

A Trauma System for Ireland

Report of the
Trauma Steering Group



A Trauma System Report of the Trauma Steering Group **for Ireland**

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Minister's Foreword

While a relatively small number of people suffer from major trauma each year their injuries can cause prolonged disability or death and there is no doubting the huge impact on the patient and their family. Many more people suffer injuries of either moderate or low severity.

There is much work to be done on prevention given that the most common causes of major trauma in Ireland presently are falls and road traffic accidents. However, if you do become injured, you need the right care, in the right place, first time.

Internationally, the evidence is clear - the introduction of a trauma system is associated with a reduction in death and disability. This report sets out a vision for a national trauma system that aims to prevent unnecessary deaths, to reduce disabilities and to significantly improve the patient's chances of attaining the fullest possible recovery. Evidence-based and informed by population needs, it addresses the entire care pathway from prevention through to rehabilitation. This major report provides the blueprint for how we organise and deliver care for those who suffer traumatic injuries.

The focus is on achieving best outcomes for patients, by providing safe, high quality, patient-centred care at the lowest appropriate level of complexity. This must be integrated across the care pathway, and provided as close to home as possible or in specialist centres where necessary. In this, it is consistent with other recent strategic developments such as the National Cancer Strategy and the National Maternity Strategy.

I want to acknowledge the work of the Trauma Steering Group, chaired by Professor Ellis McGovern, which worked tirelessly and with immense commitment and dedication, to bring this report to fruition. The Steering Group was supported by five Working Groups, and these included a number of patient representatives who I particularly want to thank for their input in ensuring this report places patients at the centre. I want to thank also Professor Chris Moran, NHS, who acted as an External Advisor for the Steering Group.

I fully endorse this Report, and was delighted to present it to Government for approval. The focus now must be on ensuring the implementation of the recommendations of this Report, for the benefit of patients.

Simon Harris, T.D.

Minister for Health



Chair's Foreword

On behalf of the Steering Group, it is with great pleasure that I present this report on a Trauma System for Ireland to the Minister for Health, Mr Simon Harris, TD.

Traumatic injury is a leading cause of death and disability worldwide. We now know that some of the poor outcomes from trauma are avoidable and there is irrefutable evidence that the introduction of a programmed approach to the delivery of trauma services results in more lives being saved and fewer people being left with a disability.

The future Trauma System described in this report is based on the introduction of national standards for the delivery of trauma care so that each patient – regardless of the severity of their injury or their location – receives the highest possible standard of care in the most appropriate health care facility and so that patients with major trauma and complex needs will be managed in an integrated, seamless way due to the co-ordination and teamwork of the individual specialties and services involved in their care.

The recommendations address all components of the trauma patient journey from management at the location of the injury through to completion of the rehabilitation process and recovery. There is a strong emphasis on prevention strategies. We have learned that the most common cause of major trauma in Ireland, particularly in older people, is falls from a height of less than 2 metres. Simple measures to reduce the incidence of such falls can lessen the burden of trauma in this vulnerable section of our population. We also highlight the importance of governance, audit and quality assurance.

Patient views have been of major importance to the Steering Group. We are grateful for their input through the consultation process and through membership of the working groups; our particular thanks to Stephen Shortall and Colm Whooley, who have kindly allowed us to incorporate their personal experience as trauma patients into the report. Our gratitude is also extended to Prof Chris Moran, NHS England National Clinical Director for Trauma and external adviser to the Steering Group, for his direction and wisdom.

I would like to thank the members of the working groups, Steering Group, editorial and drafting groups for their dedication and perseverance, and my particular thanks to Catherine Farrell, Programme Manager to the Trauma and Orthopaedics Clinical Programme, for her trojan work on this project, her expert knowledge of our subject and her many injections of humour.

We look forward to the implementation of this new Trauma System for Ireland and to the benefits for trauma patients which will follow – a decreased incidence of trauma due to robust prevention, and better outcomes reflected by improved survival and reduced disability.

Professor Eilis McGovern

Chair

Glossary of Terms and Definitions

CT	Computed tomography (CT) is a scanning technique that uses x-rays to take highly detailed images of the body.
Critical Care	Critical care refers to two related processes. Firstly, 'critical' refers to discernment or recognition of a crucial and a decisive turning point, the deterioration of the patient's condition, followed, secondly, by 'care' i.e. intervention including resuscitation and transport to a critical care service. Critical care resuscitation and treatment interventions include a complex range of general and specialty procedures, supports and diagnostic procedures. Thus, the critically ill patient benefits from appropriate and timely critical care in the health system with a greatly increased probability of survival.
Definitive Care	Definitive care is the care that is rendered to conclusively manage a patient's condition, such as full range of preventive, curative acute, convalescent, restorative, and rehabilitative medical care.
HEMS	Helicopter Emergency Medical Service
HIPE	Hospital In-Patient Enquiry System
HSE	Health Service Executive
Injury Unit (IU)	Locally based service designed to treat injuries of lesser severity that are unlikely to need admission to hospital.
ISS	The Injury Severity Score is 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 >15 is considered severe and signifies major trauma. ISS is calculated using the Abbreviated Injury Scale.
Local Emergency Hospital	A Local Emergency Hospital is a hospital within a Trauma Network with an Emergency Department that does not have the required range of services or expertise to safely manage major trauma patients. It treats injuries of lesser severity and non-trauma related illnesses requiring urgent treatment.
Major Trauma Centre	A Major Trauma Centre is a multi-specialty hospital, on a single site, optimised for the provision of trauma care, integrated with the rest of the Trauma Network.
Major trauma	Major trauma describes serious and often multiple injuries where there is a strong possibility of death or disability.
MRI	Magnetic resonance imaging
MTA	Major Trauma Audit

NAS	National Ambulance Service
NCEC	National Clinical Effectiveness Committee
NCLTS	National Clinical Lead for Trauma Services
NHS	National Health Service in England, Scotland, Wales and Northern Ireland
NOCA	National Office of Clinical Audit
NRH	National Rehabilitation Hospital
PHECC	Pre-Hospital Emergency Care Council
PROMS	Patient Reported Outcome Measures
PREMS	Patient Reported Experience Measures
Reablement	Reablement is a short and intensive service, usually delivered in the home, which is offered to people recovering from an injury to promote and maximise independence.
RTC	Road traffic collision
TARN	Trauma Audit and Research Network
Trauma & Orthopaedic	Trauma & Orthopaedic Surgery involves treating traumatic, developmental and degenerative conditions of the musculoskeletal system and also some tumours that affect bones and soft tissues.
Trauma Network	A Trauma Network is a coordinated integrated system within a defined geographical region to deliver care to injured patients from injury to recovery, through prevention, pre-hospital care and 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.
Trauma	Trauma is a term which refers to physical injuries of sudden onset and severity which require immediate medical attention.
TUSS	A Trauma Unit with Specialist Services (TUSS) is a major hospital within a Trauma Network with additional expertise and resources over and above those of a Trauma Unit.



Executive Summary

Injury is a public health problem of enormous magnitude, whether measured by years of productive life lost, prolonged or permanent disability, or financial cost. Injuries place significant costs on individuals, their families and the health service. Trauma happened yesterday, it is happening today, and it will happen tomorrow.

Improvements in outcomes for patients can be achieved by providing patient-focused and planned trauma care. The introduction of a trauma system in England has been associated with a 25% improvement in the risk-adjusted odds of survival for patients sustaining major trauma during 2014/15 compared with 2011/12. In recognition of the benefits of a trauma system for patients and the potential to reduce avoidable deaths and disability, the Minister for Health in 2015 established a Trauma Policy for Ireland Steering Group, chaired by Professor Eilis McGovern, to develop a trauma policy for Ireland. The Steering Group considered approaches to trauma care elsewhere, considered the needs of trauma patients in Ireland and developed recommendations for how their treatment can be improved.

Trauma in Ireland

Traumatic injury can be categorised as low severity, moderate severity or severe, using an Injury Severity Score (ISS). Examples of low and moderate severity injuries include soft tissue injuries, simple wrist and ankle fractures or simple skull fractures, with no associated brain injury. Severe injury, signified by an ISS of greater than 15, is also known as major trauma and involves injuries which have the potential to cause prolonged disability or death. Major trauma is the leading cause of death among children and young adults. Trauma, as a result of falls, is increasingly a cause of death among older adults. Low falls are the most common cause of major trauma, while falls and road traffic collisions together account for over 8 out of every 10 cases of major trauma recorded in Ireland.

Our understanding of who becomes injured, the injuries they sustain, how they come to hospital and the care they receive requires good information systems at national level. In the case of major trauma this has been improved by the establishment of the Major Trauma Audit in Irish hospitals by the National Office of Clinical Audit in 2013. Major trauma cases are typically a very small part of the total number of trauma cases, with UK experience indicating that major trauma cases represent of the order of 1% of trauma cases overall and fewer than 1 in 1,000 Emergency Department admissions. However, these major trauma cases have an extremely significant impact not just on the people involved but also on health services overall.

In December 2016, the Major Trauma Audit became the first National Clinical Effectiveness Committee clinical audit with a Ministerial mandate for national implementation. This will provide comprehensive data for analysis and further improve our understanding of immediate outcomes for major trauma patients.

Prevention and treatment of trauma

We know that much can be done to reduce the incidence of trauma. Trauma prevention includes initiatives and strategies such as road safety, workplace safety, tackling violence, reducing self-harm and preventing falls. Over half of all trauma injuries are caused by falls and much can be done to prevent them.

Trauma care is often complex and challenging. Many critical decisions are made during the early phases, involving multiple specialist teams of paramedics, doctors, nurses and other health care professionals. Each and every part of this journey impacts on whether the patient lives or dies and what disabilities they will live with for the rest of their lives.

Organisation of trauma services

Trauma services in Ireland have developed in an ad hoc manner and we know that trauma patients do not always receive the right treatment in the right place at the right time. High numbers of major trauma patients go to hospitals that cannot provide necessary and definitive care; in 2014 and 2015, 30% of major trauma patients had to be transferred to another hospital for urgent or ongoing care as their care needs could not be provided by the initial receiving hospital.

The optimal care of patients with injuries requires a coordinated and integrated system of trauma care. Evidence from other countries has shown that the introduction of inclusive trauma systems has significantly reduced the number of deaths and disability caused by major trauma. Inclusive trauma systems have been demonstrated to provide better patient outcomes than exclusive systems. In addition, geographically dispersed and less densely populated regions, such as Ireland, are likely better served within an inclusive trauma system.

This report on a Trauma System for Ireland recommends the establishment of an inclusive trauma system, and sets out key recommendations for the organisation of trauma care and the provision of patient-centred trauma services. It takes a whole system approach addressing all elements of the trauma care pathway including prevention, pre-hospital care, acute hospital care, rehabilitation and supported discharge.

- Pre-hospital care and transport protocols are required to ensure that individual trauma patients will be brought to the most appropriate facility – to receive the right treatment in the right place at the right time.
- Two regional hub-and-spoke Trauma Networks, each with a designated Major Trauma Centre for the treatment of major trauma that requires access to specialised trauma care, will provide the appropriate structures to meet the needs of trauma patients in Ireland. Trauma care will also be provided in designated Trauma Units, hospitals which meet specified requirements for the provision of quality trauma care, and there will be clear roles for Injury Units and Local Emergency Hospitals in the Trauma Networks in the treatment of non-trauma related illnesses requiring urgent treatment and less severe traumatic injuries.
- A strong focus on comprehensive, patient-centred rehabilitation services is required, with early assessment of rehabilitation needs, as well as enhanced acute, post-acute, regional and community rehabilitation, to enable patients to achieve their maximum functional potential.

Patient safety and quality must be at the core of the trauma system, which will continually strive to reduce variability in the provision of trauma care across the care pathway. This care will be patient-centred, and provided in a trauma system that listens and learns, that has a culture of continuous improvement and strives to meet key safety and quality performance indicators that can be benchmarked nationally and internationally.

This report on a Trauma System for Ireland will guide efforts to prevent trauma and inform the development of health services across the entire trauma care pathway. It will require effective change management, resourcing, reconfiguration, leadership and ongoing review. Continuing our efforts to prevent trauma and providing trauma services in an organised manner, as set out in this policy, will reduce the burden of trauma and ensure the best outcomes for patients.

This report sets out 45 key recommendations, addressing the development of a patient-focused and whole-system approach, trauma system configuration, and each component of the care pathway, workforce, training and education, and governance and quality assurance.

This report addresses the provision of trauma care for adults. The provision of trauma care for children has been considered separately by the relevant National Clinical Programmes, and in the context of the development of the new children's hospital which will be the paediatric Major Trauma Centre. In particular, paediatric trauma care is addressed in the Paediatric Model of Care, and the document Improving Services for General Paediatric Surgery, developed by the National Clinical Programme for Paediatrics, and in the National Models of Care for Trauma and Orthopaedic Surgery and for Paediatric Anaesthesia. The patient journey as outlined in these documents will apply.

Key Recommendations

Patient-focused and whole system approach

1. The HSE should ensure that patients and their families/carers as key stakeholders are placed at the centre of the Irish Trauma System, empowered to have their voices heard and supported to achieve independence and reablement. Where a patient does not have the capacity to engage, there must be an advocate for them in the care process.
2. The HSE should ensure that the Trauma System delivers standardised care throughout the country, irrespective of location.

Trauma System Configuration

3. The HSE should implement an inclusive hub-and-spoke Trauma System in Ireland comprising of two regional Trauma Networks.
4. Two Major Trauma Centres corresponding to the two Trauma Networks (Central and South) should be located in the most populated areas, namely Dublin city and Cork city, in order to optimise access and ensure the minimum caseload required for better outcomes.
5. The HSE should determine the geographical boundaries of the Trauma Networks by proximity and access to designated Trauma Units, and should keep the boundaries under review to take account of any changes over time, including demographic changes or changes to the road network.

6. The Department of Health and the HSE should continue to explore the potential for all-island collaboration to improve access to trauma services, particularly in border areas.
7. The HSE should designate Cork University Hospital as the Major Trauma Centre for the South Trauma Network, contingent on it meeting the recommended designation criteria.
8. The Department of Health and the HSE should invite Hospital Groups in the Dublin region to submit proposals nominating hospitals to be considered for designation as the Major Trauma Centre for the Central Trauma Network.
9. The HSE should review hospitals outside of the Dublin region with on-site Trauma and Orthopaedic Surgery for potential designation as Trauma Units.
10. The HSE should undertake a review of hospitals with Trauma and Orthopaedic Surgery in the Dublin region with a view to a reduction in the number of such units, to a maximum of two Trauma Units in addition to the Major Trauma Centre, in the context of wider service remodelling within and across the Hospital Groups.
11. The HSE should consider University Hospital Galway for designation as a Trauma Unit with Specialist Services within the Central Trauma Network, along with the development of appropriate access and bypass protocols taking into account the role of the hospital in the network.
12. The National Ambulance Service will develop triage and bypass protocols, in line with National Clinical Effectiveness Committee Standards for Clinical Practice Guidance.

Prevention

13. The appropriate Government Departments and Agencies should continue to implement measures to reduce the incidence of trauma, in particular falls and road traffic collisions, with support from the National Office for Trauma Services to determine the potential benefits and cost-effectiveness of future trauma prevention programmes.
14. The HSE should ensure that each Major Trauma Centre, Trauma Unit and Trauma Unit with Specialist Services has an orthogeriatric service which takes a leadership role in falls prevention.
15. The HSE should develop a comprehensive Fracture Liaison Service to provide high quality, evidence-based care to those who suffer a fragility fracture with a focus on achieving the best outcomes for recovery, rehabilitation and secondary prevention of further fracture.

Pre-Hospital Care and Retrieval

16. The National Ambulance Service should develop policies and protocols, in line with the National Clinical Effectiveness Committee's Standards for Clinical Practice Guidance, to ensure the safe and timely transport and inter-hospital transfer of patients with major trauma.
17. The National Ambulance Service should ensure a PHECC registered Advanced Paramedic (AP), with appropriate additional training, is present in the National Emergency Operations Centre (NEOC) 24/7 with support from a consultant level doctor with significant pre-hospital trauma experience, to ensure timely and accurate identification of major trauma in the pre-hospital setting.

18. The HSE should examine how existing HEMS resources can be enhanced and further developed, recognising the critical role of aeromedical transport in the timely transfer of high acuity patients and the implementation of a trauma system.
19. The HSE National Transport Medicine Programme / service should continue to develop retrieval services in order to ensure capacity and capability to provide a robust and consistent national critical care retrieval service.
20. The National Ambulance Service should ensure that patients with suspected major trauma are taken directly to a Major Trauma Centre where travel times are within 45 minutes or if travel times exceed this, to the nearest Trauma Unit for rapid stabilisation and subsequent transfer to the Major Trauma Centre if the complexity of their injuries exceeds the capability of the Trauma Unit.
21. The National Ambulance Service should enhance pre-hospital care in areas outside of 60 minutes travel time to the nearest Trauma Unit and/or in circumstances where direct transportation to a Major Trauma Centre is required.

Reception and Intervention

22. The HSE should ensure that a Family/Patient Liaison Officer is included in the trauma team activation and be in a position to remain with the patient/family at each stage of their hospital journey and particularly on discharge from hospital.
23. The HSE should ensure that all patients admitted to a Major Trauma Centre, Trauma Unit and Trauma Unit with Specialist Services, following trauma team activation, are admitted under a named consultant, who is responsible for overseeing their optimal care until or unless agreement is reached with another consultant that the nature of the patient's injuries makes it appropriate for their admission under a particular specialty.
24. The HSE should ensure that a number of key specialists are available in the Major Trauma Centre on a 24/7 basis (as outlined in the Designation Criteria at Appendix 6) and where these are not available (particularly in Trauma Units), protocols are put in place to ensure that they can be accessed as needed.
25. The HSE should ensure that Major Trauma Centres have the necessary resources (including theatre and ICU capacity) available for trauma. The National Critical Care Audit should be used to inform planning for critical care beds.

Reconstruction and Ongoing Care

26. The HSE should ensure that Major Trauma Centres have access to dedicated, separate, fully resourced daytime operating theatres for trauma and reconstructive surgery, and that Trauma Units have appropriate access to theatres during normal working hours, and after as required.
27. The HSE should ensure that Major Trauma Centres, Trauma Units and Trauma Units with Specialist Services develop dedicated trauma wards, to enable co-location of patients with multiple injuries.

Rehabilitation

28. The HSE should ensure that all trauma patients in Major Trauma Centres, Trauma Units and Trauma Units with Specialist Services can access rehabilitation and have their rehabilitation needs assessed

within 48 hours of admission, generating a flexible personal prescription for rehabilitation that should accompany all patients as they transition through the pathway.

29. The HSE should ensure that rehabilitation services in both acute and community settings adopt a person centred approach, which empowers the patient and the family to participate actively in the process. This process includes the provision of timely information, education and a range of supports on the rehabilitation journey.
30. The HSE should ensure coordinated development of regional and community rehabilitation services and long-term support, to meet the needs of all trauma patients within a Trauma Network. This should include appropriately resourced and skilled community rehabilitation teams (CRTs), co-ordination with disability services and the appointment of case managers.

Workforce

31. The Department of Health and the HSE should consider the introduction of a Trauma System for selection as one of the priority workforce planning projects under the National Strategic Framework for Health Workforce Planning. In this context, consideration should be given to development of the following:
 - A mapped patient pathway, to clearly identify all staff, roles, competencies and skills now compared to those required for every member of the future multidisciplinary Trauma Network Teams.
 - A Strategic Integrated Workforce Plan for the Trauma Network so that we have defined multidisciplinary team model(s) into the future.
 - An Education and Training Framework for all members of the multi-disciplinary team together with a plan for how workforce development and optimisation opportunities can be maximised so that all staff can work to their full potential.
 - A technology and innovation enablement workstream that can ensure the workforce model(s) developed are future-proofed as much as possible.
32. In tandem with Recommendation 31, the determination of the nursing workforce across acute trauma wards should have regard to the Framework for Safe Nurse Staffing and Skill Mix.

