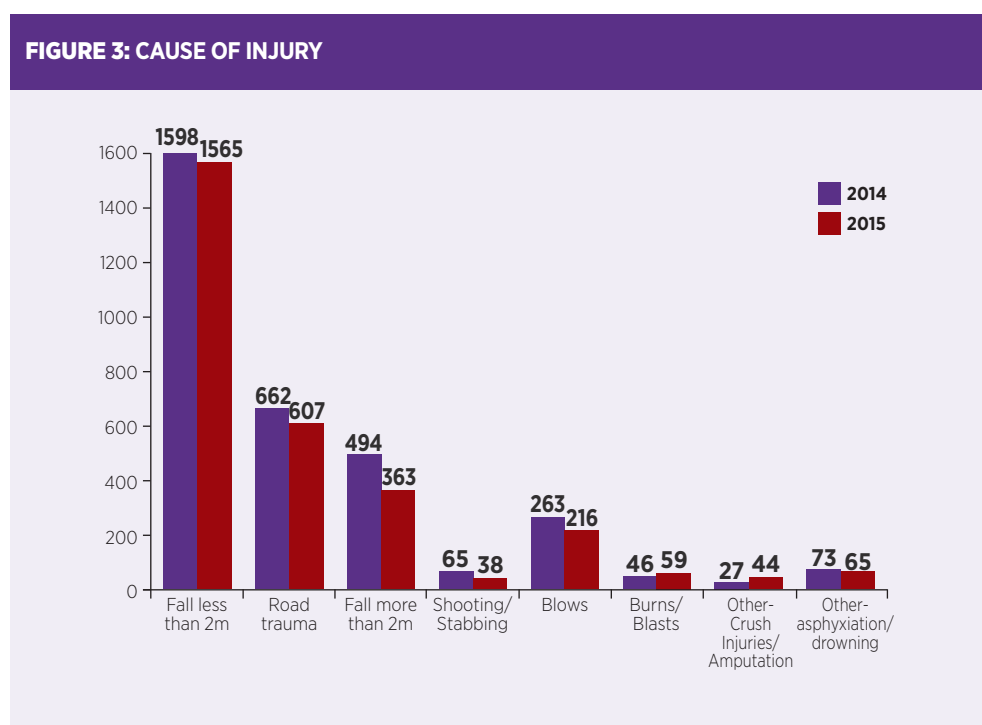
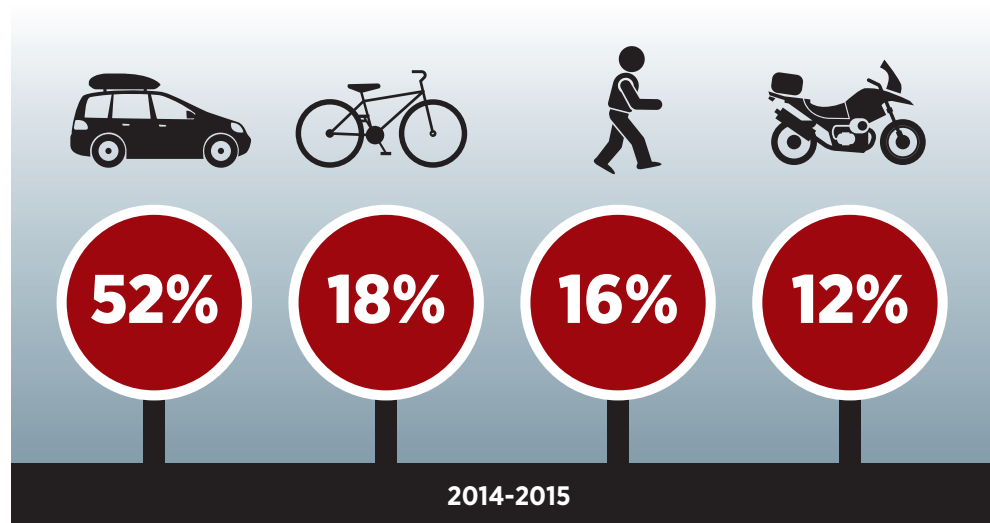


TABLE 8: BREAKDOWN OF ROAD TRAUMA

	2014	2015
Car	342 (52%)	320 (53%)
Cyclist	118 (18%)	113 (19%)
Pedestrian	108 (16%)	98 (16%)
Motor cycle	86 (13%)	71 (12%)

Missing data: 2014-8; 2015- 5 Percentages may not sum to 100% due to rounding.



The median ISS score for patients sustaining road trauma is presented in Table 9.

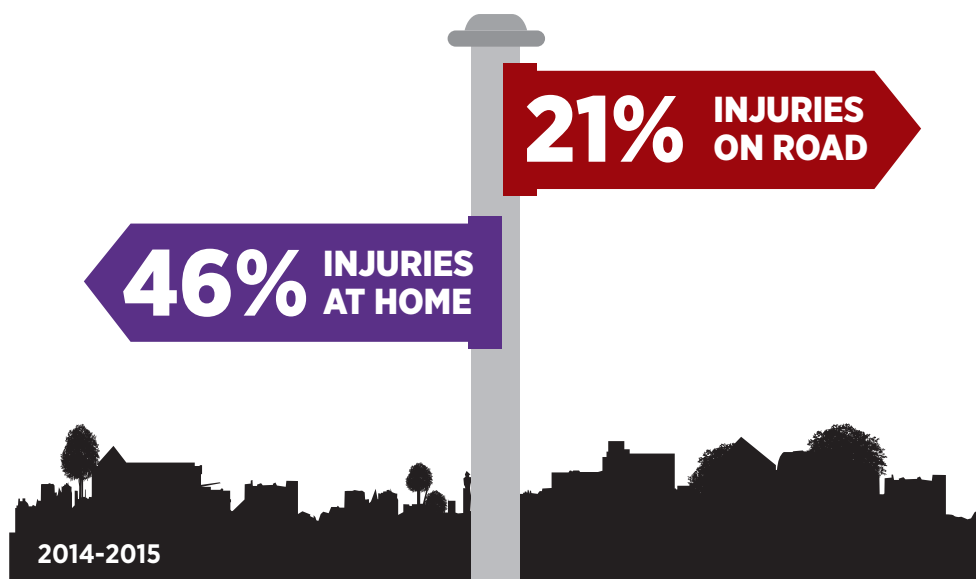
TABLE 9: MEDIAN ISS PER MECHANISM OF ROAD TRAUMA

	MEDIAN ISS (IQR)
Cyclist	13 (9-21)
Car	12 (9-22)
Motor cycle	10 (9-18)
Pedestrian	14 (9-27)

PLACE OF INJURY

The most common place of injury was at home;

- In 2014, 1452 (45%) and in 2015, 1363 (46%) of major trauma patients sustained injury at home
- The road was the next most common place of injury; in 2014, 728 (23%) and in 2015, 599 (20%) of major trauma patients were injured on the road.
- Farm-related injuries accounted for 125 (4%) major trauma injuries in 2014 and 148 (5%) in 2015.

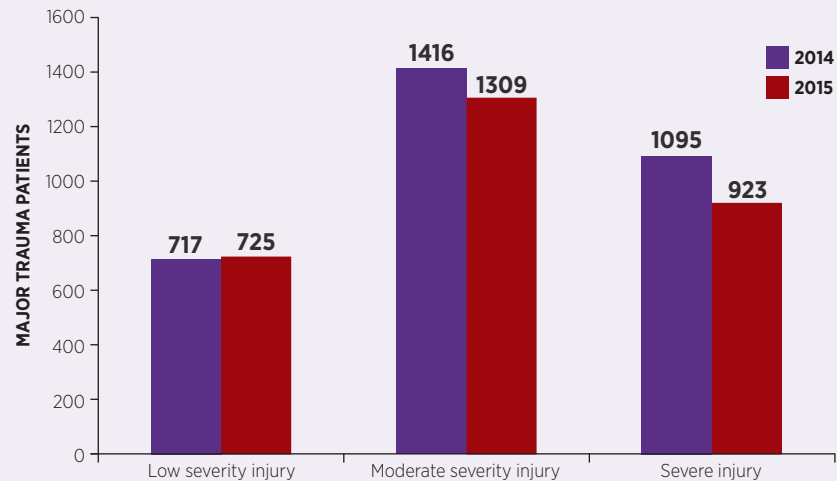


Health services need to take account of the changing demographic of trauma patients; specifically MTA highlights a high incidence of older patients sustaining major trauma. Injury prevention programmes should consider methods of reducing injury across the trauma spectrum, especially the high burden of injury associated with low falls.

SEVERITY OF INJURY

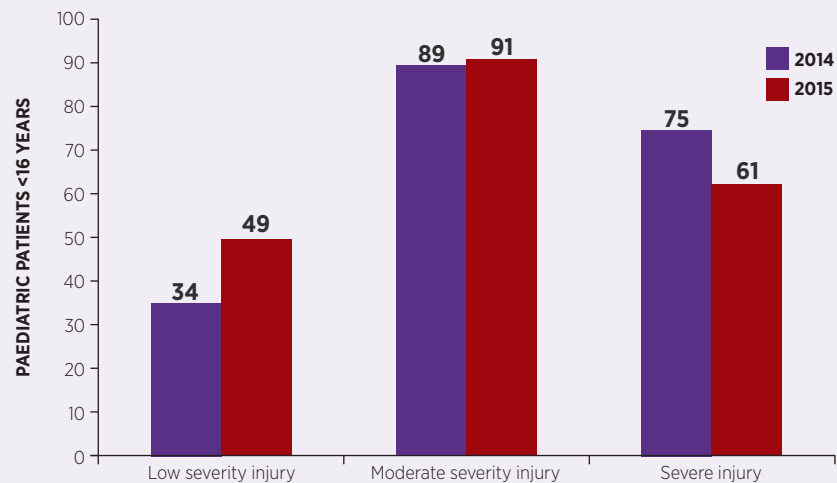
A breakdown of the ISS across all injured patients is presented in Figure 4.

FIGURE 4: INJURY SEVERITY SCORE



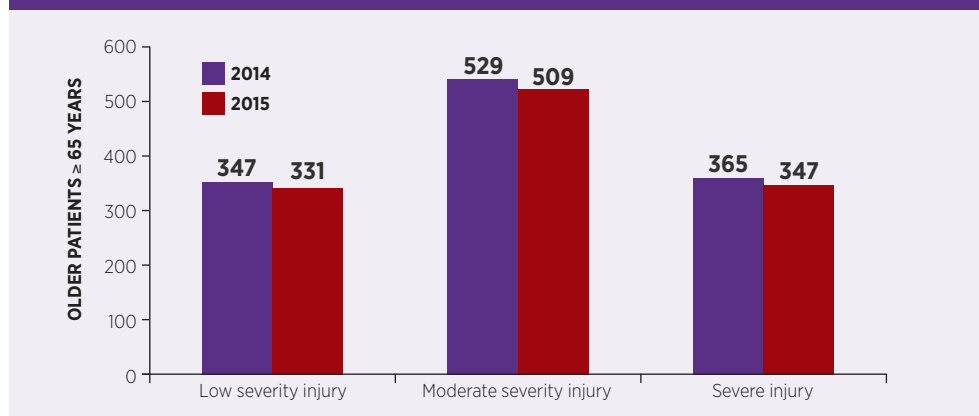
- The breakdown of ISS for paediatric patients (age < 16 years) is presented in Figure 5.
- The breakdown of ISS for older patients (age ≥ 65 years) is presented in Figure 6.

FIGURE 5: PAEDIATRIC PATIENTS (16 YEARS OR LESS): INJURY SEVERITY SCORE



77% of major trauma patients had moderate to severe injury

FIGURE 6: OLDER PATIENTS (65 YEARS OR OLDER): INJURY SEVERITY SCORE



THE INJURIES SUSTAINED

Injuries are reported based on body region. Most patients had an injury to one single body region. In 2014, there were 2057 (64%) major trauma patients with an injury to one body region and there were 1964 (66%) patients in 2015.

Table 10 shows the distribution by specific body region, the injuries sustained by major trauma patients. For example in 2014, 929 major trauma patients had head injuries, of which 420 had severe head injuries with no other injuries and 377 had severe head injuries with other injuries.

TABLE 10: INJURIES SUSTAINED BY MAJOR TRAUMA PATIENTS

ISS CLASSIFICATION	2014	2015
All head injuries²	929	745
Isolated severe head injuries ³	420 (13%)	335 (11%)
Severe head injuries and other associated injuries ⁴	377 (12%)	309 (11%)
All limb injuries	1382	1249
Isolated severe limb injuries	745 (23%)	668 (23%)
Severe limb and other associated injuries	637 (20%)	581 (20%)
All pelvic injuries	459	442
Severe isolated pelvic injuries	26 (1%)	30 (1%)
Severe pelvis and other associated injuries	57 (2%)	58 (2%)
All spinal injuries	754	697
Severe isolated spinal injuries	176 (5%)	189 (6%)
Severe spinal and other associated injuries	152 (5%)	142 (5%)
All chest and abdominal Injuries	122	74
Severe chest and abdominal injuries only	17 (1%)	8 (-)
Severe chest and abdominal injuries and other associated Injuries	38 (1%)	19 (1%)

2 All injuries: All injuries to specific body region with AIS 1-6.

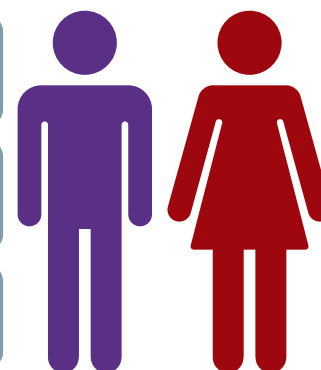
3 Isolated body region: Body region e.g. head, pelvis with AIS =3 -6 with no other injuries.

4 Body region and other associated injuries: Body region e.g. head, pelvis with AIS =3 -6 in addition to another injury AIS 1-6

23% SERIOUS HEAD INJURY Severe head trauma, both isolated and that associated with other injuries, accounted for 23% of all major trauma.

11% SERIOUS SPINAL INJURY Severe spinal trauma, both isolated and that associated with other injuries, accounted for 11% of major trauma.

35% MULTIPLE INJURIES 35% of major trauma patients had multiple injuries



2014-2015

HEAD INJURIES

Head injury is the most common cause of death in patients sustaining major trauma who survive to hospital admission but later die. In those that survive, it can be a devastating injury for the patient and their families and carries a high societal cost.

A marker of head injury on arrival of the patient at the ED is the level of consciousness measured as the Glasgow Coma Score (GCS). Ninety five per cent of people who sustain head injuries present with a normal or minimally impaired consciousness level (GCS of 13 to 15) but the majority of fatal outcomes are in the moderate (GCS 9–12) or severe (GCS 8 or less) head injury group (NICE, 2014).

The median GCS for all head injury major trauma patients was 14 (IQR 12–15). There were 108 (3%) major trauma patients who had a GCS of 3 on arrival to hospital which is the lowest possible GCS that can be recorded; 33 (37%) survived to hospital discharge. In MTA, head injuries are classified according to the findings on the CT scan (measured by the AIS score) and by GCS on initial arrival to the first ED. An analysis of severe head injuries is presented in Table 11.