Trauma Specific Training and Education

33. The HSE National Office for Trauma Services should establish a formal trauma training committee and the HSE should appoint a dedicated lead for trauma education.
34. The HSE should ensure that enhanced trauma training and education for surgeons and members of the multi-disciplinary team healthcare workers in the proposed Trauma Network for Ireland includes up-to-date Advanced Trauma Life Support certification, participation in an advanced trauma course (such as Definitive Surgical Trauma Skills), ongoing trauma Continuing Medical Education, trauma leadership and trauma team training.

35. Higher Education Institutes should review the current specialist nursing post-graduate orthopaedic education and training curriculum, to ensure the proposed changes to trauma care are reflected appropriately.

Governance

36. The HSE should appoint a National Clinical Lead for Trauma Services reporting to the proposed new Chief Clinical Officer once appointed, and the National Director of Acute Hospital Services in the meantime, to lead a National Office for Trauma Services and manage the implementation and oversight of the Trauma System.
37. The HSE National Office for Trauma Services should establish a Trauma Patient Advisory Committee to provide input into the development of the Trauma System. Membership of this Committee will reflect the diversity of patients living with the effects of trauma.
38. The HSE National Office for Trauma Services should oversee the establishment of an appropriate governance framework for the Trauma System, which supports a safe and high quality Trauma System.

Quality Assurance

39. The HSE should ensure that each Trauma Network and trauma service provider will put in place a quality assurance system framework, inclusive of clinical audit and performance measurement at national, network and local levels that links to the governance framework and participates in the Major Trauma Audit.
40. The HSE National Office for Trauma Services should introduce a peer review system for all components of the Trauma System based on agreed “quality measures” and publish reports to provide accessible information about the quality of services.
41. The HSE National Office for Trauma Services in conjunction with the Major Trauma Audit Committee should develop an agreed set of high level key performance indicators for the Irish Trauma System, to be used as part of the HSE’s performance monitoring framework.
42. The National Office of Clinical Audit (NOCA) should develop the TARN dataset to collect functional and quality of life outcome data for all components of the major trauma care pathway.
43. The HSE should consider the introduction of a best practice tariff for major trauma under Activity Based Funding.

Implementation

44. An interim HSE implementation group, to include representation from the Department of Health, should be formed immediately following the adoption of the report to commence the four immediate actions within the first three months of implementation, and to ensure a seamless transfer of responsibility to the National Clinical Lead for Trauma Services, once appointed, and the National Office for Trauma Services.

Funding

45. The Government should commit to providing annual development funding for this trauma policy across all of its components – prevention, pre-hospital care, hospital care and rehabilitation.



Chapter 1

Introduction

1.1 Trauma

The primary aim of the development of a Trauma System for Ireland is to improve patient outcomes by a reduction in preventable death and disability from both intentional and unintentional injuries.

Injuries are a global health problem, causing over five million deaths per year¹. Five of the 15 leading causes of death in persons 15 to 29 years of age worldwide are unintentional injury related, including road traffic injuries, falls, farm and industrial accidents, drowning and burns. In the EU, injury represents the fourth and in Ireland the third leading cause of death², and accounts for at least 8.5% of admissions to hospitals³.

Injuries can be graded as low, moderate and high severity. Examples of low and moderate severity injuries include soft tissue injuries, simple wrist and ankle fractures and simple skull fractures without associated brain injury. Major trauma involves high severity injuries which have the potential to cause prolonged disability or death and includes injuries such as knife and gunshot wounds, major head injury, multiple injuries to different parts of the body, fractures with extensive soft tissue damage, spinal injury and severe burns. Patterns of injury vary widely by cause, age, sex, region and time⁴. Ageing populations may experience an increase in the burden of injury caused by falls.

Trauma can be classified using different classification systems, one of which is the injury severity score (ISS). This is an internationally recognised anatomical scoring system which retrospectively assigns a measure of severity ranging from zero to 75, with a score of ISS>15 signifying major trauma. Mortality increases with ISS, and a score of 75 signifies injuries which are unlikely to be survived.

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

Source: NOCA Major Trauma Audit – National Interim Report 2014 – 2015

For each trauma fatality, there are two survivors with serious or permanent disability that will have a significant impact on their quality of life⁵. Patients with major trauma often require highly specialised care, extended hospital stays and extensive rehabilitation in both acute and post-acute settings. Injuries, which are preventable in the main, create a substantial burden on individuals and their families, the health service and society. Every injury results in direct and indirect health-care costs. Direct costs include the immediate costs such as hospital treatment, medications, prostheses, rehabilitation and ongoing follow-on treatment (e.g. home care, outpatient care and visits to health care professionals). Indirect costs consist of each individual's lost productivity and ability to work.

Trauma is, therefore, not only a leading cause of death but also a large socio-economic burden. The estimated cost of the management of trauma in the EU is estimated to be around €78 billion per annum⁶. The individual and wider societal costs of major trauma include family and relationship breakdown, unemployment, depression, anxiety, alcohol misuse, drug abuse and suicide.

1.2 Background to the Development of the Policy

For reasons of safety and quality, the Department of Health has recognised the need to develop policy direction in relation to a number of key national and supra regional services in order to guide overall hospital services reorganisation. As Hospital Groups are implemented and developed, of key importance will be the demonstration of progress towards a more coordinated approach to the planning and delivery of services within and, in particular, across the Hospital Groups, and an increased focus on networks of service provision, with smaller hospitals managing low-complexity urgent or planned care locally while more complex care is managed in the larger hub hospitals.

The Department of Health is committed to developing national policy direction in relation to these key national and supra regional services as part of the overarching policy framework for the implementation of Hospital Groups.

Trauma is one of these services. The current fragmented approach to the management of trauma patients in pre-hospital emergency services, hospital care and rehabilitation in Ireland has also long been a subject of concern by a number of the National Clinical Programmes^a and there is a general consensus that the management of patients with multiple injuries compares poorly with contemporary international standards in trauma care⁷. In 2015 the Minister for Health established a Trauma Policy for Ireland Steering Group, chaired by Professor Eilis McGovern. The terms of reference of the Steering Group were:

- to examine the international evidence base with regard to the most efficient and effective organisation of trauma services;
- to examine the current and projected need for trauma services in Ireland;
- to describe and evaluate current models of trauma care in Ireland;
- to consider the information gathered on trauma in Ireland;
- to examine options regarding the development of a Trauma Network for Ireland, including consideration of trauma care pathways, a Trauma Network as well as the designation of Major Trauma Centres within any proposed network;
- to consider the challenges in more remote communities where the full range of specialist trauma centres may not be available;

^a Emergency Medicine, Surgery, Critical Care, Trauma and Orthopaedic Surgery and Rehabilitation Medicine

- to consider and evaluate best international practice and make recommendations regarding the development of performance metrics for trauma care in Ireland;
- to engage in appropriate consultation with key stakeholders to build consensus around a preferred policy for a Trauma Network for Ireland, and
- having considered options, to submit a policy for a Trauma Network for Ireland to the Minister for Health.

This report addresses the provision of trauma services for adults. The provision of trauma services for children has been considered separately by the National Clinical Programme in Paediatrics in its National Model of Care⁸, in its related document Improving Services for General Paediatric Surgery⁹ and in the National Models of Care for Trauma and Orthopaedic Surgery¹⁰ and for Paediatric Anaesthesia¹¹. It will be implemented by the delivery system in the HSE accordingly, in line with the roll-out of the Paediatric Model of Care and the development of the new children's hospital. The Steering Group considers that it is essential that appropriate consultation be undertaken with those responsible for paediatric service delivery, including the Children's Hospital Group, in the implementation of the recommendations outlined in this report, to ensure necessary co-ordination and linkages between adult and paediatric trauma services and that paediatric service providers are considered at all stages of the care pathway.

The Steering Group was assisted in its work by an external advisor, Professor Chris Moran, NHS National Clinical Director for Trauma. Four working groups were also established to examine individual components of the trauma care pathway. A fifth working group examined the optimal configuration of a Trauma System for Ireland. All working groups reviewed relevant international guidelines and adapted them to an Irish context where appropriate. The membership of the Steering Group and working groups are set out in Appendix 1. All groups were clinically-led and included patient representatives as members. The reports of the Working Groups will be made available online through the National Office for Trauma Services once established.

The work of the Steering Group was informed by consultation with members of the public, trauma patients and health care providers, the findings of which are provided in Appendix 2. The Steering Group's recommendations were also informed by research carried out on the impact of the introduction of Trauma Systems in other countries, as well as a site visit to a Trauma Network in England. Members of the Steering Group also engaged with health service representatives in Northern Ireland to explore the potential for collaboration in the future provision of trauma services in border areas.

1.3 Prevention and Treatment of Trauma

Although the ultimate goal must be to prevent injuries from happening in the first place, much can be done to minimise deaths and disability from the injuries that occur.

Non-major trauma patients, once identified, can be managed locally if appropriate expertise is available. Other injured patients require extensive acute care. Significant improvements in outcomes from trauma may be expected, if services targeting the specific needs of patients with major trauma are developed within Major Trauma Centres i.e. designated hospitals specialising in the provision of trauma care.

Given the limited available resources in the health system and the need for urgent care of the seriously injured, it is critical to utilise a method of differentiating the injured patient who needs the specialised expertise and resources available in Major Trauma Centres from those who can be adequately cared for

more locally. Triage tools, care guidelines and referral processes can be used to separate those patients who require the resources of a Major Trauma Centre from those who do not. An accurate and rapidly performed triage tool, which can identify major trauma patients, is an integral part of a Trauma System.

Improving the organisation, planning and access to trauma care systems, including prevention, pre-hospital, hospital-based care and rehabilitation has been proven in other countries to reduce the death rate and the effects of injuries.

A Trauma System is an organised, coordinated effort in a defined geographic area that delivers the full range of care to all injured patients and is integrated with the local public health system. It spans the full spectrum of care from prevention, pre-hospital care, Emergency Department care, reconstruction and ongoing care to rehabilitation. The trauma care pathway consists of:



A Trauma System enhances the chance of survival by making sure the right person gets to the right place, at the right time. Furthermore, a Trauma System standardises trauma care delivery so that all patients get the right care all the time.

1.4 Evidence for Improved Patient Outcomes

Other countries have also acknowledged deficiencies in their management of major trauma patients and focused on restructuring services to improve the care of trauma patients. The introduction of Trauma Systems in other jurisdictions such as the US, England, Wales, Norway and Victoria (Australia) has led to a reduction in the number of preventable deaths and level of disability among major trauma patients. For example, the introduction of regional Trauma Networks in the UK has been associated with large increases in survival rates for major trauma patients, with the risk-adjusted odds of a major trauma patient surviving being 25% better in 2014/2015 than in 2011/2012, following the implementation of the Trauma System¹².

1.5 Safety, Quality and Person-Centred Care

High quality trauma services means services that are safe, evidence-based, appropriate, timely, efficient, effective and equitable. Safety is fundamental to quality care and assurance of patient safety requires active leadership, clinical governance and clinical commitment to quality for all trauma services at each level. The Department of Health is committed to patient safety and to this end established a National Patient Safety Office in December 2016 to provide policy leadership for patient safety, build a programme of patient safety legislation, introduce a patient safety surveillance system and extend the clinical effectiveness agenda.

Safe care requires developing capacity for patient safety and quality and focusing on the integration of best available evidence through quality assured National Clinical Effectiveness Committee (NCEC) National Clinical Guidelines, National Clinical Audit such as the Major Trauma Audit and general clinical guidance developed in line with the Standards for Clinical Practice Guidance¹³.

Patient safety training and education for health professionals is necessary and the implementation of multidisciplinary patient safety tools is recommended to minimise risk and patient safety incidents. These include NCEC Clinical Handover¹⁴ and Early Warning System¹⁵ guidelines which include the communication tools ISBAR (identify situation, background, assessment and recommendation).

International patient safety evidence for improving care, reducing variation and minimising risk identifies that the need for health systems to commit to encompassing key fundamental patient safety initiatives and having systems in place for assuring their full sustained implementation. The proposed Trauma System commits to these principles which will include the measurement of patient experience within the trauma services, the measurement of key performance indicators, the use of guidelines and audit for evidence based practice and the reporting of patient safety incidents.

A patient safety focus will require the Trauma System to build capacity for patient safety, evidence based practice and quality assurance. This means that systems to deliver and monitor core patient safety and quality activities for the Irish Trauma System will be developed. Patient representatives should be involved in planning, practice and oversight of trauma care at local, Trauma Network and Trauma System levels.

Recommendation 1

The HSE should ensure that patients and their families/carers as key stakeholders are placed at the centre of the Irish Trauma System, empowered to have their voices heard and supported to achieve independence and reablement. Where a patient does not have the capacity to engage, there must be an advocate for them in the care process.

1.6 Vision

The vision for the national Trauma System for Ireland is that it will reduce both the incidence and burden of trauma and increase the survival rate of major trauma patients by delivering a seamless transition between each phase of care. A fully resourced Trauma System for Ireland will, when implemented, save lives and enhance the health, safety and wellbeing of the population, through an organised system of injury prevention, pre-hospital care, acute care and rehabilitation. It will be fully integrated within the wider healthcare system and supported by other key sectors. The development of this policy is consistent with the mission of the Department of Health, which is to improve the health and wellbeing of people in Ireland.

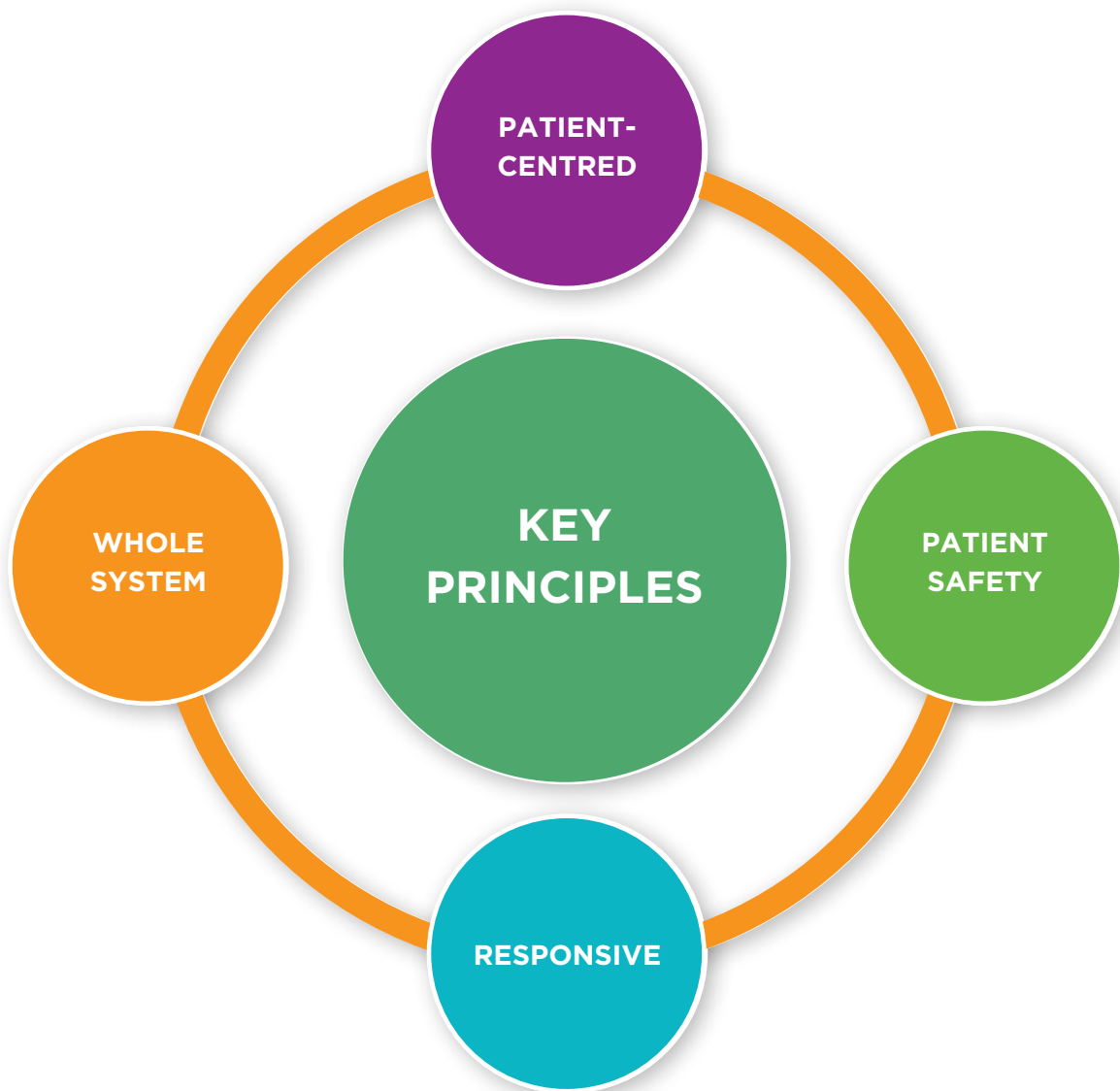
The objectives of a national Trauma System for Ireland are:

- To decrease the incidence and severity of trauma;
- To ensure equitable access to the right care for all persons sustaining trauma;
- To prevent unnecessary deaths;
- To reduce disabilities and significantly improve the chances of attaining the fullest possible recovery.

The four key principles underpinning the vision of a national Trauma System for Ireland are:

- There should be a focus on the delivery of patient-centred services at all stages along the trauma care pathway from wellbeing and prevention through to rehabilitation and supported discharge;
- Patient safety and quality will be assured through the sustained implementation of a set of patient safety initiatives delivered in a systematic consistent manner across all stages of the trauma pathway;
- There should be a whole system approach, rather than a hospital-centric approach, to the prevention and treatment of injury and to the rehabilitation of patients, with necessary collaboration across care areas;
- The Trauma System should be responsive, adaptive and enabled to evolve over time on the basis of learned experiences.

FIGURE 1: KEY PRINCIPLES UNDERPINNING A NATIONAL TRAUMA SYSTEM



Chapter 2

Current Provision of Trauma Services

When considering the future of trauma care in Ireland, it is important to understand the current provision of trauma services along the care pathway. The development of an integrated and inclusive Trauma System can build on the existing strengths of many individual elements of the trauma prevention and care pathway as well as address recognised shortcomings in trauma care.

In October 2013, the National Office of Clinical Audit (NOCA) established the Major Trauma Audit (MTA) using Trauma Audit Research Network (TARN) methodology. Since 2016, 26 hospitals that receive trauma patients contribute data to the MTA. The Minister for Health endorsed the Major Trauma Audit as the first NCEC National Clinical Audit in December 2016¹⁶.

As an NCEC National Clinical Audit, an annual report is published and the first annual report based on data from 26 hospitals receiving trauma patients is expected at the end of 2017. This will supply accurate information for analysis on issues such as trauma incidence and severity.

The National Report for 2014-2015, published at the end of 2016¹⁷ is not fully comprehensive as not all Emergency Departments were recording data for the full report years, not all required data was gathered by the hospitals, the tracking of patients who were transferred to another hospital was challenging and some Emergency Departments had low numbers of major trauma patients. Therefore, any conclusions drawn must be treated with caution. Not all the necessary information is documented well enough or in a standard way across the patient journey including pre-hospital care and no data was collected on functional and quality of life patient outcomes.

Although these caveats place limitations on the conclusions that can be drawn from the data, there are pointers to where improvement in trauma care might occur on a national basis, for example:

- Initial patient assessment is undertaken by trauma teams of varying sizes and expertise;
- The proportion of major trauma audit patients who arrive at an appropriate hospital capable of providing definitive care was just over 70%; in other words, 30% of trauma patients captured were transferred to another hospital for definitive care as their care needs could not be met by the receiving hospital;
- Not all patients who suffered a traumatic brain injury were transferred to a neurosciences centre.

These variations in patient care must be addressed by the introduction of a Trauma System to ensure that all trauma patients can access the treatments they need in a timely manner.

Recommendation 2

The HSE should ensure that the Trauma System delivers standardised care throughout the country, irrespective of location.

2.1 Prevention

Traumatic injury is a public health problem. Injury prevention addresses this public health challenge by reducing the number of new cases of injury, as well as by reducing the severity of those injuries that do occur.

Traumatic injury is no longer considered ‘an accident’, but a predictable and preventable disease¹⁸. Appropriate interventions can save lives and reduce disability. These interventions can often be readily, easily and inexpensively implemented. Effective trauma prevention interventions can involve education, environmental modifications and legislation.