TABLE 11: SEVERE HEAD INJURIES

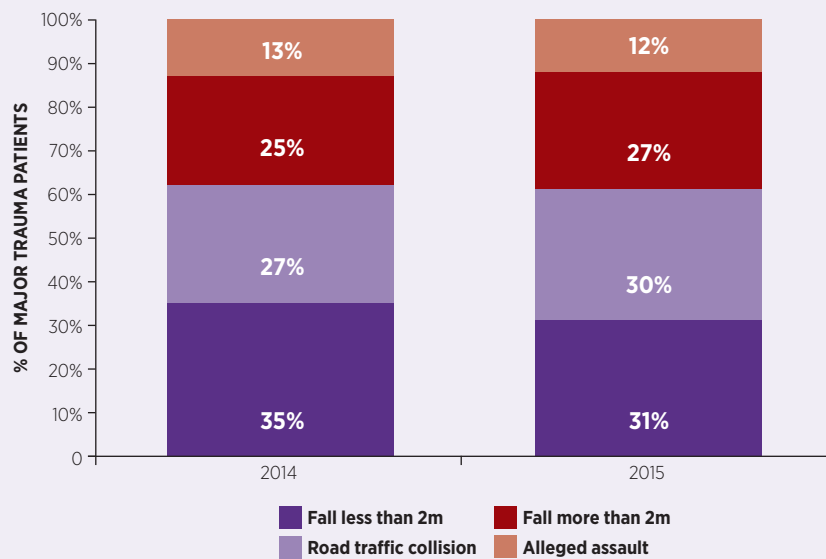
Classification of severe head injury	2014 (n=789)	2015 (n=633)
Traumatic Brain Injury (AIS 3+, GCS 13–15)	533 (67%)	452 (71%)
Traumatic Brain Injury (AIS 3+, GCS 9–12)	109 (14%)	62 (10%)
Severe Traumatic Brain Injury (AIS 3+, GCS ≤8)	147 (19%)	119 (19%)

Missing GCS data: 2014-7; 2015 -11.

The median age (interquartile range: years) of patients presenting with severe traumatic brain injuries (TBI) was 41 years (27–63) in 2014 and 40 years (23–62) in 2015. This is younger than the overall major trauma patient population. The cause of injury in patients with severe TBI is presented in Figure 7.

- Falls of less than 2 metres were the greatest cause of severe TBI.
- There were 31 (61%) patients over 65 years of age in 2014, and 19 (50%) in 2015 who sustained severe TBI due to a fall of less than 2 metres.
- Almost one third of severe TBI were caused by road trauma; 39 patients in 2014 and 36 patients in 2015.

FIGURE 7: CAUSE OF INJURY IN PATIENTS WITH SEVERE TBI



Patients with severe TBI are younger than the overall major trauma population

THE PATIENT JOURNEY



THE PATIENT JOURNEY

PRE- HOSPITAL CARE

A record of pre-hospital care was available for 4276 (75%) patients. Some patients may have come to hospital accompanied by family or another service such as the Gardaí. In some cases, the pre hospital care report (PCR) was not available for MTA; there was 23% of missing data for 2014-15.

TABLE 12: MODE OF PRE-HOSPITAL CARE

	2014	2015
Ambulance	342 (52%)	320 (53%)
Helicopter	118 (18%)	113 (19%)
Ambulance & Helicopter	108 (16%)	98 (16%)

Missing pre- hospital data: 2014-510; 2015-483.



97%



2%



<1%

2014-2015

The most senior attending pre-hospital health care professional is collected from the patient care report (PCR) and is presented in Table 13. This information was not captured in approximately 5% of cases for both years.

TABLE 13: MOST SENIOR PRE-HOSPITAL HEALTH CARE PROFESSIONAL

Pre-hospital health care professional	2014	2015
Paramedic	1306 (57%)	1069 (53%)
Advanced paramedic	808 (35%)	811 (41%)
Doctor	46 (2%)	31 (2%)
Other	6 (-)	2 (-)

More information from the pre-hospital patient care pathway will identify good practice and areas where treatment strategies may be enhanced. NOCA should work with TARN and with the pre-hospital ambulance services to improve the collection of pre-hospital data.

TRANSFER OF PATIENTS

The proportion of major trauma patients who arrived at an appropriate hospital capable of providing on-going care was just over 70%; the remaining trauma patients had to be transferred from the first treating hospital for their on-going care. In 2014, there were 917 major trauma patients and in 2015, there were 781 patients transferred to another hospital. In 31 cases, more than one transfer was required for specialist care.

30 % of patients were transferred to another hospital

TRANSFER OF MAJOR TRAUMA PATIENTS WITH HEAD INJURY

Equity of access based on need to specialist services is an important component of health service planning. One such critical service is neurosurgery. There are three neurosurgical centres in Ireland; Beaumont Hospital and Temple Street Children's University Hospital in Dublin and Cork University Hospital. Table 14 describes the care pathway for major trauma patients sustaining severe head injuries with details of the proportion who were admitted to a neurosurgical centre, those who were transferred to a neurosurgical centre and those who were not transferred. NICE (2014) recommend the transfer of patients with a severe TBI to a neurosurgical centre.

TABLE 14: CARE PATHWAY OF MAJOR TRAUMA PATIENTS WITH SEVERE HEAD INJURY

	Direct admission to neurosurgical centre	Transfer to neurosurgical centre	Not transferred to neurosurgical centre
2014			
TBI (AIS 3+, all GCS)	172 (22%)	231 (29%)	384 (49%)
Severe TBI (AIS 3+, GCS <8)	27 (19%)	70 (49%)	47 (33%)
2015			
TBI (AIS 3+, all GCS)	99 (16%)	147 (23%)	390 (61%)
Severe TBI (AIS 3+, GCS <8)	24 (20%)	38 (32%)	58 (48%)

Percentages may not sum to 100% due to rounding.

The decision to transfer a patient to a neurosurgical centre is nuanced by access to critical care beds at the neurosurgical centre, the severity of injuries, the age and co-morbidities of the patient. There were 5% of patients with TBI and 20% of patients with severe TBI who died within 24 hours of arrival in the first receiving hospital. That being said, there was a significant number of patients with TBI and severe TBI who did not receive care at neurosurgical centres.

A GCS score of 8 or lower indicates a severe traumatic brain injury. People with a head injury who have a Glasgow Coma Scale (GCS) score of 8 or lower at any time should have access to specialist treatment.

Policies on the transfer of patients with head injuries should recognise that:

- transfer would benefit all patients with serious head injuries (GCS 8 or less) irrespective of the need for neurosurgery
- where transfer of those who do not require neurosurgery is not possible, ongoing liaison with the neurosurgery unit over clinical management is essential (NICE, 2014).

Equity of access to expertise in trauma care is required to maximise patient outcomes.