Currently, in Ireland, many Government Departments, agencies and independent organisations play important roles in developing and implementing a wide range of programmes which have reduced and continue to reduce the incidence of certain types of trauma.

Healthy Ireland¹⁹ is the national framework for action to improve the health and wellbeing of the people of Ireland. One of its key goals is to protect the public from threats to health and wellbeing. The national structures for implementing Healthy Ireland provide a platform for strengthening and supporting measures to prevent trauma.

On the basis of the results of the Major Trauma Audit in relation to mechanism of injury, key areas for trauma prevention are road safety and falls prevention.

The Road Safety Authority, An Garda Síochána, the National Roads Authority and others have worked together successfully to improve education, engineering and enforcement, resulting in significant improvements in road safety. The biggest single success factor in Ireland’s improved road safety performance over the past decade has been the marked change in personal behaviour and attitudes to responsible road user behaviour. A recent study of road traffic related injury hospital activity data from seven Irish hospitals

supports the effectiveness of the penalty points system and demonstrates the effectiveness of the strategies implemented to reduce trauma from road traffic collisions in Ireland²⁰.

“Before my accident I thought I was bulletproof”

Since 1990, falls from a height of less than two metres have overtaken road traffic collisions as the most frequent cause of major trauma in the UK²¹. Figures from the Irish Major Trauma Audit Report 2014-2015 indicate that falls from less than 2m are the most frequent cause of major trauma (particularly among older people) in Ireland too.

The latest findings of the Irish Longitudinal Study on Ageing (TILDA) have demonstrated that the burden of falls in adults aged 50 years and over in Ireland is high²². Almost 40% of participants reported at least one fall during a 4 year period. Furthermore, half of fallers or nearly 20% of the study population reported recurrent falls or a fall that resulted in an injury serious enough to require medical treatment.

TILDA noted that an Economic Burden of Illness Study²³ estimated that fall-related injuries in older people costed €402 million to the Irish economy in 2006 and that this would increase to €922-1077 million by 2020 in the absence of a strategy to prevent falls and fractures.

In 2008, the HSE, Department of Health and Children and National Council on Ageing and Older People published the *Strategy to Prevent Falls and Fractures in Ireland's Ageing Population*²⁴. In 2013, the Affinity (Activating Falls and Fracture prevention in Ireland Together) project was established by the HSE and the State Claims Agency to implement and continuously improve falls prevention programmes in a more coordinated fashion throughout the country.

Falls are not confined to the older population. Every working day five people in Ireland are hurt in workplace slips, trips and falls²⁵. Those most at risk of workplace injuries continue to be the self-employed, particularly in the agricultural, forestry and fishing industries. Slips, trips and falls are the second highest single cause of workplace injuries and are more likely to lead to longer periods off work compared to all other types of workplace injuries. There are more than 1,400 workplace slips, trips and falls reported each year. The Health and Safety Authority implements workplace safety programmes that focus on known hazards in the work-place.

2.2 Pre-hospital Care and Retrieval

Pre-hospital care encompasses the time from when contact is made with emergency services, the first responder arrives at the incident and care is provided on the scene, to transfer to a hospital. It involves any clinical care or intervention that an acutely ill or injured person receives from trained personnel in the pre-hospital environment from the moment a call is received by the National Ambulance Service (NAS). Retrieval refers to the interhospital transfer of an acutely or critically ill patient.

The NAS is the statutory pre-hospital emergency care provider for the State. The service delivers pre-hospital care right across the country. In the Dublin metropolitan area, Ambulance Services which are funded by the HSE are provided by both NAS and Dublin Fire Brigade. The NAS employs over 1,600 staff across 100 locations and has a fleet of approximately 500 vehicles. The NAS also provides non-emergency patient transport for the public health system.

In recent years, the NAS has embarked on a strategic investment programme to develop a modern, quality service that is safe, responsive and fit for purpose. The service is implementing a significant reform agenda which mirrors many of the strategic changes underway in ambulance services internationally as they strive for high performance, efficiency and cope with a continuously increasing demand for services. The NAS operates the National Emergency Operations Centre which uses an internationally accredited Advanced Medical Priority Dispatch System to triage and prioritise emergency calls. The call takers can also provide medical advice to the caller, while the ambulance is en route, which ensures that there is no time lost in providing medical care.

The NAS also provides an Intermediate Care Service which focuses on non-emergency clinical transport, including inter-hospital transfers and low acuity work. This allows emergency resources, which traditionally provided these services, to focus on responding to emergency calls. An average of 90% of inter-hospital transfers are now made by Intermediate Care Service vehicles.

The Pre-hospital Emergency Care Council (PHECC) is an independent statutory body, with responsibility for standards, education and training in the area of pre-hospital emergency care. It oversees the register and regulatory function of professionals and providers working in pre-hospital emergency care.

A significant reform programme is underway in pre-hospital emergency care to reconfigure the management and delivery of pre-hospital services, into a clinically driven, nationally coordinated system, supported by technology and data. This reform is taking place against the backdrop of the Health Information and Quality Authority review of ambulance services (2014, 2017)²⁶ and the NAS Capacity Review (2016)²⁷.

Pre-hospital care and retrieval services in Ireland include good national coverage by the National Ambulance Service (NAS), facilitated by resources in the system being used more efficiently in an integrated manner. These resources include Irish Coast Guard Search and Rescue helicopters, ambulances and rapid response vehicles and the Emergency Aeromedical Service provided by the Air Corps. The Emergency Aeromedical Support Service provides dedicated aero-medical support to the NAS, mainly in the west of Ireland, where land ambulance transit times would not be clinically appropriate. The integration of the command/control/communication systems of the NAS was also a key development. The standardisation of clinical practice guidelines for pre-hospital care, enhanced paramedic and advanced paramedic training, the advent of tele-medical support and access to pre-hospital doctors are also considered as key strengths of the current service.

Retrieval deals with the care of critically ill patients in transit between one hospital and another. The standard required is to deliver the level of critical care en route that one would expect to receive at any major tertiary facility. There is significant evidence that specialised retrieval teams achieve better patient outcomes as measured by physiology, morbidity, mortality, average length of stay and reduction in adverse clinical events.

The National Transport Medicine Programme is a comprehensive retrieval/transfer system covering neonatal, paediatric and adult patients launched in 2012. The objective of the programme is the timely retrieval/transfer of critically ill patients or severely injured patients by an appropriately trained and skilled team of health professionals.

Pre-hospital care can also be provided by Community First Responders who are trained volunteers. They can provide basic life support and can attend life-threatening emergencies. Volunteers operate community first responder schemes in their own communities and these local schemes are linked to the NAS.

“My next memory is of a friendly, confident voice reassuring me that they would get me sorted out. One of the ambulance team was lying down beside me talking through the side of my helmet. Up to then I think I was relying on myself but when the ambulance arrived I felt safer”

2.3 Reception and Intervention

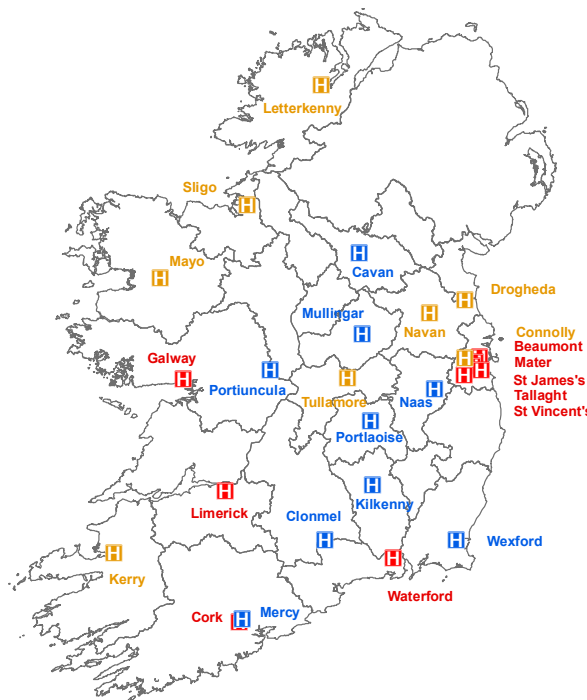
The reception and intervention phase of the care pathway begins when the trauma patient is admitted to the hospital through to when the patient is stabilised. This includes all immediate trauma care and urgent surgical interventions provided within the hospital setting. There are currently 29 Emergency Departments and 11 Injury Units in Ireland. The types of trauma treatment required and number of attendances at Emergency Departments across the country varies considerably²⁸.

TABLE 2: EMERGENCY DEPARTMENTS AND INJURY UNITS

Adult and Mixed Emergency Departments	
Mater Misericordiae University Hospital	Midland Regional Hospital Tullamore
St. James's Hospital	Our Lady's Hospital, Navan
St. Vincent's University Hospital	Cavan General Hospital
Tallaght Hospital - Adults	University Hospital Kerry
Beaumont Hospital	Wexford General Hospital
Connolly Hospital	Letterkenny University Hospital
Naas General Hospital	Mayo University Hospital
Cork University Hospital	Midland Regional Hospital Mullingar
University Hospital Galway	St Luke's Hospital Kilkenny
Our Lady of Lourdes Hospital, Drogheda	Portiuncula University Hospital Ballinasloe
University Hospital Limerick	Midland Regional Hospital Portlaoise
University Hospital Waterford	Mercy University Hospital Cork
Sligo University Hospital	South Tipperary General Hospital
Paediatric Only Emergency Departments	
Children's University Hospital Temple St.	
Our Lady's Children's Hospital, Crumlin	
Tallaght Hospital - Children	
Injury Units	
St. Columcille's Injury Unit, Loughlinstown	St. John's Injury Unit, St. John's Hospital, Limerick
Mater Smithfield Rapid Injury Clinic	The Mercy Injury Unit, Gurranabraher, Cork
Dundalk Injury Unit	Mallow Injury Unit, Mallow General Hospital, Cork
Monaghan Injury Unit	Bantry Injury Unit, Bantry General Hospital, Cork
Ennis Injury Unit, Ennis General Hospital	Roscommon Injury Unit, Roscommon University Hospital
Nenagh Injury Unit, Nenagh General Hospital	

The reception and intervention stage can be marked by the lack of an agreed, consistent and structured approach, and delays in handover.

Pre-hospital alerts of the imminent arrival of a trauma victim are frequently issued, but not always met with an appropriately cascaded response within the hospital. As a result, there may be insufficient experienced staff in the initial receiving treatment team. This can lead to delayed and/or incorrect decisions, delays in treatment, and consequent avoidable disability and death.



- H Model 3 Hospital with 24/7 ED and emergency General Surgery service
- H Model 3 Hospital with 24/7 ED, emergency Trauma Orthopaedic and General Surgery services
- H Model 4 Hospital

The Major Trauma Audit Report for 2014-2015 provides useful information in relation to reception and intervention of trauma patients in Ireland, e.g. trauma teams are not widely used in the reception of major trauma patients in Ireland yet have been shown to improve timeliness to critical interventions and patient outcomes and 58% of major trauma audit patients arrive to the Emergency Department between 4pm and 8am.

"My next memory is of lots of medical staff standing over me and talking about me, I remember I wanted them to include me more in the discussions. I remember a nurse explaining that they were going to have to cut off my leather trousers and jacket. Even after all those years the sound of a scissors cutting through cloth reminds me of that night. When they finished cutting off my leathers I felt embarrassed and very vulnerable lying there with so many people looking down at me. I remember how every change in the medical staffs' expressions, sideward glances and changes in their tone were my only focus. You so want someone to tell you it is going to be ok. Or at the very least take a minute to listen to you and answer your questions."

2.4 Reconstruction and Ongoing Care

The reconstruction and ongoing care phase of the trauma care pathway commences immediately after resuscitation and urgent surgery following admission, and continues until discharge from the acute setting.

The current system of trauma service provision by multiple hospitals is considered inadequate by international standards²⁹. Currently, trauma patients requiring orthopaedic treatment are being routinely brought from the scene of the accident to one of nine acute hospitals that do not have trauma and orthopaedic surgery on-site. Patients are often transferred to a second hospital – for example, for specialised diagnostics and/or interventions, such as neurosurgery, cardiothoracic or trauma orthopaedic treatment - causing potential delays in patients receiving appropriate definitive treatment and care. The Major Trauma Audit Report of 2014-2015 has highlighted the high numbers of trauma patients going to hospitals that cannot provide necessary and definitive care. 30% of patients captured by the audit required transfer to another hospital for on-going care as their care needs could not be provided by the initial treating hospital.

In cases of major trauma that require stabilisation and transfer, or require surgical intervention, the interdependence of the trauma clinical service with that of the anaesthesia/critical care service is paramount. However, in some hospitals outside Dublin, this anaesthesia/critical care resource is not available. Patients awaiting the transfer/retrieval team require stabilisation and initiation of appropriate critical care treatment. This is provided in the Emergency Department and, time permitting, in the ICU by the anaesthesia service, but in turn affects the availability of the anaesthesia team for other emergency surgery.

“For me the visit in ICU from an individual in a wheelchair pulling up beside my bed was one of the most important visits. Asking someone who was in the same position as yourself was so important. You need reference points. You need someone to translate this new language you were now immersed in.”

There is currently extreme pressure on critical care bed capacity. Immediate or prompt access to adequate critical care bed capacity in the receiving hospital is a key outcome determinant for the critically ill patient.

In 2008, the HSE commissioned an independent review of the existing adult critical care provision and assessment of future requirements to the year 2020 which recommended increasing the number of critical care beds to 579 by 2020³⁰. The HSE Critical Care Clinical Programme carries out an annual census of critical care capacity and activity. Based on the National Critical Care Capacity and Activity Census³¹, there are currently 237 adult critical care beds in public hospitals. It is acknowledged that there is a need to address the overall critical care bed capacity requirements.

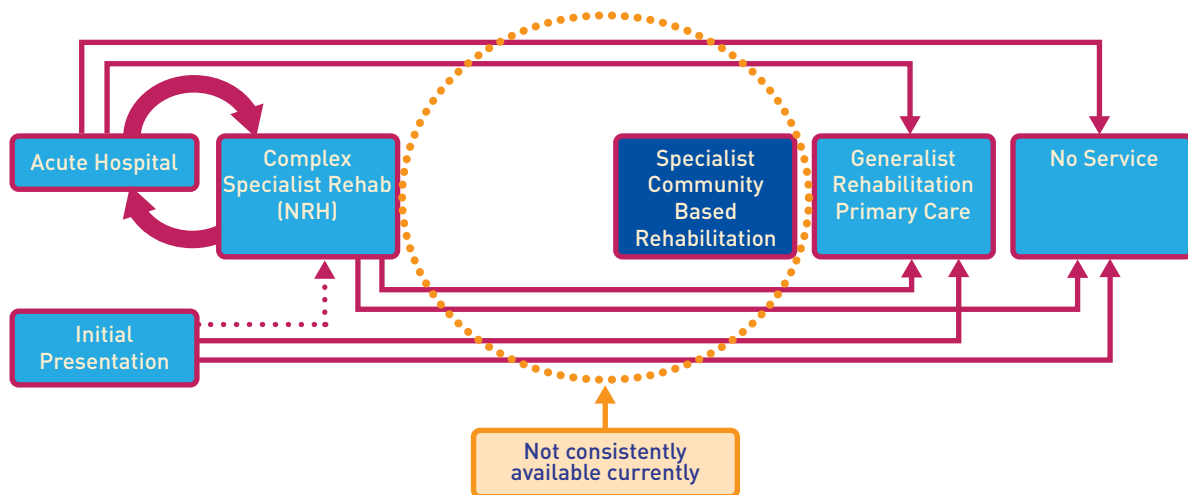
Ireland also has a low density of surgical specialists. In 2015 there were 46 surgical specialists per 100,000 inhabitants in Ireland compared with an average of 74 surgical specialists per 100,000 inhabitants in the EU Member States³². Surgical specialists include many trauma-related specialties such as General Surgery, Orthopaedics, Intensive Care and Emergency Medicine. There is also a shortage of consultants in the trauma-related specialties in some hospitals (e.g. general surgery, neurosurgery, orthopaedic surgery, intensive care medicine, rehabilitation medicine and emergency medicine). This hinders the delivery of best practice trauma care, which should be consultant delivered where possible.

2.5 Rehabilitation

The rehabilitation phase of the trauma care pathway is dedicated to improving, maintaining or restoring physical strength, cognition and mobility with maximised results. Typically, rehabilitation helps people gain greater independence after injury.

Most patients will have an uncomplicated recovery and progress through the pathway rapidly to home with non-specialist rehabilitation services. However for a small number with more complex needs, post-acute specialist rehabilitation is required. Specialist inpatient services are mostly concentrated at national level in the National Rehabilitation Hospital in Dublin. While a number of inpatient rehabilitation units do exist around the country, currently these services tend to provide lower intensity care over a longer period of time. In addition, there is limited multidisciplinary team (MDT) availability for early rehabilitation.

FIGURE 2: REHABILITATION SERVICES



Source: National Clinical Programme for Rehabilitation Medicine Model of Care, HSE

There are three recognised levels of specialist rehabilitation described for the Irish context:

- Complex specialist services: serves a national population and manages a high proportion of complex cases (60-70% will have complex needs);
- Local specialist rehabilitation service: services a population of up to 1 million and manages fewer complex cases (up to one third will have complex needs);
- Community rehabilitation services: serves a CHO catchment and comprises a wide range of therapy services including specialist and generic, and statutory and voluntary providers.

The National Rehabilitation Hospital provides complex specialist rehabilitation care (inpatient, outpatient and day-patient services) to patients who have acquired a physical or cognitive disability as a result of an illness or injury. There are currently approximately 109 beds available for inpatient admissions (including those related to brain injury, spinal injury, prosthetic and limb absence, and paediatric rehabilitation). It is

the only post-acute specialist rehabilitation unit in Ireland and is oversubscribed with long waiting times for access to specialist services.

There are also significant gaps in community-level rehabilitation services.

“Once I could clearly walk, clean and feed myself, I was discharged. Beaumont is an acute hospital and my bed was needed. They had done their job. I was sent to James’s for three days and then discharged home. If my mother had not been in a place to look after me at home, the hospital would have had no choice but to keep me. This is when my rehabilitation began, though I was convinced that it was nearly complete.”

The National Neuro-rehabilitation Strategy³³, published in 2011, made a number of recommendations for the provision of neuro-rehabilitation services. Following publication of the report, the health service, as part of its commitment to optimal care pathways for different clinical needs, established the National Clinical Programme for Rehabilitation Medicine. Since its establishment, it has been concerned with shaping future specialist rehabilitation services for adults with disability resulting from neurological injury and limb absence across acute, post-acute and primary care settings. The programme’s overall objective is to extend access to specialist rehabilitation services for people with acquired disability so that their ability can be maximised and dependency reduced.

The Rehabilitation Medicine model of care recommends a framework where patients are managed by specialist rehabilitation clinicians who are connected and supported by the governance structures of a managed clinical rehabilitation network (MCRN). The National Rehabilitation Hospital has been the national hub for specialist rehabilitation for many years, and will link formally with proposed new rehabilitation teams in regional centres within each Hospital Group, and community based neuro-rehabilitation teams within the Community Healthcare Organisations. Cross-sector working and alignment will be required.

“I planned on being back to work in a month, maybe two. I think the swelling on the side of my head did me good. It reminded me that I was not okay and that I should at least wait until it had gone. I would sleep ten hours or more every night, napping often twice a day for two hours each.”

“My employer is to be commended for his help during the long months during which I could not work. I owe them much. I do not exaggerate when I say that I might not be here if it was not for the people who helped me to recover.”

“I was, with incredible luck, brought in to the National Rehabilitation Hospital for an assessment and asked to bring a bag to stay. I was not only lucky that I was given a bed in the NRH, but I was also lucky in being placed in St Patrick’s Ward, the ICU area of the brain injury section. It offered more privacy and more space than was available in the other wards. They had many who were high dependency and I believe I fit in as requiring less attention. I would also be short term, only six weeks. The NRH changed everything, in ways that I did not realise they needed changing.”