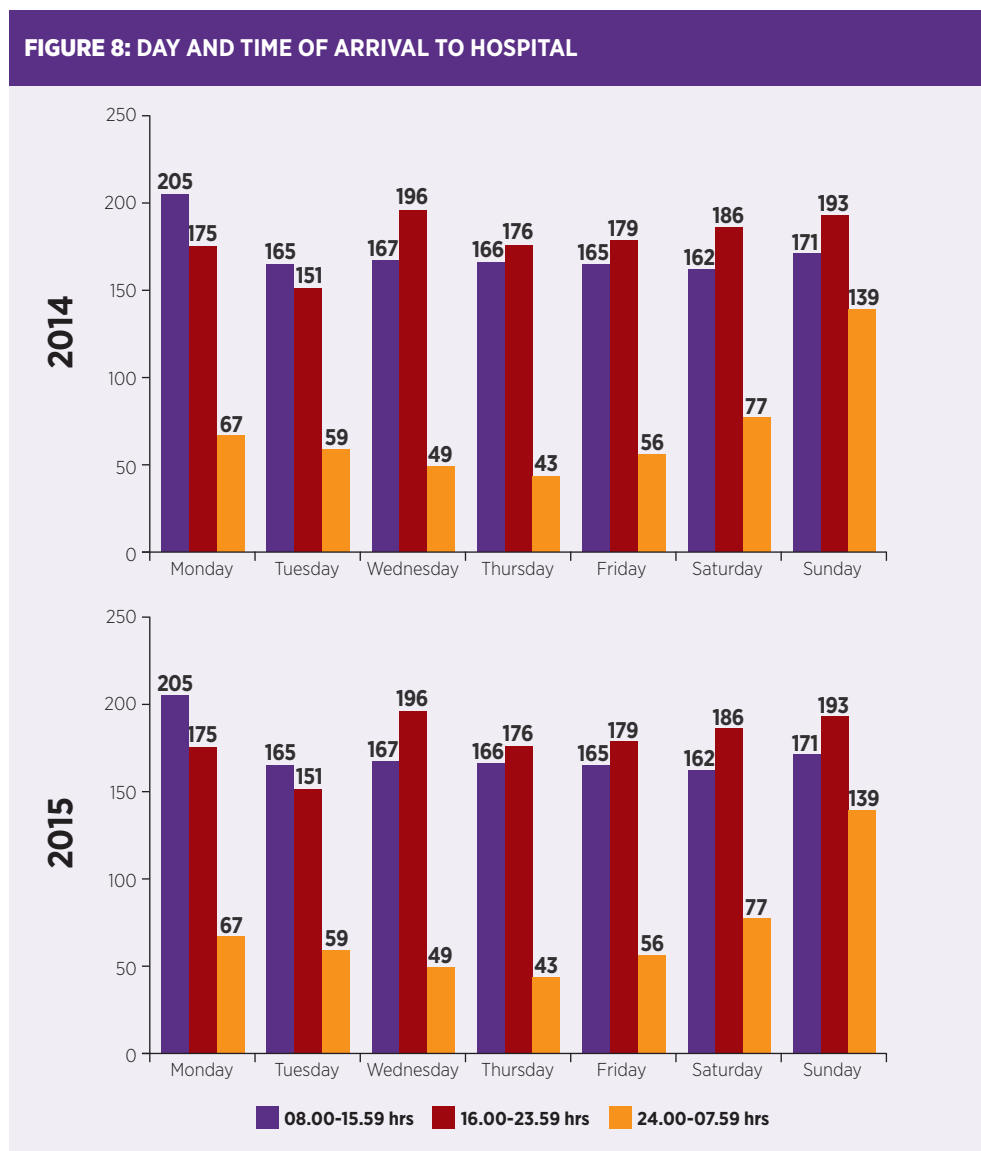
CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE



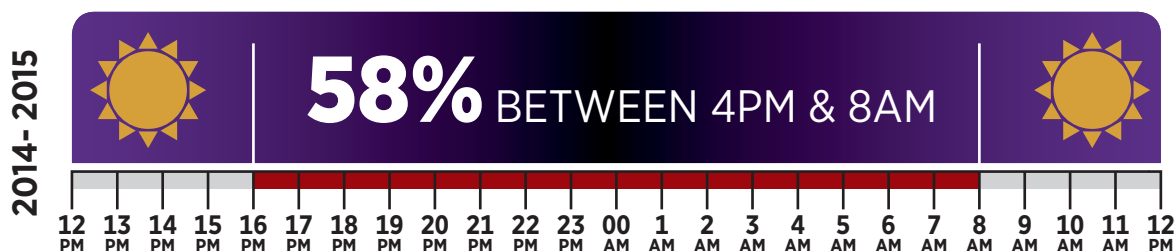
CARE OF MAJOR TRAUMA PATIENTS IN THE ACUTE HOSPITAL SERVICE

RECEPTION OF MAJOR TRAUMA PATIENTS IN HOSPITAL

Presentation of major trauma patients to hospital is presented by day of week and time of day in Figure 8



There was similar activity across the 7 days of the week. Almost 60% of major trauma patients arrived at hospital between 16:00 hrs and 08:00h



TIME TO SEE PATIENTS ON ARRIVAL TO HOSPITAL

Outcomes from the initial assessment and resuscitation of trauma patients are improved by an organised trauma team (Driscoll and Vincent, 1992). The introduction of a trauma team has led to improved patient outcomes for severely injured patients (Cornwell et al, 2003; Geraldo et al 2011). Trauma teams should be consultant-led (Royal College of Surgeons of England and the British Orthopaedic Association, 2000). The NHS Clinical Advisory Group (2010) recommend that trauma teams in major trauma centres should be led by a consultant and by an experienced registrar at trauma units.

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 if what they define a trauma team was activated.

TABLE 15: RECEPTION BY A TRAUMA TEAM

	2014	2015
All Patients received by a trauma team	410 (14%)	253 (9%)
Trauma team led by a Consultant (at 30 minutes)	240 (59%)	164 (65%)
All Severely injured patients (ISS> 15) received by a trauma team	212 (23%)	140 (15%)
Severely injured patients (ISS> 15): Trauma Team led by a Consultant (at 30 minutes)	140 (66%)	102 (73%)

Trauma teams are not widely utilised in the reception of major trauma patients in Ireland yet have been shown to be associated with better process metrics and outcomes.

Clear national guidance is required to support hospitals in developing trauma teams which have been shown to improve timeliness to critical interventions and patient outcomes.

The grade of attending doctor in the Emergency Department (ED) was captured for all major trauma patients (Table 16), and for patients with an ISS >15 (Table 17). These findings suggest a low level of initial assessment by senior clinical decision makers in the Emergency Department.

Stakeholder feedback highlights reduced numbers of consultants in Emergency Medicine per unit in comparison to other jurisdictions (Irish Association of Emergency Medicine, 2014). The time of initial assessment and treatment is not captured robustly in clinical documentation and NOCA are working with hospitals to improve this. Therefore, this data should be cautiously interpreted. It does, nonetheless, signal a lack of consultant presence and leadership in the initial stages of trauma reception and resuscitation.

TABLE 16: MOST SENIOR DOCTOR SEEING THE PATIENT IN THE ED

	2014 (n=2954)		2015 (n=2736)	
	Seen by Dr in ED < 30 mins	Seen by Dr in in ED	Seen by Dr in ED < 30 mins	Seen by Dr in in ED
Consultant	412 (14%)	909 (31%)	314 (11%)	704 (26%)
Associate Specialist	-	15 (1%)	0 (-)	7 (-)
Specialist Registrar	7 (-)	1488 (50%)	1 (-)	1020 (37%)
Registrar	738 (25%)	52 (2%)	464 (17%)	575 (21%)
SHO	26 (1%)	417 (14%)	251 (9%)	369 (13%)
Intern	279 (9%)	1 (-)	251 (9%)	3 (-)
Other (not recorded)	10 (-)	15 (1%)	10 (-)	7 (-)
Detail not captured at time point	(50%)	57 (2%)	1445 (53%)	51 (2%)

TABLE 17: MOST SENIOR DOCTOR SEEING PATIENTS WITH AN ISS > 15

	2014 (n=970)		2015 (n=850)	
	Seen by Dr in ED < 30 mins	Seen by Dr in in ED	Seen by Dr in ED < 30 mins	Seen by Dr in in ED
Consultant	210 (22%)	421 (43%)	159 (19%)	294 (35%)
Associate Specialist	0	2 (-)	0 (-)	3 (-)
Specialist Registrar	2 (-)	418 (43%)	0 (-)	306 (36%)
Registrar	306 (32%)	19 (2%)	171 (20%)	158 (19%)
SHO	14 (1%)	91 (9%)	103 (12%)	77 (9%)
Intern	74 (8%)	1 (-)	69 (8%)	0 (-)
Other (not recorded)	1 (-)	4 (-)	2 (-)	0 (-)
Detail not captured at time point	363 (37%)	14 (1)	346 (41%)	12 (1%)

HOSPITAL SYSTEMS PERFORMANCE

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

1. Patients with GCS < 9 pre-hospital or in the ED have definitive airway management in the pre-hospital or in the ED

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

TABLE 18: PATIENTS WITH GCS < 9 HAVE DEFINITIVE AIRWAY MANAGEMENT

	2014	2015
Definitive Airway Management	159 (96%)	124 (98%)

Missing airway management data: 2014-23; 2015-27.