2.6 Critical Interdependencies

The fragmented approach to the provision of trauma services contributes to poor co-ordination between critical clinical services. Any complex service will have critical interdependencies which are mutually dependent in many ways; what happens in one area of a service can directly and indirectly affect the service as a whole. These interdependencies are outlined briefly below and discussed further in Chapter 7:

2.6.1 Co-ordination and Processes

Currently, there is little if any national co-ordination of trauma services across the trauma care pathway, and trauma has historically not been recognised as a disease entity.

2.6.2 Physical Infrastructure

There is a limited availability of designated facilities for trauma care, including diagnostics, beds, access to theatre sessions and, in particular, critical care capacity. Rehabilitation is an essential component of the trauma care pathway; however due to the high demand for beds in the National Rehabilitation Hospital (NRH), high dependency beds in acute hospitals are frequently occupied by patients who should be managed in the NRH. There is also a shortage of step-down facilities where patients can access post-acute rehabilitation closer to their home.

2.6.3 Information Technology

Efficient information management, enabling research, care management, and performance improvement, is a cornerstone of a well functioning trauma care system. However, existing databases and information management systems along the trauma care pathway often do not interface with each other.

2.6.4 Workforce

There are currently gaps in the workforce required to deliver a new Trauma System, including in the National Ambulance Service, consultant workforce, health and social care professionals and nursing. For example, the Capacity Review of the NAS identified staffing shortfalls, while current consultant staffing does not support consultant-delivered care to major trauma patients. Little or no data exists to assist in determining health and social care professional (HSCP) service requirements for major trauma patients; these are highly educated and skilled professionals with significant contributions to make to the health, well-being and quality of life of the population. The advent of a trauma system for Ireland also introduces an additional impetus for the development of advanced roles for nursing in trauma care. While postgraduate Emergency Department (ED) courses and ICU/Critical Care incorporate trauma, currently there are no trauma specific postgraduate training courses for nurses.

Staffing and capacity difficulties have also been identified in relation to anaesthesia emergency on call cover in some hospitals, orthogeriatric services, specialist pharmacy services. There is also a need to determine nursing and health and social care professionals service requirements for major trauma patients. A range of other staff are necessary to deliver an effective trauma service, including diagnostic and laboratory staff, IT personnel, support staff, data collectors, clinical audit staff, psychologists and patient liaison staff and coordinators. Patients and their families should also have access to chaplaincy services. This shortfall is compounded by the nature of trauma care, which involves frequent on-call and out of core hours working.

2.6.5 Training and Education

Training and education are fundamental to ensuring a competent workforce delivers quality care to the injured. Currently there is a lack of structured trauma education in Ireland for doctors, nurses and health

and social care professionals. There is an international shortage of paramedic practitioners, and there are no trauma-specific postgraduate training courses for nurses. Without advanced and regularly updated training, especially for surgeons involved in trauma care, trauma team members can become de-skilled, due to the infrequent nature of operative trauma in Ireland and the need to operate in what may be 'unfamiliar' territory when it is absolutely necessary. There is an imperative to deal with such challenges. There is also a need for a network approach to training and education, in addition to a multidisciplinary approach as appropriate. Furthermore, rotational opportunities, which facilitate cross-sector working, should be encouraged.

Chapter 3

Trauma in Ireland

3.1 Introduction

Understanding the causes of injuries, the profile of trauma patients and the outcomes for patients is crucial, both for preventing trauma in the future, improving outcomes and planning for delivery of the necessary services.

Our understanding of trauma in Ireland has improved with the introduction of the Major Trauma Audit (MTA). In December 2016, the Major Trauma Audit became the first National Clinical Effectiveness Committee clinical audit with a Ministerial mandate for national implementation. This will provide comprehensive data for analysis and further improve our understanding of immediate outcomes for major trauma patients, although it should be noted that currently available data for the years 2014 and 2015 are not complete. As set out in section 1.2, the National Office of Clinical Audit (NOCA) has implemented Major Trauma Audit (MTA) in Ireland using TARN methodology (Trauma Audit and Research Network in England and Wales). TARN collects and processes data on moderately and severely injured patients. Therefore, when interpreting the MTA data, it is important to note that it is reporting on trauma of varying levels of severity (ISS) and not only major trauma (ISS>15).

Other sources of data on trauma in Ireland include the Irish Hip Fracture Database, TILDA, the Road Safety Authority (RSA), the Health and Safety Authority (HSA), the Central Statistics Office (CSO) and the Hospital Inpatient Enquiry (HIPE) system which provides a useful source of data on trauma-related activity in different hospitals in Ireland.

According to the HIPE 2015 Annual Report³⁴, injury, poisoning and certain other injuries caused by external factors was the most common cause of in-patient activity arising from trauma. This was followed by other injuries to the head (other than intracranial injury), intracranial injury and fracture of femur. It is of note that 80% of the fracture of femur cases occurred in patients aged 65 years and over.

According to the MTA report for the years 2014-2015, 6% of Major Trauma Audit patients were aged less than 16 years, 54% were aged between 16 and 64 years and 40% were aged 65 years or older. The greater burden of trauma was borne by males and this is consistent with global data. The median age of Major Trauma Audit patients was 57 years in 2014 and 58 years in 2015.

3.1.1 Trauma-related deaths

Cause of death is recorded by the Central Statistics Office. In 2016 there were 1,344 deaths due to external causes of injury and poisoning recorded, 878 of which were categorised as accidents. Of these accidents, 140 were categorised as transport accidents and 190 were categorised as accidental falls³⁵.

Of the cases recorded by the Major Trauma Audit for which outcome data is available^b, 5% of patients died. The greatest number of deaths was due to low falls, while the highest death rate was associated with major trauma patients who had suffered blows (assaults) and asphyxia/drowning. Low severity injuries were associated with higher mortality in older patients. Of patients with major trauma, signified by an Injury Severity Score of > 15, 15% in 2014 and 16% in 2015 died.

3.1.2 Trauma-related injuries

It is difficult to accurately estimate the total number of trauma injuries. Injuries of lesser severity may be untreated and not captured by any information system. Injuries treated in Injury Units and Emergency Departments that do not require admission are not captured by hospital activity data.

In 2016, 26 trauma receiving hospitals participated in the MTA. Its first National Report covers the period 2014-2015. In 2014, the MTA recorded 1,897 male and 1,331 female patients who suffered trauma of varying severity. In 2015, the number of male patients was 1684, and the number of female patients was 1273, with 1,095 of patients in 2014 and 923 patients in 2015 having an ISS of >15, signifying major trauma.

Traumatic injuries are commonly classified into blunt or penetrating, based on the cause of injury. The MTA reported that:

- 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.

The Major Trauma Audit National Report for 2014-2015 reported that most patients had an injury to one single body region. In 2015, 745 Major Trauma Audit patients had head injuries, of whom 335 had severe head injuries with no other injuries and 309 had severe head injuries with other associated injuries. Of the 1,249 patients who had limb injuries, 668 had severe limb injuries with no other injuries.

3.1.3 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 a patient at the ED is the level of consciousness measured as the Glasgow Coma Scale (GCS), a scale from 3 to 15. 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 2014-2015 MTA reports a median GCS for all head injury Major Trauma Audit patients was 14 (IQR 12-15) with almost one third of severe TBI were caused by road trauma; 39 patients in 2014 and 36 patients in 2015.

3.2 Principal Causes of Trauma

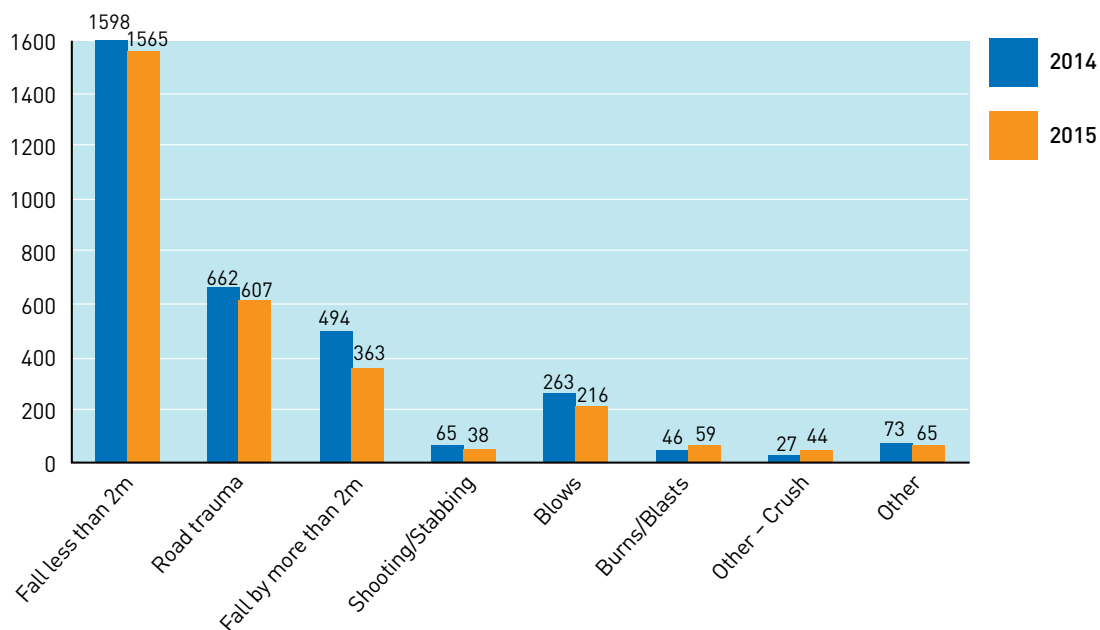
A recent study in the UK³⁶ found that, while in 1990, the overwhelming majority (60%) of recorded major trauma was caused by RTCs, by the end of 2013, this figure had halved to 30 percent and was overtaken by falls (<2m), which are now responsible for the highest proportion of patients suffering from major trauma (39%).

^b It is important to note that there are limitations with this first report, in particular the fact that not all trauma-receiving hospitals were then participating. Outcome data is available for 84% of submissions to the MTA. Tracking patients through multiple hospital transfers is challenging, and accounts to a large extent for missing outcome data. The MTA does not include patients who die in advance of reaching hospital.

The causes of injury in Ireland captured by the Major Trauma Audit in its first National Report (covering the years 2014 and 2015) include falls, road trauma, interpersonal violence (blows, shooting, stabbing), burns, blasts, crush injuries and asphyxiation. 23% of cases were classified as low severity injury (ISS 1-8), 44% of cases as moderate severity (ISS 9-15) and 33% of cases as severe injury (ISS>15).

The two most common causes of injuries recorded by the Major Trauma Audit for 2014 and 2015 were falls and road traffic collisions. “Low falls” (falls of less than 2 metres) was the most frequent cause of injury, accounting for more than 50% of Major Trauma Audit patients. This was followed by road traffic collisions, which accounted for 21% of patients.

FIGURE 3: CAUSES OF INJURY 2014 AND 2015



3.2.1 Place of Injury

The most common place of injury was at home:

- The Major Trauma Audit reported 1,452 (45%) patients in 2014 and 1,363 (46%) of patients recorded by the Major Trauma Audit 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^c.

3.2.2 Road Traffic Collisions

In 2016 the number of deaths due to road traffic collisions, as recorded by the RSA^{37d}, was 187 (provisional figure). Casualties are persons killed or injured in a road collision. Collisions on private property, such as private lanes and car parks, are excluded. RSA casualty figures from 2013 indicate that for every person killed in a road traffic collision three received a serious injury and 33 received a minor injury.

Data from the RSA also indicates that while the number of casualties among motor cyclists and car users has fallen significantly in the ten years from 2004, casualties involving pedestrians remained broadly static while those involving cyclists rose significantly³⁸.

c The Major Trauma Audit recorded 2,957 patients in 2015 and 3,228 in 2014 of whom 1,095 were given an ISS classification of severely injured, signifying major trauma. Not all patients recorded by the MTA are classified as severely injured.

d The RSA maintains a Road Collision Database which compiles data on all road traffic collisions reported to An Garda Síochána and forwarded to the RSA.

TABLE 3: ALL CASUALTIES IN 2013 CLASSIFIED BY ROAD USER TYPE AND OUTCOME

CASUALTY CLASS	KILLED	SERIOUS INJURY	MINOR INJURY	TOTAL	%
Pedestrians	31	97	791	919	13.2
Pedal Cycle Users	5	50	584	639	9.2
Motor Cycle Users	26	47	225	298	4.3
Car Users	107	270	4,175	4,552	65.5
PSV Users	0	0	43	43	0.6
Goods Vehicle Users	14	33	334	381	5.5
Other	5	11	100	116	1.7
TOTAL	188	508	6,252	6,948	100.0

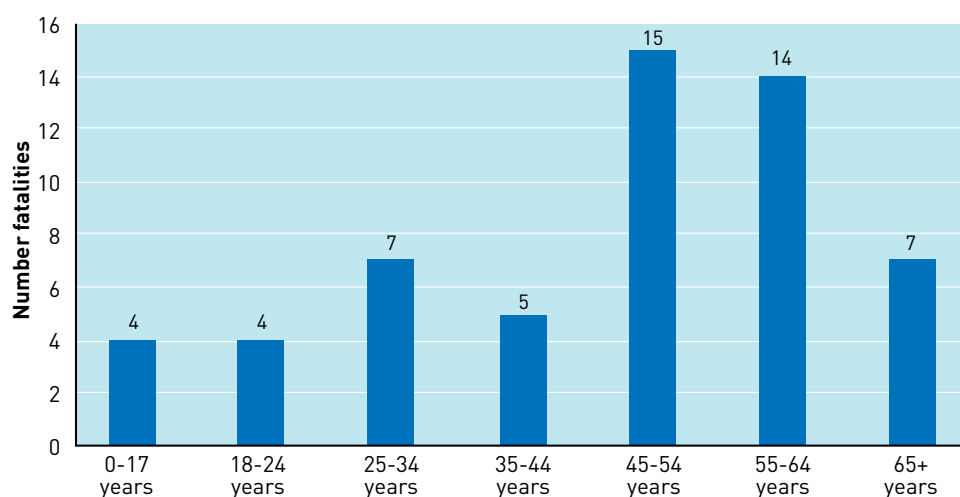
Source: RSA Road Casualties and Collisions in Ireland 2013

3.2.3 Trauma Occurring in the Workplace

There are a number of sources of work related injury and accident data, including incidents reported to the Health and Safety Authority (HSA), CSO Quarterly National Household Survey (QNHS), Eurostat European Statistics on Accidents at Work (ESAW) and Department of Social Protection occupational injury benefit claims.

Between 2009 and 2015 there were on average 50 workplace fatalities reported each year to the HSA. Agriculture, forestry and fishing accounted for almost 60% of deaths while construction accounted for a further 20%³⁹. The age profile of fatalities of workers and non-workers reported to the HSA in 2015 is illustrated in Figure 4. The three-year rolling fatality rate has remained relatively stable since 2009 following a downward trend between 2006 and 2009. Eurostat, which compiles European statistics on fatality rates, reported a fatality rate of 2.1 per 100,000 workers for Ireland in 2013. This is the sixth highest rate among the EU15 and is higher than the EU15 average of 1.6 per 100,000⁴⁰.

FIGURE 4: NUMBER OF REPORTED FATALITIES (WORKER AND NON-WORKER) BY AGE BAND, 2015 (HSA).



According to figures compiled by the Health and Safety Authority (HSA), there were 44 people killed in workplaces in 2016, representing a 21% reduction since 2015. The vast majority of sectors experienced a reduction in fatalities last year. However, the number of deaths on farms remained high, with 21 reported in 2016, compared to 18 in 2015. In fact, for the last several years, the agriculture sector has recorded the highest number of fatalities. In the case of fatal injuries, those most at risk continue to be the self-employed, particularly in the agricultural, forestry and fishing industries⁴¹.

According to the Health and Safety Authority (HSA), every working day five people are hurt in workplace slips, trips and falls. Every working day one person is so badly hurt that they miss over a month from work. Slips, trips and falls are the second highest single cause of workplace injuries. There are more than 1,400 workplace slips, trips and falls reported each year. A greater percentage of slips, trips and falls lead to over a month off work, compared to all other accidents.

According to the HSA, the triggers for occupational injuries have remained remarkably stable over recent years, with a few exceptions. The relative stability of triggers across economic sectors highlights the potential to predict and prevent such accidents within sectors⁴². The Health and Safety Authority implements work programmes that focus on known hazards in the work-place, including work-related slips, trips and falls, and targets interventions to those sectors of highest risk. A range of guidance and tools for employers and others in the workplace to promote and support occupational health and safety can be viewed on the Authority's website.

Between 2005 and 2015 there was an average of 7,500 work related injuries reported to the HSA^{43e}. However, the number of people who report experiencing work injuries that require an absence from work is much higher. In 2015 the CSO QHNS captured almost 18,800 work injuries that required an absence from work of four or more days⁴⁴.

The largest number of non-fatal injury reports to the HSA in 2015 came from the health and social work sector⁴⁵. This sector submitted 19% of the non-fatal injury reports, while the manufacturing sector accounted for 18% of reports. The over-representation of the health and social work sector is most likely due to good reporting systems. The CSO QNHS data based on self-reports reveals a different sectoral pattern⁴⁶. The highest rates of injury causing four or more days' absence from work in 2014 occurred in the transportation and storage sector, the agricultural sector and the industry sector.

3.3 Trauma in Older People

40% of Major Trauma Audit patients are from the older population (65 years or older).

TABLE 4: AGE OF MAJOR TRAUMA AUDIT 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%)

Source: NOCA Major Trauma Audit – National Interim Report 2014 – 2015

e HSA figures represent a subset of accidents where the injury is serious enough to warrant an absence from work of four or more days. Incidents related to a place of work or a work activity in which a member of the public is injured are also reportable to the HSA, where the person requires treatment from a medical practitioner

As for many areas of healthcare, the ageing population will have a significant impact on injuries in Ireland. The increase in the number of people over the age of 65 is approaching 20,000 per year. The largest proportional increase in Ireland is expected in the 85+ age group which is projected to double by 2031. Based on current CSO population projections, this trend of an ageing population is expected to continue in the forthcoming decades as a result of a substantial cohort effect and changes in net migration in previous decades as well as steady improvements in life expectancy⁴⁷.

As noted in Chapter 2, the latest findings of TILDA have demonstrated that the burden of falls in adults aged 50 years and over in Ireland is high. Almost 40% of the participants reported at least one fall during 4 years follow-up. Furthermore, approximately half of fallers or nearly 20% of the population reported recurrent falls, which is a common risk factor for further injury and hospitalisation. A similar proportion experienced a fall that resulted in an injury serious enough to require medical treatment.

In addition, in relation to falls the Irish Hip Fracture Database data⁴⁸ indicates that:

- The prevalence of falls is higher in women than men and increases with age in both;
- Of women aged 75 years and over, three out of five reported a fall during 4 years of follow-up and two out of five reported recurrent falls and a fall-related injury requiring medical attention;
- Older adults who report recurrent falls or injurious falls display poorer indicators of physical, cognitive and mental health and function compared to non-fallers.

The Irish Major Trauma Audit National Report 2014 - 2015 stated that:

- Falls of less than 2 metres accounted for over 50% of Major Trauma Audit patients;
- Forty percent of Major Trauma Audit patients were from the older population (≥ 65 years). The report states that 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.

The Major Trauma Audit reports that for 2014-2015, 38% of trauma patients had no significant pre-existing comorbidities, 36% had mild comorbidities, 19% had moderate comorbidities and 7% had severe comorbidities. As people age, they are more likely to be living with two or more chronic diseases in combination (multi-morbidity); approximately two thirds of those aged 65 years or older, and four out of five of those aged 85 years or older have two or more chronic conditions.

The likely implications of an ageing population include an increase in the total number of trauma cases caused by falls and an increase in the proportion of trauma cases characterised by existing moderate or severe chronic medical conditions (currently 26%). The Major Trauma Audit report notes that 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. Older patients will generally have a greater burden of significant pre-existing comorbidities.

3.3.1 Hip fractures

Bone health is influenced by a number of factors such as genetics, gender, race, as well as our diet and lifestyle. Osteoporosis is a disease characterised by low bone mass and deterioration in the microarchitecture of bone tissue, leading to an increased risk of fracture^f. (*Capture the Fracture 2012, a Global Campaign to Break the Fragility Fracture Cycle, page 2, www.iofbonehealth.org*). The correct identification, investigation and treatment of those at risk is currently incomplete. Prevention of secondary fractures through a coordinated service called a Fracture Liaison Service is established international best

^f Osteopenia is diagnosed when there is reduced mineral content in bone, but not as low as to be considered osteoporosis.

practice. The cost of osteoporosis care in Ireland is high, and 84% is spent on fracture care instead of on preventive treatment. In 2010, €223 million was spent on osteoporosis care. €35 million was spent on treatment to prevent fractures, compared with €188 million on care of patients who sustained fractures⁴⁹.

16 hospitals submitted data on 2,962 cases to the Irish Hip Fracture Database in 2015, representing 81% of all hip fracture cases recorded on HIPE for those hospitals combined. The data indicates that:

- Of the 2,962 hip fracture cases recorded, 2,081 or 70% were female;
- The highest proportions of cases for both genders were recorded in the 80–89 age group – 38% of males and 45% of females;
- Admissions from home were the most common source (83%). 8% were admitted from nursing homes / convalescent homes or other long-stay accommodation;
- The Irish Hip Fracture Database National Report for 2015 notes that of the 2,962 hip fracture cases recorded, 5% of patients died when in hospital.

Falls are a leading cause of hip fractures. Hip fractures can be one of the most devastating injuries resulting from a fall, due to the morbidity, mortality and disability that can occur. Due to osteoporosis as people age, a simple fall from a standing height or less can result in a hip fracture. Slowing reflexes mean that older people may not protect themselves quickly enough to break the fall. This may mean that the hip takes the full force of the fall increasing the risk of fracture. One in three people over the age of 65 fall each year and half of them will fall again within six months.

3.4 Alcohol and Trauma

Alcohol is one of the most important personal risk factors for serious and fatal injuries, contributing to approximately one third of all deaths from accidents⁵⁰. There is a long-standing link between alcohol and almost all types of unintentional injuries, including road traffic collisions, falls, drowning, burning, and occupational injuries. The risk of injury increases exponentially with an individual's blood alcohol concentration (BAC). A threshold dose for negative effects is generally found at BACs of 0.04–0.05%, which is typically reached after consuming 2–3 standard drinks in an hour.⁵¹

In Ireland between 2008 and 2013, 15.0% of alcohol-related deaths were due to traumatic causes, with a similar pattern for males and females. However, considerable age differences were apparent. People aged less than 35 years were most likely to have a traumatic cause of alcohol-related death⁵².

A total of 983 fatal collisions occurred on Irish roads between 2008 and 2012, claiming the lives of 1,077 people. Alcohol was a main contributory factor in 2 in 5 collisions analysed, claiming the lives of 286 people⁵³.

There are significant links between alcohol consumption and rates of criminal violence. Alcohol is involved in many assaults including sexual assaults and rape, domestic violence, murder and manslaughter. International studies show that alcohol is involved in 35%–85% of assaults and homicides.

The 2015 Annual Report from An Garda Síochána documented that minor assault was at its highest level since 2010 and assault causing harm the highest since 2011, up 12% and 7% respectively⁵⁴. According to the 2013 National Alcohol Diary Survey, 4.9% of respondents were assaulted as a result of someone else's drinking which is equivalent at a population level to 167,170 people suffering an alcohol-related assault⁵⁵.

Chapter 4

The Case for Change

4.1 Evolution of Trauma Systems

In 1966, the US National Academy of Sciences published the influential report titled *Accidental Death and Disability: the Neglected Disease of Modern Society*⁵⁶, more commonly known as the White Paper. This landmark report led to significant improvement in pre-hospital care, co-ordination of care within Trauma Systems, as well as a focus on functional rehabilitation. Trauma and emergency care systems have continued to mature over the past five decades in the US and other countries. A number of reports have highlighted the need for better and more organised trauma care in the UK and, in 2010, Trauma Networks were introduced, initially in London, followed by the roll-out of regional networks in 2012. More details on the Trauma Systems in other countries are provided in Appendix 3.

4.2 International Trauma Systems

A Trauma System is a coordinated integrated system to deliver care to injured patients from injury to recovery, including prevention, access, pre-hospital care and transportation, emergency and acute hospital care and rehabilitation.

There are two main types of Trauma Systems. In 'exclusive' Trauma Systems, the focus is predominantly on the Major Trauma Centres, with all patients with suspected major trauma transferred there from the scene, bypassing all other facilities. Over-reliance on a small number of Major Trauma Centres can result in unnecessarily prolonged travel times for patients.

An 'inclusive' Trauma System is a network of facilities co-operating in the care of injured patients to improve patient care and outcomes, to effectively use limited resources, and to minimise variations in care provided in all locations. 'Inclusive' Trauma Systems integrate prevention, pre-hospital care, acute care, reconstruction, rehabilitation and reablement⁹ in a structured and organised way that optimises resources, care and outcomes. This type of Trauma System takes a population health approach rather than an institutional perspective. The trauma care pathway is not organised around individual institutions but in the context of networked ones whereby all acute hospitals participate – each has a role as either a Major Trauma Centre, Trauma Unit, Local Emergency Hospital or Injury Unit. Key elements of the inclusive Trauma System introduced by NHS England in 2012 are as follows:

- The Trauma Network is the name given to the collaboration between the providers commissioned to deliver trauma care services in a specific geographical area.
- A Major Trauma Centre is a multi-specialty hospital, on a single site, optimised for the provision of trauma care. It manages all types of injuries, providing consultant-level care. Each Major Trauma Centre is optimised for the definitive care of injured patients. The Major Trauma Centre provides all

⁹ Reablement is a short and intensive service, usually delivered in the home, which is offered to people recovering from an injury to promote and maximise independence.

the major specialist services relevant to the care of major trauma, i.e. anaesthesia, general surgery, emergency medicine, vascular, orthopaedic, plastic, spinal, maxillofacial, cardiothoracic, neurosurgery and interventional radiology, along with appropriate supporting services, such as critical care. It also provides a managed transition to rehabilitation and the community.

- The Trauma Unit is a hospital within a Trauma Network that provides care for most types of injuries. Depending on the injuries sustained, major trauma patients can be taken to these hospitals for definitive care rather than to the Major Trauma Centre.
- The Local Emergency Hospital is a hospital within a Trauma Network with an Emergency Department that does not have the required range of services or expertise to comprehensively manage every type of trauma patient. It treats other injuries and non-trauma related illnesses requiring urgent treatment.

There is very strong evidence from the US, Australia and England that the establishment of inclusive hub-and-spoke Trauma Systems that deal with trauma of all levels of severity in a coordinated manner, leads to a reduction both in preventable deaths and in long term disability.

A detailed overview of studies on the effectiveness of Trauma Systems and Major Trauma Centres is provided in Appendix 4.

4.3 Evidence of the Effectiveness of Trauma Systems

There is strong evidence that trauma systems lead to:

- Better patient outcomes in terms of reduced death and disability;
- Access to quality services;
- Cost effectiveness.

4.3.1 Better patient outcomes

The majority of the published data relating to the benefits of Trauma Systems relate to victims of major trauma, defined as ISS>15. Dedicated trauma care provided in a Major Trauma Centre or equivalent has been reported to improve outcomes in the US⁵⁷⁻⁵⁹, Canada⁶⁰, Australia⁶¹, France⁶², Germany⁶³ and England⁶⁴.

Studies have consistently shown that concentration of major trauma into high volume dedicated Major Trauma Centres is associated with to better outcomes⁶⁵⁻⁶⁷ and that severely injured patients are 15-20% less likely to die if admitted to such an MTC than if admitted to other hospitals⁶⁸. In the US, research has found a clear relationship exists between Major Trauma Centre volume and outcome in the most severely injured patients. The centralisation of resource and expertise as part of a managed clinical system for the provision of trauma care reduces mortality after serious injury by between 15% and 25% and length of stay by four days.⁶⁹

In addition to the beneficial effects on overall survival rates, the introduction of Trauma Systems has also resulted in a reduction in disability rates and improved functional outcome following major trauma, in addition to financial cost-effectiveness for society.⁷⁰⁻⁸³

TARN UK analysis has demonstrated that the introduction of regional Trauma Networks in the UK has been associated with large increases in survival rates for major trauma patients, with the risk-adjusted odds of a major trauma patient surviving being 25% better in 2014/2015 than in 2011/2012⁸⁴. An audit commissioned

by the NHS England concluded that the introduction of regional Trauma Networks in 2012 showed that the networks had reduced the number of people left with a permanent disability⁸⁵.

4.3.2 Access to quality services

Evidence from the US and Europe demonstrates that Trauma Systems improve access to care and reduce length of stay⁸⁶⁻⁸⁷. Trauma centres have demonstrated significant improvements in quality and process of care. This effect extends to non-trauma patients managed in these hospitals.^{88 89} It has been reported that inclusive Trauma Systems deliver quality and process improvements, primarily through organisational change.

4.3.3 Cost effectiveness

Health economic evaluations have confirmed that regionalising trauma care is not only effective, but also cost-effective: the cost per life saved and per life year saved is low compared with other medical interventions.^{90 91}

Trauma centre care within the envelope of a mature Trauma System appears to be cost-effective, with evidence of a 5 to 15 fold return of investment for each patient returned to work. In terms of cost per life year saved, regionalised trauma centre care costs significantly less than the provision of renal dialysis, breast cancer treatment or the percutaneous or surgical management of coronary artery disease and is cost-effective when compared with the provision of other medical interventions.⁹²⁻⁹⁵

A recently published economic evaluation of regional Trauma Networks in the UK⁹⁶ noted that, over the period of the study, there had been an increase in the number of patients surviving major trauma and QALY increase as a result. It also noted that, on average the NHS investment appears to range between £5,241-£5,679 per additional QALY gained. This suggests that the introduction of Trauma Networks has been cost effective given the NICE QALY threshold of £20,000.

Chapter 5

Recommended Trauma System Configuration for Ireland

A national Trauma System is required to deliver coordinated and consistently high quality care in order to improve outcomes for trauma patients in Ireland. A key task for the Steering Group was to determine the appropriate configuration for an Irish Trauma System, taking into account experiences in other countries, population health needs, existing service provision and geographical considerations. The Steering Group has concluded that an inclusive hub-and-spoke Trauma System for Ireland should be developed. In addition, its recommendations include the number of Trauma Networks, the location of Major Trauma Centres, the boundaries between Trauma Networks, travel times and cross-border cooperation.

5.1 An Inclusive Trauma System

As outlined in Chapter 4, Trauma Systems can be categorised as inclusive or exclusive. Exclusive Trauma Systems are based around standalone Major Trauma Centres and focus on the treatment of the most severely injured patients during the acute care phase. Inclusive Trauma Systems are concerned with all injured patients in a geographical area and all hospitals have a role to play in the provision of trauma care.

Advantages of inclusive Trauma Systems include:

- Integration of prevention, pre-hospital care, acute care, reconstruction and rehabilitation in a structured and organised way to optimise resource utilisation and outcomes;
- Equal emphasis on organisation and resourcing of all components of the trauma care pathway;
- Delivery of trauma care within a tiered 'hub and spoke' system of health care facilities, each of which has a designated role based upon its capacity to provide particular levels of care appropriate to the needs of the injured patient;
- Drawing on the strengths of all hospitals within the networked system, to appropriately treat the range of injuries from non-life-threatening and injuries of a lesser severity or injuries that are unlikely to require admission to hospital right through to more severe injuries including time-critical, life-threatening trauma.

As noted in Chapter 4, inclusive Trauma Systems have been demonstrated to provide better patient outcomes than exclusive systems. Furthermore, geographically dispersed and less densely populated regions, such as Ireland, are likely better served within an inclusive Trauma System where primary transfer to a Major Trauma Centre may be neither safe nor possible on occasion.

5.2 Modelling a Trauma System for Ireland

A review of a range of international Trauma Systems has informed the design of a Trauma System that is best suited to Ireland. As stated above, an inclusive system consisting of a number of regional Trauma Networks, each organised around a Major Trauma Centre - a hub-and-spoke system - is considered the most appropriate to adopt for Ireland. The recommended system is tailored to the Irish healthcare system, but draws on the model adopted in England and Wales having regard to a number of similarities between the two regions:

- Similarity in demographics, geography and mechanism of injury for major trauma;
- The UK hospital system functions on a network approach comparable to the Irish health system development;
- Similarities in the training of healthcare professionals in Britain and Ireland, including length of training, examinations and development of subspecialisation;
- The evidence for improved patient outcomes. TARN UK analysis suggests that the introduction of a trauma system in England has been associated with a 25% improvement in the risk-adjusted odds of survival for patients sustaining major trauma during 2014/15 compared with 2011/12;
- The UK NHS Clinical Advisory Group (CAG) recommendations on regional Trauma Networks in England and Wales⁹⁷ draw on international experience and are based on guidance for developing Trauma Systems from the American College of Surgeons Committee on Trauma (ACS-COT), the Australasian College of Surgeons (RACS) and the WHO.

The proposed system sets out a new future for trauma care in Ireland, which will improve trauma outcomes for patients through a coordinated and consistent approach in care delivery. The system will also provide many opportunities to optimise the skillset of healthcare professionals delivering the services both now and into the future, to ensure improved outcomes. The National Clinical Programme for Acute Medicine has defined hospitals as models 1-4 based on the type of activity that can be provided (see Appendix 5). Optimising the utilisation of all trauma related resources and utilising these skills in a collaborative and integrated way across all of our acute hospitals and community services will provide substantial patient and financial benefit.

5.3 Specific Features/Components of the Proposed Irish Trauma System

5.3.1 The Trauma Network

Each Trauma Network will cover a defined geographic region of trauma related services from prevention and pre-hospital care through to acute care and rehabilitation. It is important to note that the Trauma Network will transcend Hospital Group boundaries. All stages of care, including the rehabilitation and transfer aspects of the patient's pathway, should be the responsibility of the Trauma Network.



At the heart of the Trauma Network will be the Major Trauma Centre, which will be tasked with the management of patients that have suffered major trauma. The Major Trauma Centre will be supported by a network of Trauma Units that deliver trauma care for less complex cases. Local Emergency Hospitals will provide ED services but will not manage major trauma cases. The pre-hospital emergency care service will be a critical part of the network, playing a key role in the assessment and transportation of patients to the right location - either directly to a Major Trauma Centre or to a Trauma Unit as appropriate. Communication and patient information will also be critical to ensure that the population being served is aware of the different roles of the hospitals for managing trauma in their region.



Prevention: Injury prevention will be a central focus of the Trauma System, because it offers the greatest potential for reducing the burden of trauma. Trauma has identifiable causes with established methods of treatment and defined methods of prevention. Coordinated injury prevention programmes that address the most common injuries in a region, and within the population groups (e.g. children, adults, drivers, pedestrians, specific occupations, etc.) in which they occur will reduce the number of injuries in the population. Features of a coordinated approach to injury prevention programmes will include:

- Collaboration with a range of stakeholders;
- Use of data to design the programmes;
- Targeting the programmes' areas of focus.

Pre-hospital Care and Retrieval: Part of the ethos of an effective Trauma System is getting the 'right patient to the right facility in the right time for the right outcome'. Patients with suspected major trauma will be transported directly to the Major Trauma Centre where travel times are within 45 minutes, or if travel times exceed this, to the nearest Trauma Unit for rapid stabilisation and subsequent transfer to the Major Trauma Centre if the complexity of their injuries exceeds the capability of the Trauma Unit. An agreed pre-alert system will alert the hospital and activate the trauma team in advance in order to ensure the appropriate level of trauma response.

Inter-hospital transfer of trauma patient: International experience suggests that up to 30% of major trauma patients will require an inter-hospital transfer⁹⁸. The role of the National Transport Medicine Service is to directly manage, operate and further develop retrieval services in Ireland. The standard required is to deliver a level of critical care en route as required for the patient's condition which one would expect to receive at any major tertiary facility.

Hospital Roles within the Trauma Networks are covered in more detail in Chapter 6. They include:

Major Trauma Centre: The Major Trauma Centre will serve as the hub of the network, and will be equipped and organised to manage all patients with major trauma, including those with time-critical injuries (e.g. major haemorrhage, traumatic brain injury) in addition to the multi-injured requiring complex or subspecialised reconstruction.

Trauma Units: A Trauma Unit will be a hospital designated within the Trauma Network that provides care for most types of injuries including:

- Injuries that are within the expertise of the Trauma Unit at that time;
- Injuries that are considered time critical where emergent management necessitates direct transfer to the nearest Trauma Unit and where Trauma Unit deferral with direct transfer to the Major Trauma Centre is considered unsafe.

Trauma Units with Specialist Services (TUSS): A TUSS is a major hospital that has additional resources and expertise as compared with Trauma Units, but does not provide one or more of the core services required in a Major Trauma Centre, and is more than 45 minutes travel time from the Major Trauma Centre.

Local Emergency Hospital: A Local Emergency Hospital is a hospital within a Trauma Network with an Emergency Department that does not have the required range of services or expertise to comprehensively manage every type of trauma patient. It treats other injuries and non-trauma related illnesses requiring urgent treatment.

Injury Unit: The IU is a locally based service designed to treat less severe injuries (i.e. walking wounded), without physician referral, which reduces the burden on local EDs whilst providing as much care locally as is safely possible.

Rehabilitation: After a traumatic injury, many patients will need input from rehabilitation services, including consultants in rehabilitation medicine. All trauma patients must be able to access rehabilitation and have their rehabilitation needs assessed within 48 hours of admission to a Major Trauma Centre or Trauma Unit, generating a flexible personal prescription for rehabilitation that should accompany all patients as they transition through the pathway and back into the community, where possible.

The components of the care pathway are discussed in more detail in Chapter 7.

5.4 Number of Trauma Networks

5.4.1 Determining the number of Trauma Networks

Each Trauma Network (TN) will cover a defined geographic region of trauma-related services from prevention and pre-hospital care through to acute care and rehabilitation. Each network will have a Major Trauma Centre tasked with the management of patients that have suffered major trauma, heading up a wider network of Trauma Units delivering trauma care for less complex cases. Local Emergency Hospitals will continue to provide Emergency Department services to patients with illnesses requiring urgent treatment and injuries of a lesser severity but will not manage major trauma cases. Injury Units will continue to provide treatment for broken bones, dislocations, sprains, strains, wounds, scalds and minor burns that are unlikely to need admission to hospital. The pre-hospital emergency care service will be a critical part of the

network, playing a key role in the assessment and transportation of patients to the right location - either directly to a Major Trauma Centre or Trauma Unit as appropriate. Communication and patient information will also be critical to ensure that the population being served is aware of the different roles of the hospitals in their region for managing trauma.

The appropriate number of Trauma Networks for Ireland must take account of

- the size of the population;
- the incidence of major trauma;
- the minimum number of major trauma patients that should be treated each year in each Major Trauma Centre, in order to maintain a critical mass of specialist expertise.

5.4.2 The incidence of major trauma

An estimation of the incidence of trauma is needed to inform decision making on the appropriate number of Trauma Networks for Ireland. However, it is challenging to provide an accurate estimate of the number of major trauma cases expected per annum. It is only as Trauma Systems are implemented and mature that trauma data can be captured in a way that facilitates service planning with a greater degree of accuracy. As set out in Chapter 2, the Major Trauma Audit (MTA) was established in the National Office of Clinical Audit (NOCA) in 2013. Since January 2016, 26 trauma receiving hospitals participate in MTA. Based on available data, it is estimated that Ireland has approximately 1,600 major trauma patients (ISS>15) each year. This equates to an incidence of 35 major trauma patients per 100,000 people and is similar to the incidence of major trauma in England and Australia^h.

5.4.3 Minimum number of trauma patients to be treated in a Major Trauma Centre

Concentrating major trauma cases in high volume centres is associated with better outcomes for patients with major trauma. Major Trauma Centres must treat a minimum volume of critically injured patients to maintain a critical mass of specialist expertise.