2. Management of shocked patients

Adult patients with blunt trauma admitted with a systolic blood pressure of less than 110mmHg have a significant increased risk of mortality (Hassler et al, 2011). The 'crude survival' does not attempt to adjust for differences in age, gender, co-morbidities etc. all of which can contribute to survival.

TABLE 19: SURVIVAL OF SHOCKED PATIENTS

	2014	2015
Crude survival rate	218 (88%)	190 (90%)

3. Time to CT for head injury patients

Injured patients with head injuries and an initial GCS < 13 should have a CT head scan within 1 hour (NICE, 2014). There were 380 (69%) patients, who met the criteria and were eligible for a CT within one hour.

TABLE 20: TIME TO CT FOR HEAD INJURY PATIENTS WITH GCS < 13

	2014	2015
Median (hours) (IQR)	1.4 (0.9- 2.0)	1.3 (0.8 - 1.8)

4. Intensive Care Unit Admission

Patients sustaining major trauma are admitted to an intensive care unit for many reasons including on-going resuscitation, organ support and or closer monitoring. The length of stay (LOS) in an Intensive Care Unit (ICU) can be determined by the needs of patients and availability of step down beds.

TABLE 21: ICU LOS (DAYS) FOR ALL MAJOR TRAUMA PATIENTS

	2014	2015
n	399 (14%)	336 (12%)
Median (IQR)	3 (1-6 days)	2 (1-5 days)
ICU bed days	2345	1377

TABLE 22: ICU LOS (DAYS) FOR SEVERELY INJURED MAJOR TRAUMA PATIENTS (ISS >15)

	2014	2015
n	250 (8%)	230 (8%)
Median (IQR)	3 (1-7 days)	2 (1-5 days)
ICU bed days	1676	928

TABLE 23: ICU LOS (DAYS) FOR MAJOR TRAUMA PATIENTS WITH SEVERE TBI

	2014	2015
n	169	136
Median (IQR)	2 (1-6 days)	2 (1-4 days)
ICU bed days	979	524

MTA should be used to inform ICU bed capacity requirements

5. Hospital length of stay

Length of stay is dependent on the ability of the hospital to discharge the patient when they have recovered from their acute episode of care. Access to rehabilitation influences the length of stay at the acute hospital for severely injured patients.

TABLE 24: HOSPITAL LOS (DAYS) FOR ALL MAJOR TRAUMA PATIENTS

	2014	2015
Median (IQR)	7 (4-15 days)	7 (4-14 days)

TABLE 25: HOSPITAL LOS (DAYS) FOR SEVERELY INJURED PATIENTS (ISS >15)

	2014	2015
Median (IQR)	7 (4-15 days)	7 (4-15 days)

LEARNING AND IMPROVING FROM MTA: JOHN'S STORY

John was 84 years of age when he fell at home. He was brought to the Emergency Department by his family complaining of severe chest pain resulting from the trauma. He was assessed by the doctors. A chest x-ray was performed and showed fractured ribs and a chest infection. He was treated as a traumatic chest injury.

Later that day, John developed an irregular heart rhythm which was treated but he became progressively more unwell. He was given antibiotics and later intravenous fluids. However his condition did not improve. In fact, John's condition continued to deteriorate and he died six days after admission.

John was identified by MTA as a case for review. The hospital MTA Clinical Lead and Audit Coordinator led a review of this case in the hospital under the direction of the hospital Quality and Safety Committee. Firstly, a data quality check was carried out to ensure all injuries had been captured. This was followed by a review of the system and processes of care that were provided to John. There were several important findings from this review including recommendations related to sepsis screening and appropriate escalation of care.

COMMENT

The elderly represent a very challenging population in trauma care. They sometimes sustain trauma as a result of medical conditions or events such as a seizure, an abnormal heart rhythm or an infection and their physical fragility is such that they do not have the bodily reserve to withstand the additional stress the trauma places on their bodies.

Individual case reviews do not infer that management of patients was sub-optimal but that questions should be asked to understand the outcome. Reviewing these cases leads to systems changes and improving care, not only for trauma patients but for all patients.

OUTCOME FOLLOWING MAJOR TRAUMA

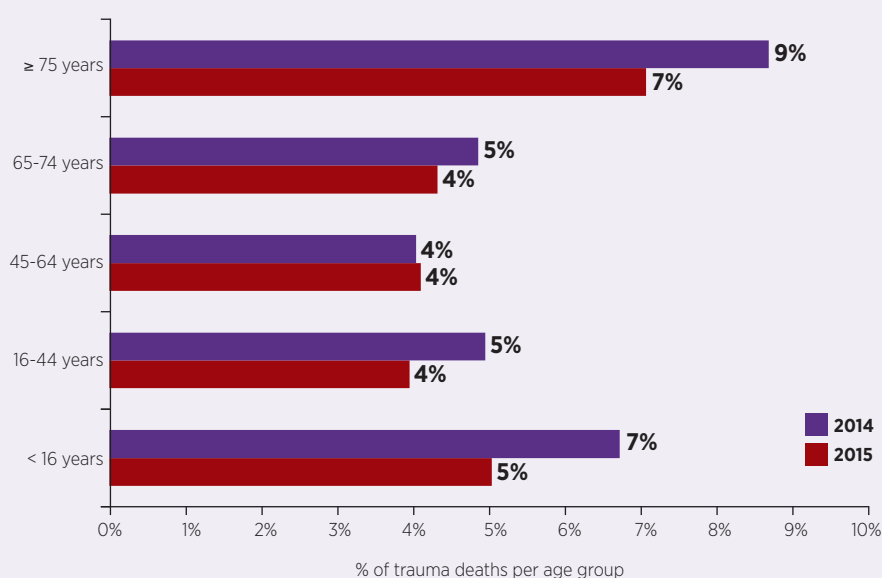


OUTCOME FOLLOWING MAJOR TRAUMA

MAJOR TRAUMA MORTALITY

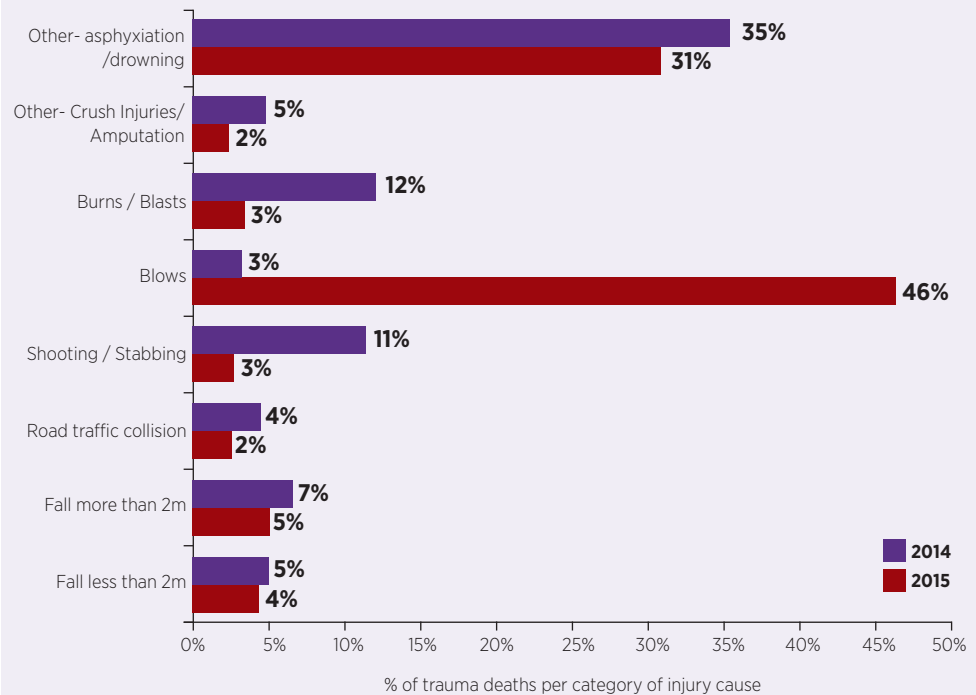
Outcome data is available for 5209 (84%) submissions. Tracking patients through the multiple hospital transfers is challenging and accounts to a large extent for the missing outcome data (n-976, 16%). There were 4925 (95%) patients who survived, with 284 (5%) confirmed deaths across the two years. Trauma survival is presented in terms of age, cause of injury and ISS.