In other countries there are minimum volumes recommended for overall trauma admissions and major trauma admissions (ISS>15) to Major Trauma Centres. The American College of Surgeons Committee on Trauma recommends that a Major Trauma Centre must admit at least 1,200 trauma patients annually (ranging from injuries of a lesser severity to major trauma) with a minimum of 240 admissions with an ISS>15⁹⁹. The Royal College of Surgeons of England advise that Major Trauma Centres should admit a minimum of 250 critically injured patients per year (ISS>15) and serve a minimum population of 2-3 million people¹⁰⁰.

Not all major trauma patients are treated in Major Trauma Centres. Major trauma patients may also be treated in Trauma Units when the appropriate services are available or stabilised in Trauma Units for further transfer to the Major Trauma Centres.

Therefore, by international standards, with a population of 4.7 million and an estimated 1,600 major trauma cases per year, Ireland could have one Trauma Network with one Major Trauma Centre linked to a number of Trauma Units. However, given the geographical spread of the population, the availability of only one Major Trauma Centre would inevitably lead to access challenges with the potential for a poorer service and reduced outcome quality. In addition, hospitals in Ireland are small relative to major hospitals in other countries. There is no one hospital of large enough scale to provide comprehensive and definitive trauma care for Ireland as a whole. For these reasons, it is recommended that there should be two Trauma Networks in Ireland.

^h In 2015, the incidence of major trauma (ISS →15) in England was 29.4 per 100,000 population. In Victoria, Australia the incidence of major trauma was 32 per 100,000 population in 2014-2015.

Recommendation 3

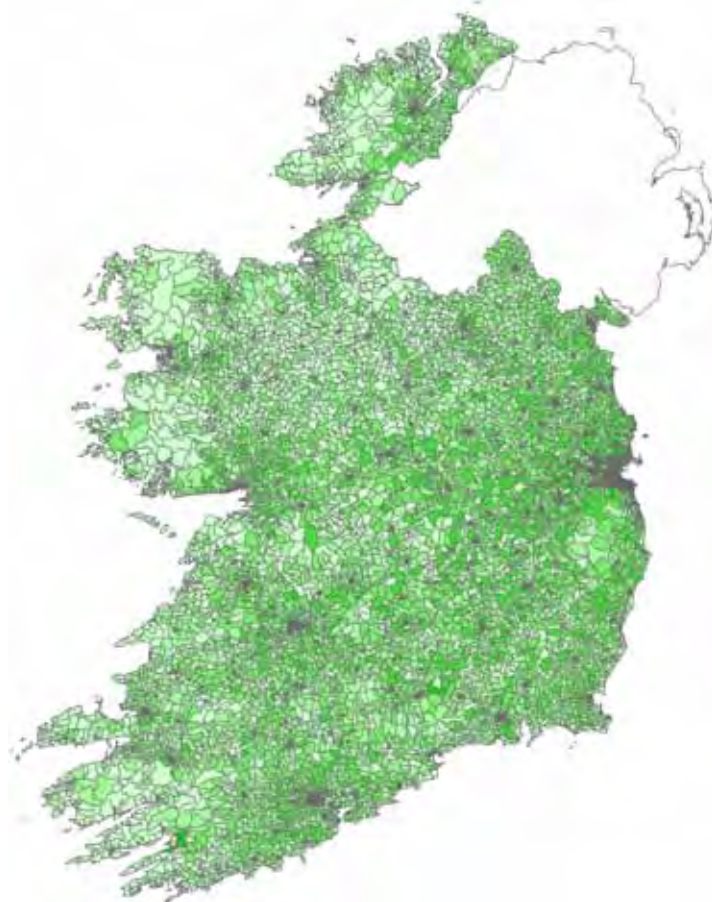
The HSE should implement an inclusive hub-and-spoke Trauma System in Ireland comprising of two regional Trauma Networks.

5.5 Trauma Network Coverage and Location of the Major Trauma Centres

Most major trauma in Ireland occurs in densely populated areas which are along the east coast and south of the country. The more densely populated areas are predominantly located within the Greater Dublin Area (i.e. Dublin City, Fingal, South Dublin, Dún Laoghaire-Rathdown, Meath, Kildare and Wicklow).

In April 2016, 44% of the State's total urban population lived in Dublin, while 11% lived in Cork¹⁰¹. The largest increase in rural population since 2011 was in County Cork with an increase of 6,946. The 2014-2015 Major Trauma Audit found that almost half of major trauma cases were the result of injuries at home and 21% were the result of road traffic collisions.

FIGURE 5: CSO SMALL AREA MAP INDICATING WHERE PEOPLE LIVE IN IRELAND BASED ON CENSUS RESULTS



The Major Trauma Audit findings for 2014-2016 indicate that road traffic collisions are one of the leading causes of serious injury in Ireland. While road traffic collisions occur in all parts of the country, figures for the period 2014-2016 show that Cork and Dublin have the highest number of road fatalities¹⁰².

Recommendation 4

Two Major Trauma Centres, corresponding to the two Trauma Networks (Central and South) should be designated in the most populated areas, namely Dublin city and Cork city, in order to optimise access and ensure the minimum caseload required for better patient outcomes.

5.6 Boundaries between the Two Trauma Networks

Determining the geographical boundaries of the two Trauma Networks must take account of distance and travel times between the potential Trauma Units, and their respective Major Trauma Centre on either side of the divide between the southern and central networks.

Analysis using CSO small area data from the 2011 census¹⁰³ and google maps transit times suggests that the Central Trauma Network will serve a population of approximately 3.1 million and the South Trauma Network will serve a population of approximately 1.5 million.

FIGURE 6

Population centres by closest Hospital with emergency trauma orthopaedic and general surgery and associated with its network MTC (South & Central)

Group/Hospital	# SA nearest Hospital	Population	Population split 2016 census figures	Central MTC	South MTC	Avg Transfer time: TU to Central MTC	Avg Transfer time: TU to South MTC
Central MTC	12,525	3,268,077	Population split	3,268,077	1,493,788	50 mins	60 mins
Beaumont	1,072	307,153					
Connolly	1,017	317,952					
Drogheda	1,424	395,503					
Galway	1,037	254,334					
James	818	190,913					
Letterkenny	667	142,768					
Mater	611	150,025					
Mayo	733	146,988					
Sligo	788	154,030					
Tallaght	1,480	443,751					
Tullamore	1,572	405,820					
Vincent's	1,306	358,840					
South MTC	6,116	1,493,788					
Cork	2,127	529,571					
Kerry	856	178,650					
Limerick	1,526	383,214					
Waterford	1,607	402,353					
Grand Total	18,641	4,761,865					

Small Areas are the lowest / smallest level at which the CSO permit geo-position population analysis using the 2016 Census data. Each small area consists of approximately 100 address points with an average population of 250. This supports CSO level accuracy and very fine grained analysis of catchment areas.

Google maps transit times between hospitals are used to determine time from each to the MTC (without traffic)

It should be noted that the boundary shown in the map above is an indicative one only. Boundaries will be subject to change over time. Work is required both to determine the boundary now and to maintain it under constant review.

Given the population of each Trauma Network and a projected incidence of 35 cases of major trauma per 100,000 population, it can be estimated that there will be approximately 1,100 cases of major trauma occurring in the Central Trauma Network, and approximately 500 cases in the South Trauma Network each year. This distribution of major trauma cases would mean that both proposed Major Trauma Centres would admit a minimum of 240/250 major trauma cases as required to maintain a critical mass of specialist expertise, bearing in mind that not all cases of major trauma will be treated in the Major Trauma Centres.

TABLE 5: POPULATION PER TRAUMA NETWORK (INDICATIVE)

	#CSO SMALL AREAS	POPULATION
Central Trauma Network	12,408	3,135,178
South Trauma Network	6,080	1,453,074
Grand Total	18,488	4,588,252

Recommendation 5

The HSE should determine the geographical boundaries of the Trauma Networks by proximity and access to designated Trauma Units, and should keep the boundaries under review to take account of any changes over time, including demographic changes or changes to the road network.

5.7 Cross Border Cooperation

Cross border cooperation with Northern Ireland has proven successful in many areas of healthcare service provision, including Paediatric Surgery and Cardiothoracic Surgery. Northern Ireland is currently reviewing its trauma service delivery and further collaboration would enhance trauma service delivery and coverage, especially for those areas in close proximity to the border with Northern Ireland which are beyond a 60 minute travel time to the nearest Trauma Unit. The Department of Health will continue to engage with the Department of Health in Belfast in relation to a 'bi-directional' arrangement for healthcare delivery with the potential for collaboration on trauma services.

Recommendation 6

The Department of Health and the HSE should continue to explore the potential for all-island collaboration to improve access to trauma services, particularly in border areas.

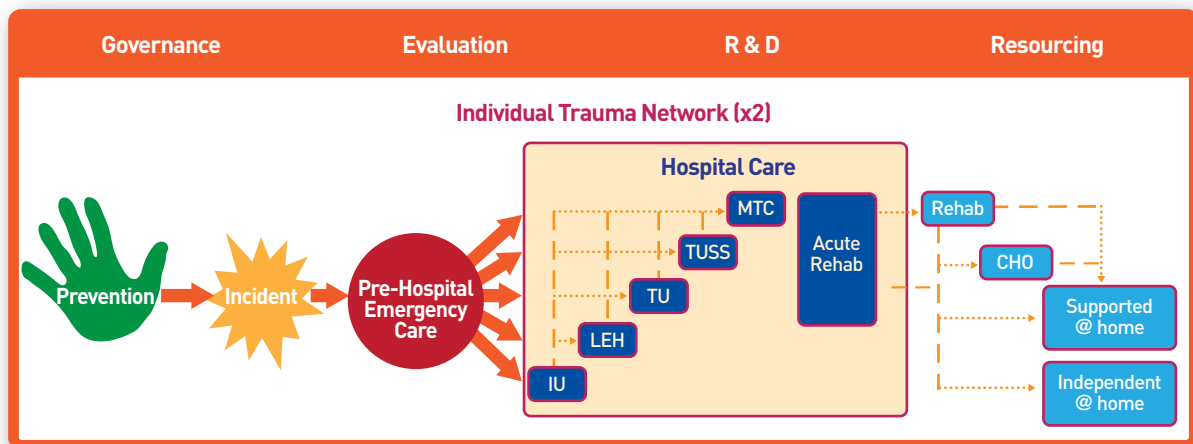
Chapter 6

Hospital Roles within Trauma Networks

6.1 The Proposed Irish Trauma System

As outlined at Section 5.3, each Trauma Network will cover a defined geographic region of trauma-related services including prevention, pre-hospital emergency care, inter-hospital transfer, hospital care at the appropriate location and rehabilitation. This chapter deals with the role of hospitals within the Trauma Networks.

FIGURE 7: INCLUSIVE TRAUMA SYSTEMⁱ



All hospitals will have a role within the Trauma Networks, each equally vital to the success of the Trauma System. Countries with established Trauma Systems have set out criteria for designating hospitals to particular roles within their Trauma Networks. The current UK Peer Review Guidelines for Major Trauma Centres and Trauma Units¹⁰⁴ have informed the proposed designation criteria for the Irish Trauma System (see detailed proposed designation criteria for Major Trauma Centres and Trauma Units in Appendix 6).

6.2 Designation of the Two Major Trauma Centres

There will be one Major Trauma Centre for the South Trauma Network located in Cork and one Major Trauma Centre for the Central Trauma Network located in Dublin.

ⁱ There is also the need for bi-directional flow between the components of the trauma care pathway, whereby patients have pathways for readmission where necessary.

The two Major Trauma Centres will act as Trauma Units for their own catchment areas and serve as the 'hub' of each Trauma Network. They will be equipped and organised to manage all severely injured patients, including those with time-critical injuries (e.g. major haemorrhage, traumatic brain injury) in addition to patients with multiple injuries requiring complex or subspecialised reconstruction.

Each Major Trauma Centre will:

- demonstrate leadership in trauma organisation and management;
- have a trauma reception team with clearly identified expertise in the area of trauma care;
- provide consultant-led trauma care with facilities for acute care, supported by all the major specialist services required to treat the severely injured;
- have facilities for acute resuscitation, anaesthesia (or other airway team), emergency surgery (with additional training in trauma surgery), acute burns management and interventional radiology;
- have a consultant-led trauma team available at all times;
- operate a massive transfusion protocol;
- provide immediate access to operating theatres for major trauma patients;
- have computed tomography (CT) and magnetic resonance imaging (MRI);
- provide dedicated acute trauma beds;
- provide definitive care and rehabilitation for major trauma patients.

The detailed proposed designation criteria for Major Trauma Centres are set out in Appendix 6 and address reception and intervention, reconstruction and ongoing care and rehabilitation requirements.

6.2.1 Support for all hospitals within a Trauma Network

The two Major Trauma Centres will play administrative and multidisciplinary leadership roles within the Trauma Networks, providing additional academic expertise in relation to trauma care for all hospitals within the Trauma Network and providing input into the planning and development of the Trauma Network to which they belong.

Major Trauma Centres will:

- Contribute to the development of protocols for the entire Trauma System in addition to appropriate by-pass and support protocols and NCEC National Clinical Guidelines;
- Provide leadership in clinical audit committees;
- Participate in national and regional trauma needs assessment and injury surveillance;
- Participate in the NCEC Major Trauma Audit.

6.2.2 Major Trauma Centre for South Trauma Network

Cork University Hospital is the only hospital in Ireland that currently has most specialties required to function as a Major Trauma Centre. Some of the specialties provided will need to be enhanced (Neurosurgery, Acute Rehabilitation and Trauma & Orthopaedic Surgery in particular), as well as addressing any gaps in manpower, capacity and trauma capability, before Cork University Hospital can be formally designated as a Major Trauma Centre.

Recommendation 7

The HSE should designate Cork University Hospital as the Major Trauma Centre for the South Trauma Network, contingent on it meeting the recommended designation criteria.

6.2.3 Major Trauma Centre for Central Trauma Network

The configuration of adult trauma services in Dublin is such that several key medical specialties are spread across the city in different hospitals.

TABLE 6: MEDICAL SPECIALTIES IN DUBLIN HOSPITALS

HOSPITAL	MEDICAL SPECIALTIES RELEVANT TO A MAJOR TRAUMA CENTRE
Beaumont Hospital	Neurosurgery, Renal Transplant
St James's Hospital	Cardiothoracic Surgery, Burns Surgery, Plastic & Reconstructive Surgery, Oral & Maxillo-Facial Surgery
Tallaght Hospital	Pelvic and Acetabulum Reconstruction
St Vincent's Hospital	Liver Transplant, Pancreatic Surgery
Mater Hospital	Cardiothoracic Surgery, Heart and Lung Transplantation, Spinal Surgery
Connolly Hospital	Plastics and Reconstructive Surgery, Trauma and Orthopaedic Surgery

No Dublin hospital currently has all of the acute specialties required for Major Trauma Centre designation. Providing care for major trauma on separate hospital sites is challenging and not consistent with best international trauma practice. There are, however, a number of hospitals that, with further investment and service re-organisation within their Hospital Group and beyond, could be designated as the Major Trauma Centre for the Central Trauma Network.

Based on the consultation process that informed the development of the policy, it is expected that a number of Hospital Groups will express an interest in hosting the Major Trauma Centre for the Central Trauma Network and that the process of submitting proposals will entail collaboration and agreement across hospitals for service re-organisation requirements, as well as Hospital Group collaboration and co-ordination. It is anticipated that international expertise will be required in the evaluation of proposals and recommendation of a hospital for designation as a Major Trauma Centre. The proposed selection process for the Major Trauma Centre in Dublin is outlined in Chapter 10.

Recommendation 8

The Department of Health and the HSE should invite Hospital Groups in the Dublin region to submit proposals nominating hospitals to be considered for designation as the Major Trauma Centre for the Central Trauma Network.

6.3 Designation of Trauma Units

The Trauma Units within each network will be hospitals that typically lack one or more of the defined criteria for designation as a Major Trauma Centre. However, Trauma Units will accept and manage:

- Patients with injuries within the expertise of the Trauma Unit at that time and which do not require the direct expertise of the Major Trauma Centre;
- Patients with injuries that are considered time critical requiring direct transfer to the nearest Trauma Unit and where direct transfer to the Major Trauma Centre is considered unsafe.

Trauma Units will deliver multi-disciplinary care by specialists in Anaesthesia, Emergency Medicine, Radiology, Vascular Surgery, Trauma and Orthopaedic Surgery and General Surgery with additional training and expertise in acute trauma management.

The detailed proposed designation criteria for Trauma Units are set out in Appendix 6 and address reception and intervention, reconstruction and ongoing care and rehabilitation requirements.

Certain major trauma patients will receive all of their treatment within Trauma Units, where appropriate. For example, an older person having fallen from standing, sustaining head, chest and fragility injuries, compounded by frailty, totalling an ISS>15, may not require transfer to a Major Trauma Centre. Within the Trauma Networks in England, depending on the nature of their injuries and the capacity of the respective Trauma Unit, some major trauma patients with ISS>15 receive complete care at a Trauma Unit without transfer to a Major Trauma Centre. Treating some major trauma patients in Trauma Units will reduce pressure on the Major Trauma Centres and minimise travel times for patients and their families when appropriate.

Equally, there are many patients with ISS<15 treated at Major Trauma Centres, as they fulfil pre-hospital trauma triage criteria for major trauma mandating transfer to the Major Trauma Centre, but are subsequently found to have an ISS <15 (based on retrospective injury severity scoring on clinical and radiological findings). This over-triage of injury is an ongoing challenge for Trauma Networks. The American College of Surgeons Committee on Trauma estimates that an over-triage rate of about 25% (patients treated unnecessarily in a Major Trauma Centre) is necessary to maintain an under-triage rate of <10% (patients with major trauma who should be treated in a Major Trauma Centre but who receive treatment elsewhere) ¹⁰⁵.

In 2015, within English Major Trauma Centres, the proportion of trauma patients with ISS>15 was 37% while 47% had an ISS of 9-15¹⁰⁶.

Trauma Units will have a consultant-led 24/7 Emergency Department with Trauma & Orthopaedic Surgery and General Surgery on-site, along with advanced capability for major haemorrhage control.

Currently in Ireland, there are 16 acute hospitals that could potentially meet the designation criteria for Trauma Units (see figure 8), with six of these located within the Dublin region. While at present these hospitals all treat acute trauma, there are resource deficiencies in many of the hospitals that would need further enhancement and management to meet the level of service provision required to fulfil the designation criteria for Trauma Units.

FIGURE 8: HOSPITALS WITH EMERGENCY, TRAUMA & ORTHOPAEDIC AND GENERAL SURGERY SERVICES



A key consideration when designating Trauma Units will be the ability to meet the workforce requirements for General Surgery. Hospital Groups may need to reconfigure services with their group to address any acute general surgical recruitment challenges. The recruitment and retention of consultant orthopaedic surgeons may also be a challenge for some hospitals outside of the Dublin region.

Recommendation 9

The HSE should review hospitals outside of the Dublin region with on-site Trauma & Orthopaedic Surgery for potential designation as Trauma Units.

6.3.1 Trauma Units in the Dublin Region

As noted above, several key specialties are spread across hospitals in Dublin with no standardised inter-hospital arrangements and some service duplication, leading to poor resource utilisation and practice inefficiencies. In addition, there is a diluted effect on trauma expertise and system management when too many hospitals in the same region provide low-volume trauma care, which is associated with poorer outcomes for patients. Currently there are six hospitals with Trauma & Orthopaedic Surgery and General Surgery in Dublin that receive major trauma patients: Beaumont Hospital, Connolly Hospital, St. James's Hospital, Tallaght Hospital, St. Vincent's University Hospital and the Mater Misericordiae University Hospital.

Recommendation 10

The HSE should undertake a review of hospitals with Trauma & Orthopaedic Surgery in the Dublin region with a view to a reduction in the number of such units to a maximum of two Trauma Units in addition to the Major Trauma Centre, in the context of wider service remodelling within and across the Hospital Groups.

6.4 Trauma Unit with Specialist Services (TUSS)

In the Irish Trauma System, a Trauma Unit with Specialist Services will be a major hospital within a Trauma Network that is more than 45 minutes travel time from the Major Trauma Centre. It will have additional resources and expertise above Trauma Unit status and be equipped to manage most major injuries due to the breadth and depth of services available.