FIGURE 9: MAJOR TRAUMA DEATHS / AGE



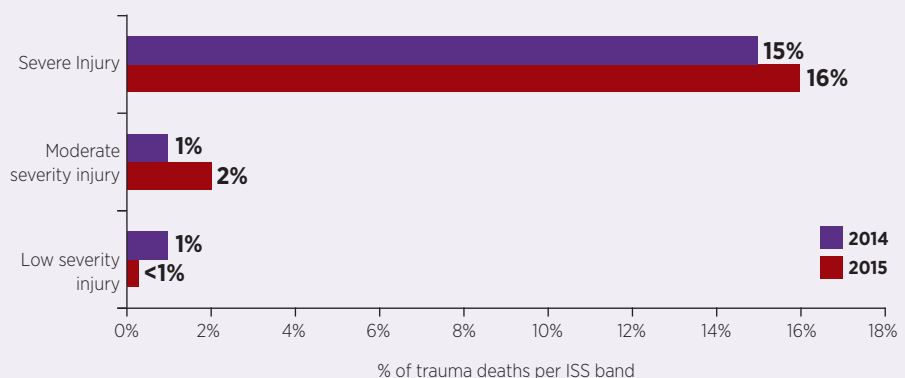
Missing outcome data: 2014-572; 2015 454.

FIGURE 10: MAJOR TRAUMA DEATHS / CAUSE OF INJURY



While the greatest number of deaths were due to low falls (falls from less than 2 metres), the highest death rate was associated with major trauma patients who had suffered blows (assaults) and asphyxia / drowning.

FIGURE 11: MAJOR TRAUMA DEATHS / ISS



Low severity injuries were associated with higher mortality in older patients (Table 26).

TABLE 26: ISS / AGE OF MAJOR TRAUMA PATIENTS WHO DIE

ISS BAND	MEDIAN ISS (IQR)
Low severity injury (ISS 1-8)	87 years (78- 93 years)
Moderate severity injury (ISS 9-15)	83 years (60- 89 years)
Severe injury (ISS > 15)	69 years (49 – 82 years)

Age, cause of injury and ISS are summarised for paediatric, working age and older population age groups who die following major trauma in Table 27.

TABLE 27: CHARACTERISTICS OF MAJOR TRAUMA PATIENTS WHO DIE FOLLOWING INJURY

	YOUNG POPULATION (n=16)	WORKING AGE POPULATION (n=117)	OLDER POPULATION (n=151)
Median Age (IQR)	11 years (5-14 years)	44 years (30-56 years)	83 years (77-89 years)
Gender	Male - 75%	Male - 76%	Female - 51%
Predominant cause of injury	Other asphyxia/ drowning - 50%	Other asphyxia/ drowning - 28%	Fall less than 2m - 75%
Median ISS (IQR)	25 (25-26)	25 (25-30)	25 (16-26)

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

Risk-adjustment is a process that allows data to be compared, 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 is calculated for Ireland for 2014-2015. This is based on all approved submissions from participating hospitals and is adjusted for case-mix. This is referred to as the Ws value.

- Ireland Ws value: 1.7 (95% confidence interval 1.1 - 2.2)

That is to say that for every 100 major trauma patients treated in Ireland there are 1.7 more survivors than the TARN statistical model predicts (Bouamra et al, 2015), i.e. more than expected when the confounding factors were taken into account. With overall data completeness at 61% and outcomes completeness at 84% for 2014-2015, a more complete data set will influence the Ws value. The Ws value for Ireland should not therefore be over interpreted.

The hospital Ws is calculated where there are over 50 approved TARN submissions, but becomes more reliable with over 200 approved submissions. From approved TARN submissions, a risk adjusted survival rate-Ws is calculated for Irish hospitals for 2014-2015. The hospital Ws score ranged from -2.4 (-6.4 - 1.5, 95% confidence interval) to 3.9 (0.1 - 8, 95% confidence interval). This variation must be interpreted in light of data completeness (number of approved submissions) and the number of hospitals with smaller numbers. In 2014-2015, 21 hospitals were included having over 50 approved submissions. The number of discharges ranged between 52 to 948 per hospital, with 11 hospitals having less than 200 approved submissions.

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 major trauma audit. In Victoria Australia, a structured telephone questionnaire is used to measure functional and quality of life outcomes at 6, 12 and 24 months. Information about functional ability and health-related quality of life, is collected during the interviews (Department of Health and Human Services- State of Victoria, 2016).

Functional and quality of life patient outcomes should be incorporated into major trauma audit.

IN SUMMARY

Outstanding improvements have been seen in England with the reconfiguration of trauma services in 2012; in 2015 TARN reported that the odds of a major trauma patient surviving in NHS England were 63% better in 2014/15 than in 2008/09, with a statistically significant seven-year improvement trend. No significant trend for improved odds of survival was not noted prior to the introduction of the new trauma networks (TARN; Available at: <https://www.tarn.ac.uk/Content.aspx?c=3477>, Accessed on 16/10/2016). An evaluation of the London Trauma System showed increased early survival for severely injured patients (Cole et al, 2016).

It is timely that the Department of Health Strategic Advisory Group on development of trauma networks has been established to advise on how such a trauma system might be developed in Ireland. The establishment of national MTA can inform the design of a trauma system and monitor the effects of changes in how care is delivered; all the constituents that contribute to the outcome for a patient are monitored through MTA. Indeed, the public and service providers can be assured that it is now possible to robustly monitor equity of access to timely trauma expertise, processes and outcomes.

CONCLUSION: BUILDING ON PROGRESS TO DATE



CONCLUSION: BUILDING ON PROGRESS TO DATE

Modern healthcare is a complex system that requires reliable measurement to ensure that the highest quality of care is being provided. It is important to acknowledge the dedication and commitment of doctors, nurses, paramedics and many other healthcare professionals involved in the care of injured patients in Ireland who shaped the patient journeys that have constituted this report. Patients presenting with major trauma to acute hospitals in Ireland have the right to expect the highest standard of care and clinicians are highly motivated to provide that care.

It is one of the roles of the national MTA to provide these professionals and patients with reliable information to confirm that the care that is delivered is of the highest quality and to identify potential areas for improvement. This is the first snapshot of major trauma in Ireland. It covers the years 2014 and 2015. This was achieved by the leadership of hospital Clinical Leads and the dedicated professional approach of MTA Coordinators.

This report presents information on patient demographics, their injuries as well as systems and processes of care. It provides an overview of how MTA can support the development of trauma care in Ireland through:

- Ongoing monitoring of processes and outcomes of major trauma and the effects of changes in trauma service provision,
- Supporting the quality assurance and improvement of trauma care through benchmarking of performance,
- Identification and prioritisation of opportunities to collaborate on improving trauma care through more in-depth and themed data analyses,
- Providing a platform which makes data available for collaborative research activities.

MTA has been successful in becoming the first National Clinical Effectiveness Committee (NCEC) national clinical audit in December 2016. The NCEC provides a mechanism of endorsement of clinical audit mandated by the Minister for Health for the Irish healthcare system. This supports the rigorous use of data for evaluation and quality improvement. This will ensure the sustainability of MTA establishing it as a cornerstone of the national trauma system's quality programme in Ireland.