However, a Trauma Unit with Specialist Services will not provide one or more of the major specialist services required for Major Trauma Centre designation (e.g. Neurosurgery, Cardiothoracic Surgery, Oral & Maxillo-Facial Surgery, etc.). A Trauma Unit with Specialist Services will, however, manage most of the trauma workload for its catchment area.

University Hospital Galway is a major teaching hospital with a wide range of specialist services capable of providing definitive care for a wide range of injuries occurring within the surrounding region, in particular, those patients not requiring neurosurgery or neuro-critical care services. University Hospital Galway could function as a Trauma Unit with Specialist Services and should be considered for designation as such, given the breadth and depth of services currently provided and travel distance from the nearest Major Trauma Centre.

Recommendation 11

The HSE should consider University Hospital Galway for designation as a Trauma Unit with Specialist Services within the Central Trauma Network along with the development of appropriate access and bypass protocols taking into account the role of the hospital in the network.

6.5 Local Emergency Hospital and Injury Units

A number of hospitals in Ireland have mature and well-functioning Emergency Departments, but do not possess either the population base or range of services for designation as a Trauma Unit. Local Emergency Hospitals will continue to treat patients with illnesses requiring urgent treatment (sudden chest pain, respiratory conditions, etc) and will play an important role within the inclusive Trauma System treating patients with less severe injuries.

Trauma bypass protocols, based on best international practice, will be put in place to ensure that injured patients are not inappropriately brought to Local Emergency Hospitals by ambulance. Local Emergency Hospitals will also put processes in place to ensure that if a trauma patient self presents with treatment needs beyond the capability of the ED, they will be stabilised and transferred to a Trauma Unit or Major Trauma Centre as appropriate.

It should be noted that major trauma accounts for a very low volume of total Emergency Department activity and, therefore, trauma bypass should not impact on Emergency Department activity overall in Local Emergency Hospitals. The Royal College of Surgeons in England has reported that major trauma represents less than 1 in every 1,000 Emergency Department admissions¹⁰⁷.

Injury Units will continue as locally-based services designed to treat minor injuries, without physician-referral, which reduces the burden on local Emergency Departments. Typical injuries that can be managed in an injury unit include:

- Suspected fractures;
- Sprains and strains;
- Simple wounds;
- Minor facial injuries;
- Minor scalds and burns;
- Wounds, bites, cuts, grazes and scalp lacerations;
- Splinters and fish hooks;
- Foreign bodies in eyes/ears/nose;
- Minor head injury.

Recommendation 12:

The National Ambulance Service will develop triage and bypass protocols, in line with National Clinical Effectiveness Committee Standards for Clinical Practice Guidance.

Chapter 7

Recommended Trauma Care Pathway Components



7.1 Prevention

A Trauma System must focus on preventing and reducing the severity of injuries in order to save lives and to improve the quality of life for those that suffer serious injury. Given the multiple causes of injury across a number of settings, affecting a variety of population groups, a coordinated approach to prevention offers the greatest potential for reducing the burden of trauma for individuals, their families and the health service.

Recommendation 13

The appropriate Government Departments and Agencies should continue to implement measures to reduce the incidence of trauma, in particular falls and road traffic collisions, with support from The National Office for Trauma Services to determine the potential benefits and cost-effectiveness of future trauma prevention programmes.

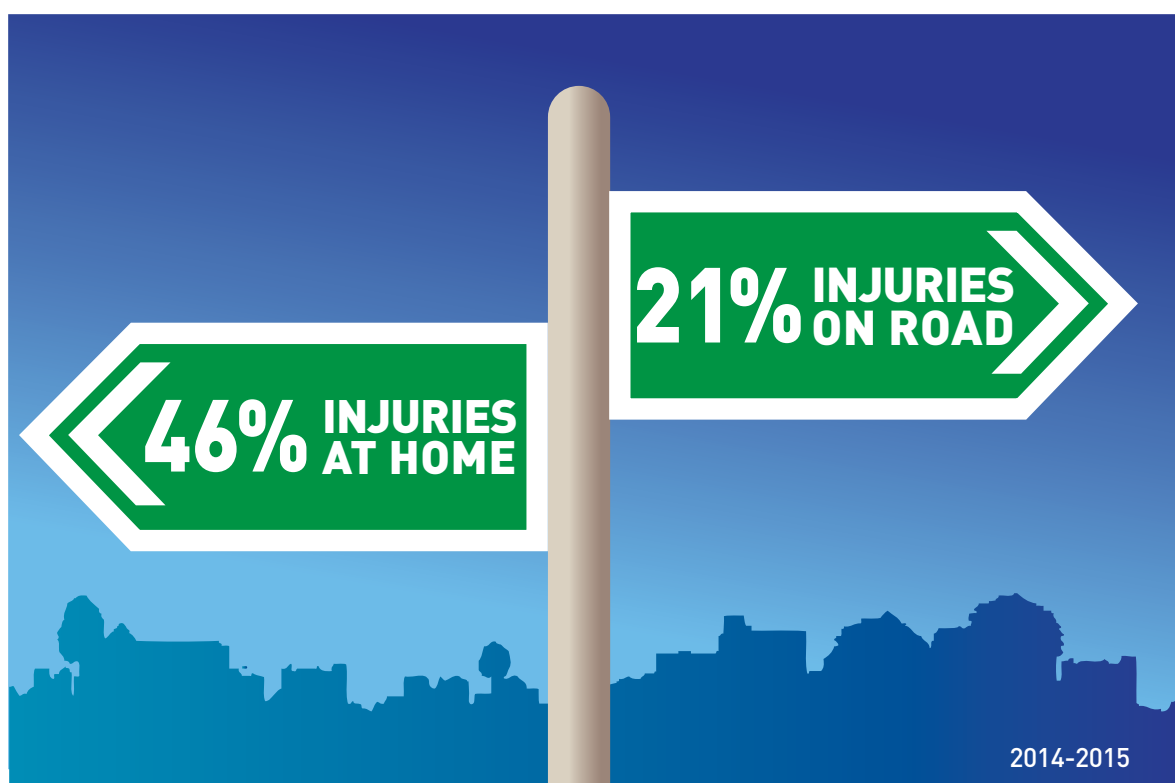
Trauma prevention, both regionally within the two Trauma Networks and nationally at Trauma System level, will involve identifying the causes of trauma for different population groups, evaluating existing prevention programmes and developing new programmes where required. Section 2.1 sets out the current approaches to trauma prevention in Ireland.

Features of a coordinated approach to trauma prevention within the Trauma System will include:

- Supporting existing programmes to tackle the main causes of trauma;
- Collaboration with a range of stakeholders;
- Use of data to design and prioritise programmes;
- Targeted prevention programmes to maximise effectiveness.

The NOCA's Major Trauma Audit (MTA) Report 2014-2015 indicates that the most frequent causes of injury in Ireland are falls from a height of less than two metres and road traffic collisions.

FIGURE 9: PLACE OF INJURIES



Source: NOCA Major Trauma Audit – National Interim Report 2014–2015

There must be a collaborative and whole system approach to the prevention of, response to and treatment of falls. This involves a broad range of strategies including:

- Promoting health in older people including access to exercise opportunities that promote strength, balance and co-ordination as well as lifelong optimisation of bone health;

- Case identification, assessment and appropriate intervention for those at increased level of fall risk;
- Integrated care pathways for frail older persons at the high level of fall risk.

7.1.1 Road Traffic Accidents

The Government and Local Authorities, working with the Road Safety Authority, An Garda Síochána, National Roads Authority and others to improve education, engineering and enforcement, has resulted in Ireland becoming one of the best-performing EU member states in terms of road safety. The biggest single success factor has been the marked change in personal behaviour and attitudes to responsible road user behaviour¹⁰⁸. However, there was an increase of 16% in fatalities in 2016 on the previous year (187:166), with Dublin and Cork having the highest number of fatalities overall (21 respectively).

The Road Safety Strategy 2013-2020 aims to reduce road collision fatalities on Irish roads to 25 per million population or less by 2020. This means reducing deaths to 124 or fewer by 2020. A provisional target for the reduction of serious injuries by 30% from 472 in 2011 to 330 or fewer by 2020 or 61 per million population has also been set¹⁰⁹.

7.1.2 Falls from a height of more than 2 metres

While it is unclear from the MTA data what the causes of the falls from over 2 metres were, it is likely that workplace injuries were represented in these figures.

According to figures compiled by the Health and Safety Authority (HSA), there were 44 people killed in workplaces in 2016, representing a 21% reduction since 2015¹¹⁰. The vast majority of sectors experienced a reduction in fatalities last year. In the case of fatal injuries, those most at risk continue to be the self-employed, particularly in the agricultural, forestry and fishing industries.

According to the HSA, the triggers for occupational injuries have remained remarkably stable over recent years, with a few exceptions. The Health and Safety Authority implements work programmes that focus on known hazards in the work-place, including work-related slips, trips and falls, and targets interventions to those sectors of highest risk. A range of guidance and tools for employers and others in the workplace to promote and support occupational health and safety can be viewed on the Authority's website.

7.1.3 Falls from a height of less than 2 metres

The Major Trauma Audit National Report 2014-2015 recommends that injury prevention programmes should consider methods of reducing the burden of injury associated with low falls in the general population and especially in the older population. This will require strengthening efforts to improve our understanding of the many factors associated with falls and a collaborative and whole system approach to the prevention of, response to and treatment of falls. This involves the enablement of a broad range of strategies which includes:

- health promotion in the wider population of older persons, including access to exercise opportunities that promote strength, balance and coordination as well as lifelong optimisation of bone health;
- case identification, assessment and appropriate intervention for those at increased level of fall risk;
- integrated care pathways for frail older persons at the highest level of fall risk spectrum.

Ireland faces particular demographic challenges; the growing proportion of older people in our population will result in a doubling in fracture incidence and the cost of osteoporosis care unless action is taken.



Osteoporosis can be prevented, diagnosed and treated before fractures occur. Importantly, even after the first fracture has occurred, there are effective treatments to decrease the risk of further fractures.¹¹¹

Affinity (Activating Falls and Fracture Prevention in Ireland Together) is a collaboration between the HSE and State Claims Agency. The purpose of the project is to develop and implement a framework and governance structure to deliver the vision described in the National Strategy for Prevention of Falls and Fractures in Ireland's Ageing Population, published in 2008. Overall the aim is to implement and continuously improve Falls Prevention Programmes in a more coordinated fashion throughout the country. That vision is one of sustained good health, independence and quality of life for older persons by prevention of falls and fall related injuries and lifelong improvement of bone health.

Since the project commenced in 2013 it has supported the implementation of evidence based practice in the area of falls and fracture prevention in a number early adopter sites around the country. The ongoing work in this project will provide a platform for the development and prioritisation of a phased implementation plan for the roll out of key initiatives to provide maximum impact in the area of falls and fracture prevention in Ireland.

In relation to falls among older people, hip fracture is the most common fracture experienced. According to recent Irish research¹¹², hip fracture is not only associated with increased mortality and a 25% reduction in life expectancy (controlling for age and gender) but also costly to the health system. It noted that the annual cost of managing acute hip fracture patients in a university hospital in Ireland in 2005 was over €1.3m for 143 patients treated, which is the equivalent of a mean cost for acute hospital stay per patient of €9,236. An orthogeriatric service is a multidisciplinary approach to hip fracture that involves comprehensive geriatric assessment, daily medical involvement and specialised follow-up assessment and it has been found that this type of service leads to a significant reduction in mortality and improved outcomes in a cost effective manner.

Recommendation 14

The HSE should ensure that each Major Trauma Centre, Trauma Unit and Trauma Unit with Specialist Services has an orthogeriatric service which takes a leadership role in falls prevention.

Prevention of secondary fractures through a coordinated service called a Fracture Liaison Service (FLS) is established, international best practice. A Fracture Liaison Service systematically identifies treats and refers to appropriate services, all eligible patients aged over 50 years within a local population who have suffered a fragility fracture, with the aim of reducing their risk of subsequent fractures. In the first instance, an integrated approach with primary care to prevent/reduce osteoporosis is also required. The Single Assessment Tool (SAT) has a specific fragility outcomes measure, which will assist in the identification of appropriate referrals to the FLS.

Recommendation 15

The HSE should develop a comprehensive Fracture Liaison Service to provide high quality, evidence-based care to those who suffer a fragility fracture with a focus on achieving the best outcomes for recovery, rehabilitation and secondary prevention of further fracture.

7.2 Pre-hospital Care and Retrieval

Ireland's Trauma System will only be as effective as the rapidity and accuracy of the identification of major trauma patients in the pre-hospital setting. The pre-hospital emergency care service will be a critical part of each network, playing a key role in the assessment and transportation of patients to the right location. Timely assessment of injuries when they occur with specific and agreed protocols for transport and bypass are necessary for the success of the Trauma Network¹¹³. The development and introduction of policies and protocols for triage, transport and bypass will help ensure that as many patients as possible are brought to the nearest appropriate hospital.

Recommendation 16

The National Ambulance Service should develop policies and protocols, in line with the National Clinical Effectiveness Committee's Standards for Clinical Practice Guidance, to ensure the safe and timely transport and inter-hospital transfer of patients with major trauma.

The rapid and accurate identification of major trauma patients before they are brought to hospital is a key requirement for an effective Trauma System. Patients with major trauma can have numerous and complex injuries and it is essential that enhanced clinical care be provided to them as soon as possible. Although there will always be some level of over- and under-triage, it is important to bring patients to the right place, both in terms of providing the right treatment at the right time and utilising all facilities in the Trauma Network correctly.

A hierarchical system of triage (clinical prioritisation) will be used by pre-hospital emergency services to identify those patients who are most likely to have sustained a major injury.

Recent research from the UK has noted that its current Trauma System appears to have difficulty in the early identification of older patients with major trauma as a result of a fall¹¹⁴. The research proposed that this might be due to the fact that falls are a low energy mechanism of injury, whereby the potential for major injury is less obvious from the accident scene than in the case of RTCs and also because the signs of significant injury may take longer to manifest in older people. The research concluded that the UK's current trauma triage protocols do not reliably distinguish older patients with low falls who have sustained serious injuries from those who have not. A pan-London trauma group, comprising of multi-disciplinary professionals with interest and expertise in managing older injured patients, convened in 2016 to develop clinical guidelines and commissioning standards specifically for major trauma in older people. A clear message from the group was that prospective recognition of multiple injuries is key to improving

overall care and outcomes for older people¹¹⁵. Therefore, in the pre-hospital component of the Irish trauma system, a high index of suspicion is required during pre-triage of older people who have fallen from a height of less than 2 metres in particular.

After assessment of injury, the pre-hospital care team will decide whether a patient requires direct transfer to the Major Trauma Centre, with all specialties and subspecialties available around the clock, or to a Trauma Unit for less demanding injuries.

Recommendation 17

The National Ambulance Service should ensure a PHECC registered Advanced Paramedic (AP), with appropriate additional training, is present in the National Emergency Operations Centre (NEOC) 24/7 with support from a consultant level doctor with significant pre-hospital trauma experience, to ensure timely and accurate identification of major trauma in the pre-hospital setting.

An agreed pre-alert system will alert the receiving hospital and activate the trauma team in advance for the appropriate level of trauma response (i.e. trauma team, laboratories, theatre manager, CT radiologist, etc.). Patients with suspected major trauma, ideally, will be transported directly to the Major Trauma Centre within 45 minutes travel time. If travel times exceed 45 minutes, patients will be brought to the nearest Trauma Unit for stabilisation and management. Patients outside 45 minutes road travel time to a Major Trauma Centre may, on discussion with the NEOC senior clinicians, be brought directly to a Major Trauma Centre by air. Consideration should be given as to how existing HEMS resources available to the National Ambulance Service could be enhanced to improve trauma care in Ireland, particularly in relation to areas which are outside 60 minutes road travel time from a Major Trauma Centre or Trauma Unit.

When both the Trauma Unit and Major Trauma Centre deem it necessary, appropriate and safe to do so, the patient can then be transferred to the Major Trauma Centre for definitive care. Transfer decisions will be guided by protocols, expertise and leadership from within the Trauma Network.

Patients inadvertently under-triaged or who may have self-presented to a Trauma Unit or Local Emergency Hospital with an unexpected serious injury that exceeds the resources and capability of that hospital will be transferred to the nearest Trauma Unit or Major Trauma Centre as appropriate.

Implementing these changes will require investment and training, as well as further consideration of likely numbers, interdependencies (e.g. repatriation of patients post-surgery) and other issues that arise in the development of protocols and policies in relation to triage, transport and bypass. These are likely to include:

- Investment in ambulances and staff;
- An enhanced skill set of advanced paramedics to specifically focus on the treatment of trauma patients at the scene;
- Enhanced ground inter-hospital transfers systems;
- The introduction of hospital by-pass and no refusal policies;

- More integrated capture of patient electronic records;
- Further development of Helicopter Emergency Medical Services.

A standardised approach to provide consistent, high-quality care to the injured is essential and will include care guidelines for all trauma patients – those requiring immediate transfer to a higher level of trauma care and those with less serious injury who may be managed locally. These clinical guidelines should be endorsed by the National Clinical Effectiveness Committee (NCEC) and any protocols regarding patient transfer should follow any NCEC clinical guidelines where relevant, e.g. Communication and Clinical Handover.

Recommendation 18

The HSE should examine how existing HEMS resources can be enhanced and further developed, recognising the critical role of aeromedical transport in the timely transfer of high acuity patients and the implementation of a trauma system.

7.2.1 Transport medicine

Transport medicine is the medical subspecialty that deals with the care of critically ill patients in transit between one location and another. The standard required is to deliver a level of critical care en route required for the patients' condition that one would expect to receive at any major tertiary facility. There is significant evidence that specialised retrieval teams achieve better patient outcomes as measured by physiology, morbidity, mortality, average length of stay and reduction in adverse clinical events. Delay in access to specialised care produces opposite outcomes.

The National Transport Medicine Service (NTMS) role is to directly manage, operate and further develop retrieval services in Ireland. Retrieval differs from that of Emergency Ambulance and Intermediate Care services currently provided by the NAS in the use of highly specialised medical and nursing staff, specialised equipment, and that it focuses on inter-facility transfer of high acuity patients to critical care settings, rather than pre-hospital care.

The concept of dynamic connectivity between Trauma Units and Major Trauma Centres is a cornerstone of any Trauma System. Delivering this connectivity will be a shared responsibility between the anaesthesia team in the hospital where the trauma patient presents and others, including nursing personnel and the NAS.

Other essential components for delivering on this connectivity will be robust referral and acceptance procedures, a national communication system and a critical care bed information system. The further development of retrieval services in Ireland to ensure capability to provide a robust service for those patients requiring a critical care retrieval team to support their care.

A severely injured patient may be too far from a Major Trauma Centre to be brought there safely and may need to be taken to the nearest Trauma Unit for stabilisation.

Alternatively, a patient who is initially assessed as requiring a Trauma Unit may deteriorate and need to be brought to a Major Trauma Centre for more specialised treatment. Repatriation of patients from Major Trauma Centres to Trauma Units or other healthcare facilities, once their initial phase of care is complete, will be a necessary part of Trauma Networks.

Recommendation 19

The HSE National Transport Medicine Programme/service should continue to develop retrieval services in order to ensure capacity and capability to provide a robust and consistent national critical care retrieval service.

A standardised approach to provide consistent, high-quality care to the injured is essential and will include guidelines of care (management protocols) for all trauma patients – those requiring immediate transfer to a higher level of trauma care and those with less serious injury who may be managed more locally.

The ability to transport major trauma patients to a Major Trauma Centre within a 45 minute target is hindered by Ireland's geography, population distribution and road system. This means that Trauma Units will have an important role to play in the treatment of major trauma. Trauma Units will be capable of managing most injuries. They will stabilise, resuscitate and transfer cases of major trauma that are outside of 45 minutes travel time to a Major Trauma Centre, if necessary, and which require treatment at the Major Trauma Centre.

For example, a person sustaining a major injury in north Kerry, may be transferred to their nearest Trauma Unit, University Hospital Kerry, for further assessment and stabilisation after which transfer for definitive care may be Cork University Hospital, the Major Trauma Centre for the South Trauma Network. A person sustaining a major trauma injury in Offaly, may be transferred to their nearest Trauma Unit, the Midland Regional Hospital Tullamore, for stabilisation with further follow on care at the partner Major Trauma Centre in Dublin.