REFERENCES

- Association for the Advancement of Automotive Medicine (2005) AIS 2005, Abbreviated Injury Scale 2005 ©, Update 2008. Association for the Advancement of Automotive Medicine: USA, Barrington IL.
- Bouamra, O. Jacques, R. Edwards, A. Yates, D. Lawrence, T. Jenks, T. Woodford, M and Lecky, F. (2015) Prediction modelling for trauma using comorbidity and 'true' 30-day outcome. *Emergency Medicine Journal*. 32(12):933-8.
- Charlson, M. Pompei, P. Ales, K. et al. (1987) A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases*. 40(5):373-83.
- Cole, E. Lecky, F. West, A. et al (2016) The Impact of a Pan-regional Inclusive Trauma System on Quality of Care. *Annals of Surgery*. 264(1):188-94.
- Cornwell, E. Chang, D. Phillips, J. and Campbell, K. (2003) Enhanced trauma program commitment at a level I trauma center: effect on the process and outcome of care. *Archives of Surgery*. 138(8):838-43.
- Department of Health and Human Services (State of Victoria, Australia) (2016) Victorian State Trauma System and Registry, Annual Report, 1 July 2014 to 30 June 2015. Available at: <https://www2.health.vic.gov.au/about/publications/annualreports/victorian-state-trauma-registry-summary-report-2014-15> [Accessed: 18/10/2016].
- Driscoll, P. and Vincent, C. (1992) Variation in trauma resuscitation and its effect on patient outcome. *Injury*. 23(2):111-5.
- Gerardo, C. Glickman, S. Vaslef, S. Chandra, A. Pietrobon, R. and Cairns, C. (2011) The rapid impact on mortality rates of a dedicated care team including trauma and emergency physicians at an academic medical center. *The Journal of Emergency Medicine*. 40(5):586-91.
- Hasler, R. Nuesch, E. Jüni, P. Bouamra, O. Exadaktylos, A. and Lecky, F. (2011) Systolic blood pressure below 110 mm Hg is associated with increased mortality in blunt major trauma patients: multicentre cohort study. *Resuscitation*. 82(9):1202-7.
- Irish Association of Emergency Medicine (2014) An Integrated Trauma System for Ireland. Available at: <http://www.iaem.ie/news/publications/publications-2014/> [Accessed: 18/10/2016].
- National Audit Office (UK) (2010) Major trauma care in England. Available at: <https://www.nao.org.uk/wp-content/uploads/2010/02/0910213.pdf> [Accessed: 17/03/2016]
- National Clinical Effectiveness Committee (2015) Prioritisation and Quality Assurance for National Clinical Audit. Available at: <http://health.gov.ie/patient-safety/nccec/national-clinical-audit/> [Accessed: 08/08/2016].
- NHS Clinical Advisory Groups Report (UK) (2010) Regional Networks for Major Trauma, September 2010. Available at: http://www.ukemtrauma.com/uploads/3/0/6/6/30664511/major_trauma_report_final_1.pdf [Accessed: 21/03/2016].
- National Institute for Health and Care Excellence (NICE) (2014) Head injury: assessment and early Management. NICE clinical guidelines [CG176]. Available at: <https://www.nice.org.uk/guidance/cg176/> [Accessed: 04/05/2016].
- National Office of Clinical Audit (2015) Major Trauma Audit Handbook for Collection and Review of TARN Data in Ireland. Available at: <https://www.noca.ie/audits> [Accessed: 21/03/2016].
- Royal College of Surgeons of England and British Orthopaedic Association (2000) Better Care for the Severely Injured. Available at: https://www.rcseng.ac.uk/publications/docs/severely_injured.html [Accessed: 05/04/2016].
- Royal College of Surgeons of England (1999) Royal College of Surgeons of England, Report of the working party on the management of patients with head injuries. London: Royal College of Surgeons of England.

APPENDICES



APPENDIX 1: HOSPITAL MTA CLINICAL LEADS AND AUDIT COORDINATORS

Hospital Group	Hospital Name	Clinical Lead	MTA Coordinator
RCSI Hospital Group	Beaumont Hospital	Dr Patricia Houlihan	Anna Duffy Sarah Connor
	Cavan General Hospital	Mr Ashraf Butt	Eilish Sweeney
	Connolly Hospital, Blanchardstown	Dr Emily O Connor	Therese Yore
	Our Lady of Lourdes Hospital, Drogheda	Dr Niall O Connor	Deborah McDaniel
Ireland East Hospital Group	Mater Misericordiae University Hospital	Dr Tomás Breslin Mr Seamus Morris	Marian Lynders (Previously Christina Nte)
	St. Vincent's University Hospital	Dr John Cronin (Previously: Dr David Menzies)	Jenny Beatty (Previously: Eibhlin Loughman)
	Midland Regional Hospital, Mullingar	Dr Sam Kuan	Máire Maguire Wendy O Doherty Helen Evans
	St Luke's General Hospital, Kilkenny	Dr David Maritz (Previously: Dr Frank O Dwyer)	Frances Walsh
	Wexford General Hospital	Dr Paul Kelly Dr Michael Molloy	Shelagh Twomey Mary Doyle
Dublin Midlands Hospital Group	Tallaght Hospital	Dr Jean O Sullivan Dr Jason Carthy Dr Ciara Martin	Noel Redmond
	Midland Regional Hospital, Tullamore	Dr Anna Moore Dr Sean O'Rourke	Neil Perry
	Naas General Hospital	Dr George Little	Breda Murphy
	Midland Regional Hospital, Portlaoise	Dr Suvarna Maharaj	Louise Cooke (Previously: Karina Boyhan)
	St James Hospital, Dublin	Mr Niall Hogan Dr Geraldine McMahon	Alison Reynolds
Children's Hospital Group	Temple Street Children's University Hospital	Prof Alf Nicholson	Jennifer Doyle
	Our Lady's Children's Hospital Crumlin	Dr Carol Blackburn Mr Brian Sweeney	Julie Hughes Previously: Suzanne Byrne)
	Tallaght Hospital	Dr Jean O Sullivan Dr Jason Carthy Dr Ciara Martin	Noel Redmond

Hospital Group	Hospital Name	Clinical Lead	MTA Coordinator
South / South West Hospital Group	Cork University Hospital	Dr Sinead Ahern (Previously: Dr Dorothy Breen)	Karina Caine Ann Deasy
	University Hospital Kerry	Dr Martin Boyd	Esther O Mahony
	Mercy University Hospital	Dr Chris Luke	Ann Deasy
	South Tipperary General Hospital	Mr Cyrus Mobed	Susan Ryan
	University Hospital Waterford	Dr Des Fitzgerald Mr Morgan McMonagle	Margaret Mulcahy
University of Limerick Hospital Group	University Hospital Limerick	Dr Cormac Mehigan	Michael Fitzpatrick Eoin Barry
Saolta University Healthcare Group	Letterkenny University Hospital	Dr Sinead O’Gorman	Patrick McGonagle Sarah Meagher
	Mayo University Hospital	Dr Ciara Canavan Dr Andrew Jackson	Paul Crisham
	Sligo University Hospital	Dr Kieran Cunningham	Rosemary Maguire
	University Hospital Galway	Mr Alan Hussey	Paul Crisham

APPENDIX 2: MTA GOVERNANCE COMMITTEE

MEMBERSHIP AND ATTENDANCE AT GOVERNANCE COMMITTEE MEETINGS 2014 – 2015

Name	Role / Representing Body	5 Mar 2014	23 Sept 2014	4 Dec 2014	12 Mar 2015	17 Jun 2015	15 Sept 2015	17 Dec 2015
Dr Conor Deasy	Clinical Lead & Chair	YES	YES	YES	YES	YES	YES	YES
Mr David Alcutt	Neurosurgery Programme	NO	NO	YES	YES	NO	NO	NO
Mr Turloch Bolger ¹	Paediatric Emergency Medicine	N/A	YES	NO	YES	NO	NO	NO
Fiona Cahill	NOCA Executive Manager	YES	YES	YES	YES	YES	YES	YES
Vincent Daly	National Ambulance Service	N/A	YES	NO	YES	NO	YES	NO
Anna Duffy	Hospital MTA Coordinator	YES	YES	YES	NO	YES	YES	NO
Jacqueline Egan	Pre Hospital Emergency Care Council	NO	YES	YES	NO	NO	YES	NO
Dr Una Geary	National Emergency Medicine Programme	NO	NO	YES	YES	NO	NO	YES
Dr Andrew Hanrahan ²	Royal College of Physicians of Ireland nominee - Rehabilitation Medicine	YES	N/A	N/A	N/A	N/A	N/A	N/A
Dr Patrick Hayden	Royal College of Physicians of Ireland nominee - Pathology	YES	YES	YES	NO	NO	NO	NO
Dr Orla Healy ⁴	Royal College of Physicians of Ireland nominee - Public Health	YES	NO	NO	NO	NO	N/A	N/A
Dr Patricia Houlihan	Irish Association for Emergency Medicine	YES	YES	NO	NO	NO	NO	NO
Mr Alan Hussey ⁵	Irish Association of Plastic Surgeons	NO	YES	NO	N/A	N/A	N/A	N/A
Mr Dara Kavanagh	Royal College of Surgeons in Ireland nominee - Acute Surgical Specialty/ General Surgery	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dr Gerry Lane	Irish Committee for Emergency Medicine Training Nominee	YES	NO	NO	NO	NO	NO	NO
Dr George Little	National Emergency Medicine Programme Nominee	N/A	YES	YES	YES	NO	NO	NO
Dr Peter MacMahon	Royal College of Surgeons in Ireland - Faculty of Radiology	YES	YES	YES	YES	YES	NO	YES

MEMBERSHIP AND ATTENDANCE AT GOVERNANCE COMMITTEE MEETINGS 2014 – 2015 (CONTINUED)

Name	Role / Representing Body	5 Mar 2014	23 Sept 2014	4 Dec 2014	12 Mar 2015	17 Jun 2015	15 Sept 2015	17 Dec 2015
Dr Ciara Martin ¹	Paediatric Emergency Medicine	N/A	NO	NO	NO	YES	YES	NO
Dr Caroline Mason-Mohan ⁴	Royal College of Physicians of Ireland nominee - Public Health	N/A	N/A	N/A	N/A	N/A	YES	YES
Fiona McDaid	Emergency Medicine Nursing Interest Group	YES	YES	YES	YES	YES	NO	YES
Mr Morgan McMonagle	Irish Association of Vascular Surgeons	YES	YES	YES	NO	NO	YES	NO
Mr Ken Mealy ⁶	Royal College of Surgeons in Ireland nominee - Acute Surgical Specialty/ General Surgery	NO	NO	NO	NO	NO	NO	NO
Dr Jacinta McElligott ²	Royal College of Physicians of Ireland nominee- Rehabilitation Medicine	N/A	N/A	N/A	N/A	N/A	N/A	YES
Dr Jacinta Morgan ²	Royal College of Physicians of Ireland nominee- Rehabilitation Medicine	N/A	YES	YES	NO	NO	NO	N/A
Dr Jeanne Moriarty	Joint Faculty of Intensive Care Medicine of Ireland	N/A	N/A	N/A	YES	YES	NO	NO
Mr Joe O Bernie ³	Trauma and Orthopaedic Programme	YES	NO	N/A	N/A	N/A	N/A	N/A
Mr Brendan O'Daly ³	Trauma and Orthopaedic Programme	N/A	N/A	NO	YES	YES	YES	YES
Des O'Toole	Hospital Business Manager	YES	NO	YES	YES	YES	NO	YES
Iryna Pokhilo ⁷	Patient Representative	YES	NO	NO	YES	YES	YES	N/A
Rosie Quinn	Therapy Representative	YES	YES	YES	YES	YES	YES	YES
Geraldine Shaw	HSE Office of Nursing & Midwifery Division	YES	YES	YES	YES	NO	NO	YES
Marina Cronin	In attendance: NOCA Hospital Relations Manager	YES	YES	YES	YES	YES	YES	YES
Deborah McDaniel	In attendance: NOCA Hospital Relations Coordinator	N/A	N/A	N/A	N/A	N/A	N/A	N/A

1 Shared representation on the MTA Governance Committee

2-4 Change of representation on the MTA Governance Committee

5-7 Resigned from the MTA Governance Committee

N/A Representatives not yet appointed or resigned from Committee for meeting dates stated above

APPENDIX 3: TARN INCLUSION CRITERIA

The decision to include a patient should be based on the following 3 criteria:

1. ALL TRAUMA PATIENTS IRRESPECTIVE OF AGE

2. WHO FULFIL ONE OF THE FOLLOWING LENGTH OF STAY CRITERIA

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

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.
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.
LIMB – UPPER (EXCEPT HANDS /FINGERS)	Any Open injury. Any 2 limb fractures &/or dislocations.	Any Closed unilateral injury (including multiple closed fractures &/or dislocations or the same limb)

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, amputation or crush &/or multiple injuries.
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.	Simple skin lacerations or penetrating injuries with blood loss < 20% (1000mls); single or multiple. Contusions or abrasions: single or multiple. Minor degloving injury.
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

APPENDIX 4: OVERVIEW OF CLINICAL GUIDELINES AND STANDARDS

Author / Year	Title of Guideline
NICE (2016)	Fractures (complex): assessment and management NICE guidelines [NG37] Major trauma NICE guidelines [NG39] Major trauma: service delivery NICE guidelines [NG40] Spinal injury: assessment and initial management, NICE guidelines [NG41]
NICE (2014)	Head injury: assessment and early management NICE guidelines [CG176]
NICE (2010)	Insertion of metal rib reinforcements to stabilise a flail chest wall, NICE interventional procedure guidance [IPG361]
Crash II (2011)	CRASH A large randomised placebo controlled trial among trauma patients with, or at risk of, significant haemorrhage, of the effects of antifibrinolytic treatment on death and transfusion requirement
The British Orthopaedic Association and the British Association of Plastic, Reconstructive & Aesthetic Surgeons,	Standard for Trauma (2009) BOAST Guidelines BOAST 4: The Management of severe open limb fractures
Royal College of Surgeons in England and British Orthopaedic Association	Better Care of the Severely Injured; Recommended Standards of Care in Major Trauma, Abdominal Injuries

APPENDIX 5: GLOSSARY OF TERMS AND DEFINITIONS

AIS	Abbreviated Injury Scale score. A value between 1 (minor) and 6 (very severe) can be assigned to each injury. TARN currently uses the AIS 2005 system Association for the Advancement of Automotive Medicine (2005).
Direct admissions	Describes care in the first treating hospital.
Individual TARN submissions /Patient	Individual TARN submissions are those where there is no transfer between hospitals and where transfers have been matched by TARN
IQR (Inter quartile range)	Range of values within a selection of data excluding the top 25% and bottom 25%. This filters out unusually high and unusually low values and shows where the most significant values in the data range are concentrated.
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. 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).
Major trauma centre	A Major Trauma Centre (MTC) is a multi-specialty hospital, on a single 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 Groups Report (UK)(2010).
Median	The middle value in a range. Less easily distorted by very high or very low values than other aggregation methods, such as the mean.
MTA	Major Trauma Audit
NICE	National Institute for Health and Care Excellence. This organisation sets standards for patient care including for severe head injury, trauma service delivery.
Paediatric	Patients under 16 years of age at time of admission.
PHECC	The Pre-Hospital Emergency Care Council (PHECC) maintains a statutory register of all pre-hospital emergency care practitioners, such as paramedics and advanced paramedics, who meet their standards.
TARN	Trauma Audit and Research Network
TBI	Traumatic brain injury
Trauma unit	A trauma unit (TU) is a hospital in a trauma network that provides care for most injured patients (NHS Clinical Advisory Groups Report (UK)(2010)
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.

NOTES

NCCA National Office of
Clinical Audit



+353 1 4028577



mta@noca.ie



@noca_irl



www.noca.ie