Recommendation 20

The National Ambulance Service should ensure that patients with suspected major trauma are taken directly to a Major Trauma Centre where travel times are within 45 minutes or if travel times exceed this, to the nearest Trauma Unit for rapid stabilisation and subsequent transfer to the Major Trauma Centre if the complexity of their injuries exceeds the capability of the Trauma Unit.

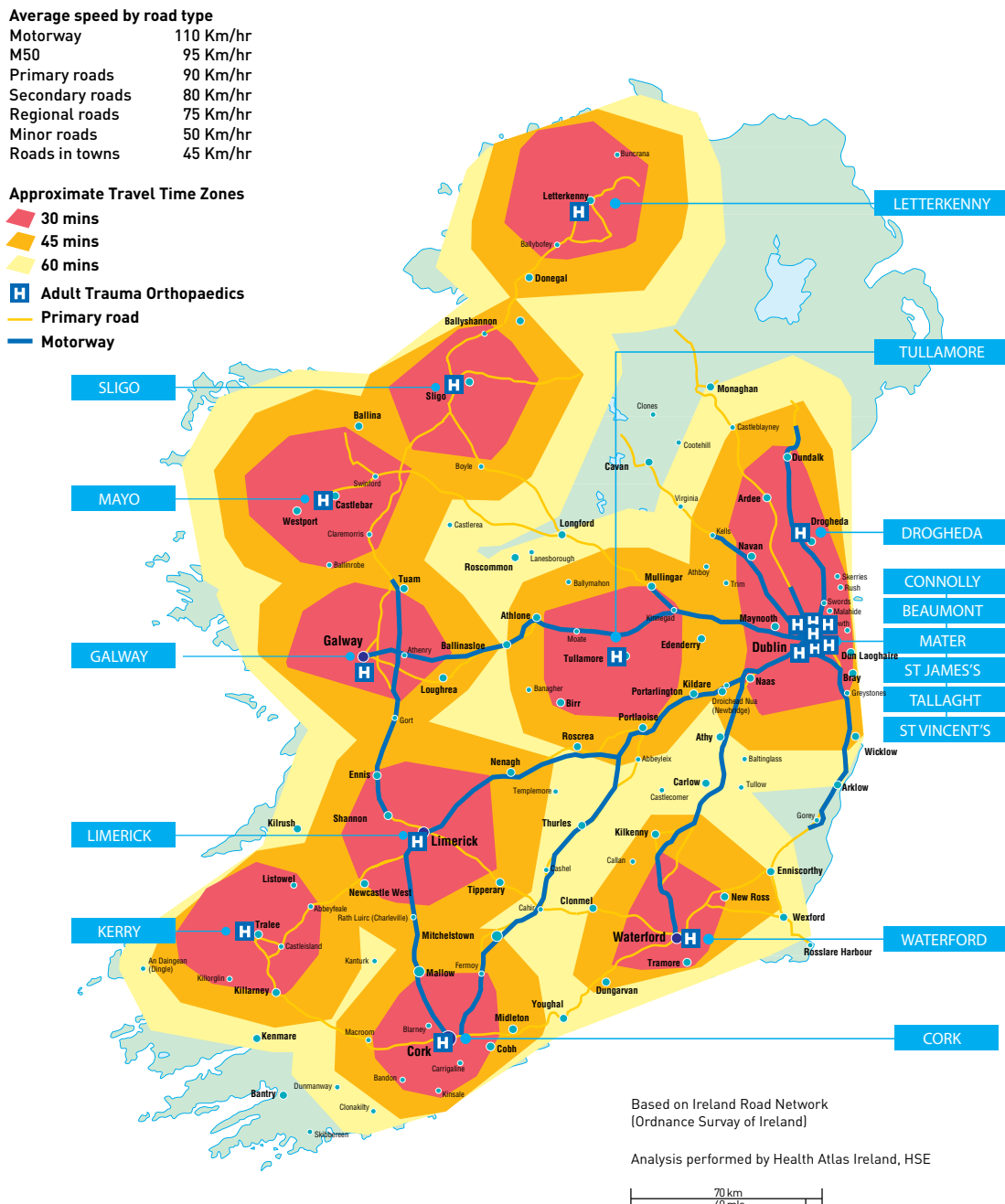
Audit and feedback for pre-hospital care practitioners will be key components of Trauma System clinical governance, and ambulance services should participate in the clinical governance and audit activities of Trauma Networks as well as NAS processes.

7.2.2 Travel time of more than 60 minutes to potential Trauma Units

An analysis was conducted of the catchment areas and travel times to each of the 16 identified hospitals in Ireland that currently have 24/7 Emergency Department with Trauma & Orthopaedic Surgery and General Surgery available on-call, i.e. all potential Trauma Units. Travel times to potential Trauma Units were categorised as less than 30 minutes, between 30 and 45 minutes, between 45 and 60 minutes and greater than 60 minutes by road ambulance from the nearest potential Trauma Unit.

This analysis demonstrated that 96% of the population is located within a 60 minute road travel time from a potential Trauma Unit. The needs of those outside of 60 minutes road travel time from a Trauma Unit (white areas on Figure 4 below, 4% of the population) must be considered and addressed. This will require the targeted provision of additional pre-hospital care resources for these areas.

FIGURE 10: ROAD TRAVEL TIMES TO POTENTIAL TRAUMA UNITS



Recommendation 21

The National Ambulance Service should enhance pre-hospital care in areas outside of 60 minutes travel time to the nearest Trauma Unit and/or in circumstances where direct transportation to a Major Trauma Centre is required.

7.3 Reception and Intervention

While in Ireland there is an increasing number of appropriately trained professionals who have direct experience of working in Trauma Systems in other developed countries, it is considered that the reception and intervention stage of the trauma care pathway is currently marked by the lack of an agreed, consistent and structured approach. Pre-hospital alerts of the imminent arrival of a trauma team may not always be met with an appropriately cascaded response within the receiving hospital. A lack of staff with sufficient experience in the initial receiving trauma team can lead to delayed and/or incorrect decisions, delays in treatment and consequent avoidable disability and death.

Good integration between the pre-hospital care provided to a trauma patient and their reception into a Trauma Unit or Major Trauma Centre is crucial. A pre-alert system with effective communication between pre-hospital and in-hospital teams is required, and there should be scalable criteria for the activation of trauma teams as required, while minimising unnecessary activation. Clarity in relation to the ownership of the patient is required to ensure a timely and efficient transfer of the patient from the pre-hospital to the hospital team.

Given that a patient that has suffered major trauma is likely to have multiple injuries, it is critical that a number of specialists are available in the Major Trauma Centre on a 24/7 basis.

A trauma team should include members of each of the following specialties: emergency medicine, orthopaedics, general surgery and anaesthesia/intensive care, with prescribed response times for additional specialties which may be needed (these include neurosurgery, spinal and spinal cord surgery, vascular surgery, cardiothoracic surgery, plastic surgery, maxillofacial surgery, ENT surgery, diagnostic radiology, interventional radiology, intensive care). The trauma team in the Trauma Unit should be networked in with the Major Trauma Centre team, with excellent communication a prerequisite.

Recommendation 22

The HSE should ensure that a Family/Patient Liaison Officer is included in the trauma team activation and be in a position to remain with the patient/family at each stage of their hospital journey and particularly on discharge from hospital.

A key requirement is for a designated consultant to assume responsibility for co-ordinating the patient's care, particularly when a number of specialties are required.

Recommendation 23

The HSE should ensure that all patients admitted Major Trauma Centres and Trauma Units following trauma team activation are admitted under a named consultant who is responsible for overseeing their optimal care until or unless agreement is reached with another consultant that the nature of the patient's injuries makes it appropriate for their admission under a particular specialty.

Recommendation 24

The HSE should ensure that a number of key specialists are available on a 24/7 basis in Major Trauma Centres and Trauma Units, or where these are not available (particularly in Trauma Units), protocols are put in place to ensure that they can be accessed as needed.

Initial diagnosis of a person who is critically injured, with possibly multiple injuries, is a challenging task, and initial diagnosis must rapidly identify life-threatening injuries, initiate adequate supportive therapy and efficiently organise definitive care or transfer to a facility that can provide definitive care. The proposed designation criteria for Major Trauma Centres and Trauma Units set out requirements for initial diagnostics and the necessary infrastructure required to deliver high quality trauma care.

Recommendation 25

The HSE should ensure that Major Trauma Centres have the necessary resources (including theatre and ICU capacity) available for trauma. The National Critical Care Audit should be used to inform planning for critical care beds.

Each Trauma Network needs to meet the care needs of all trauma patients, not just those who access the Major Trauma Centre. All hospitals receiving trauma patients should have appropriately skilled staff in place to deal with the immediate needs of all patients likely to be brought to that hospital. This includes recognising the need to cater for psychological and other immediate needs of the patient and their family.

7.4 Reconstruction and Ongoing Care

Currently in Ireland patients are still being brought to hospitals that do not have the full range of services to provide definitive care for their injuries. Trauma and orthopaedics and plastic surgery are particularly relevant in this regard. In addition to emergency medicine and the surgical specialties, trauma patients also require the care of anaesthesia and intensivist services.

Trauma patients also require rapid access to essential facilities such as readily available intensive care beds, adequate operating theatre sessions for reconstructive surgery and a dedicated trauma ward.

Recommendation 26

The HSE should ensure that Major Trauma Centres have access to dedicated, separate, fully resourced daytime operating theatres for trauma and reconstructive surgery and that Trauma Units have appropriate access to theatres during normal working hours and after as required

There must be adequate consultant staffing in the essential specialties to provide a consultant led service for trauma patients, as well as sufficient numbers of appropriately trained nursing and health and social care professional staff.

The provision of person-centred care requires that each person is considered as an equal partner in the planning of care and that his or her opinions are important and respected. Across Trauma Networks, there should be a focus on delivery of patient-centred services which consider all of the health and wellbeing needs of people who have sustained traumatic injuries. The important role of family and carers should be acknowledged and actively supported.

Given that major trauma is often characterised by multiple injuries, the co-ordination of care provided by a number of specialties is critical to the provision of person centred care. Within the Major Trauma Centres, patients' care should be overseen and coordinated by a dedicated trauma service while specialist teams with a designated responsible consultant should take this role in a Trauma Unit. The co-ordination of this care will be further facilitated with the provision of a dedicated trauma ward.

Recommendation 27

The HSE should ensure that Major Trauma Centres, Trauma Units and Trauma Units with Specialist Services develop dedicated trauma wards, to enable co-location of patients with multiple injuries.

Individual specialties required to manage injuries will exist in some Trauma Units. Where they do not, or where there are multiple injuries, clear referral pathways to Major Trauma Centres must be defined. Pre-existing medical conditions should be considered and other specialists involved in care as appropriate.

Once specialist medical care has been comprehensively provided, some patients may be able to return home with little further intervention. However, for those who have experienced major trauma, it is likely that ongoing rehabilitation will be required. There should be cross-network agreements and adequate resources to ensure that once specialist medical care has been completed, patients can be transferred to the care of a service which is able to meet their ongoing care and rehabilitation needs.

More detailed recommendations regarding infrastructure and staffing requirements for Major Trauma Centres and Trauma Units are set out in the proposed designation criteria at Appendix 6.

7.5 Rehabilitation

After a traumatic injury, many patients need input from rehabilitation services. Trauma patients with early access to rehabilitation will have better outcomes. All trauma patients must be able to access specialist senior opinion and have their needs assessed within 48 hours of admission to a Major Trauma Centre or a Trauma Unit generating a flexible personal prescription for rehabilitation to accompany them as they transition through the trauma care pathway.

Rehabilitation requirements are not always correlated with the severity of injury. It is therefore recommended that all patients with ISS ≥ 9 (indicative of severe injury upwards) should have a specialist rehabilitation prescription (SPR).

The patient and their family are a critical part of the recovery and are key stakeholders in the rehabilitation process. The patient must be placed at the centre of rehabilitation and be empowered to have their voice heard. Where the patient has not the capacity to engage, there must be an advocate for them in the rehabilitation process. Rehabilitation should adopt a person-centred approach which empowers the patient and the family to participate actively in the process. This includes the provision of timely information, education and a range of supports on the rehabilitation journey.

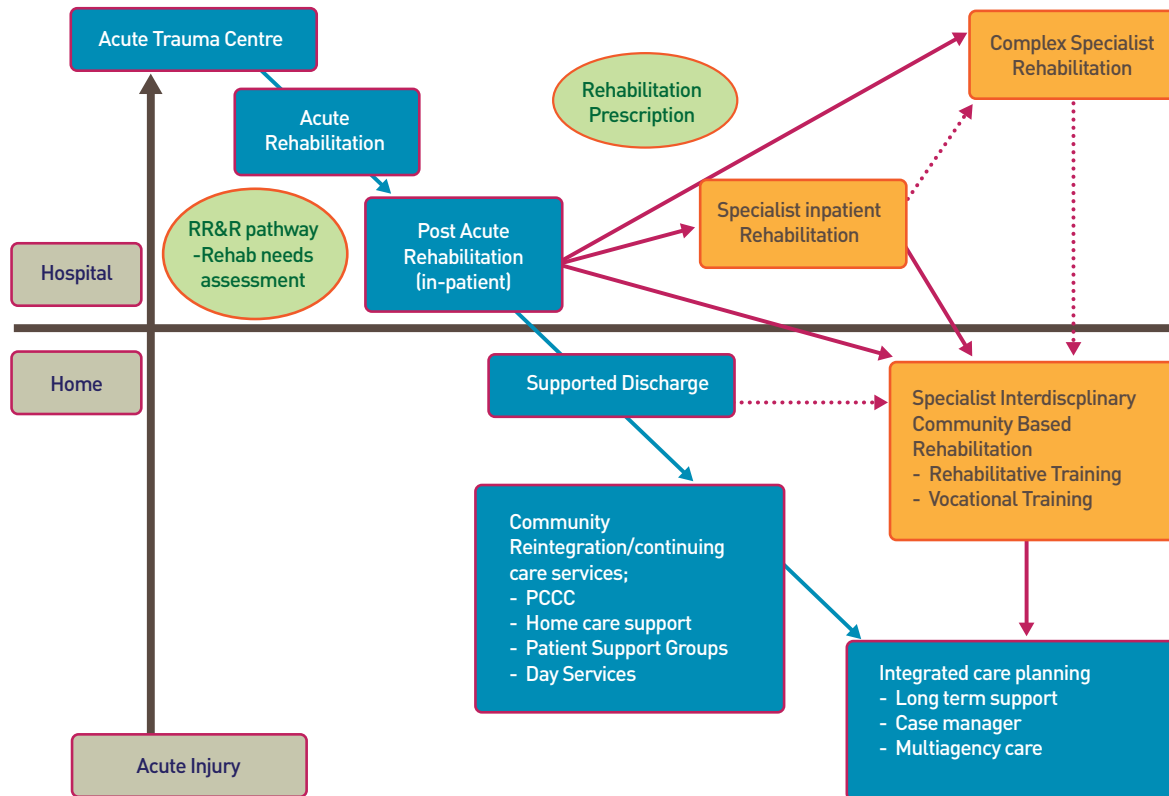
The family and carers will be aware of, and appropriately involved, in the generation of the rehabilitation prescription and its evolution towards discharge from hospital, as this awareness and inclusion in the process is essential in adapting to change for both families and patient, in addition to managing their expectations and preparing them for discharge.

Recommendation 28

The HSE should ensure that all trauma patients in Major Trauma Centres, Trauma Units and Trauma Units with Specialist Services can access rehabilitation and have their rehabilitation needs assessed within 48 hours of admission to a generating a flexible personal prescription for rehabilitation that should accompany all patients as they transition through the trauma care pathway.

The majority of patients will have a relatively uncomplicated recovery and progress down the 'recovery, reablement and rehabilitation' pathway as illustrated below.

FIGURE 11: PATHWAY FOR PATIENTS WITH TRAUMA ADAPTED FROM BSRR CORE STANDARDS (BSRR, 2013)



Patients who no longer require the provision of acute services will be transferred to the most suitable facility based on their ongoing rehabilitation needs assessment (via the rehabilitation pathway), including home with appropriate community support, as required. For these patients, their rehabilitation needs can be met within general rehabilitation services. There will be coordinated development of regional and community rehabilitation services and long-term support to meet the needs of all trauma patients within a Trauma Network and a multidisciplinary team. The rehabilitation requirements of major trauma patients are reflected in the objective of the Neuro-Rehabilitation Strategy to have dedicated Community Rehabilitation Teams in the community.

Some patients will have complex needs requiring more prolonged input from post-acute specialist rehabilitation services. Specialist rehabilitation is a critical component of the trauma care pathway without which, the trauma care pathway will fail¹¹⁶. Suitable post-acute specialist regional services should be developed to build capacity for specialist rehabilitation and complex specialist rehabilitation for trauma patients, enhancing patient care and flow through the system and reducing waiting times for rehabilitation across the Trauma Network. An estimated 60 beds per million population are required for post-acute services.

As many trauma patients are of working age, it is proposed that vocational rehabilitation should be a key component of rehabilitation.



Recommendation 29

The HSE should ensure that rehabilitation services, in both acute and community care settings, will adopt a person centred approach, which empowers the patient and the family to participate actively in the process and include the provision of timely information, education and a range of supports on the rehabilitation journey.

Recommendation 30

The HSE will ensure coordinated development of regional and community rehabilitation services and long-term support to meet the needs of all trauma patients within a Trauma Network. This should include appropriately resourced and skilled community rehabilitation teams, co-ordination with disability services and the appointment of case managers.

In determining the community nursing resource, the Policy on Developing a Community Nursing and Midwifery Response to Integrated Care should be considered as appropriate in the wider context of the community nursing resource. Coordinator roles are required, specifically rehabilitation coordinators and nurse coordinators to ensure flow through network/system and prevent unnecessary delays in transfer and timely discharge, while also providing support to patients and families during inpatient stay.

For the relatively small numbers of people with complex disability following injury, the availability of home care packages, to enable discharge to community, is critical and centralised funding should be considered to support a consistent approach across care areas.

Self-management support is an important component of rehabilitation. The National Clinical Programme for Rehabilitation Medicine defines self-management support (SMS) as a person-centred approach which enables individuals and their carers to take an active role in caring for and managing their own condition with professional guidance when required. Self-management support should allow individuals access to the information and skills they need to manage their own condition confidently and to make daily decisions which improve their health and well-being and improve clinical, emotional and social outcomes.

7.6 Critical Interdependencies

It is important to recognise that it will take time to fully implement the trauma system. It is equally important to highlight the fact that there are critical interdependencies which will impact on the effectiveness of the system. A comprehensive and fully inclusive system will have administrative, surveillance, prevention, clinical, training, and research, elements working in unison supported by effective governance and quality assurance.

Each component is a vital link in a chain which will ensure that each patient moves quickly and safely along the continuum of care. Many of the interdependency issues will be addressed or supported by specific recommendations in the trauma pathway components.

7.6.1 Co-ordination

In order to ensure co-ordination of trauma services nationally and at network level, robust governance arrangements that provide national leadership and ensure integration across organisational boundaries and services should be introduced. This is addressed in Chapter 8.

7.6.2 Physical Infrastructure

To meet the needs of critically ill patients presenting to the Trauma System, adequate critical care capacity and diagnostics are required with an inbuilt ability to respond to activity surges. Demand for ward beds in acute hospitals is very high; however there is an imperative to have designated wards for trauma patients. Access to emergency theatres, designated theatres for plastic and orthopaedic reconstructive surgery are also key requirements. An analysis of theatre utilisation across acute hospitals should identify where there is underutilised theatre capacity. Extending core working hours in theatre departments would also allow better access.

7.6.3 Information Technology

Information systems that are capable of capturing the data related to the complete cycle of trauma, from prevention to post-hospital care should be developed or acquired.

7.6.4 Workforce

To provide a fully functioning Trauma System there must be an adequate number of staff in critical specialties available.

Addressing identified capacity shortfalls in the NAS will require recruitment and retention strategies and increased training output and innovative solutions, such as retraining. An appropriate anaesthesia/critical care resource available in a hospital receiving trauma patients is an essential factor in the provision of the tiered levels of care proposed. To underpin a national Trauma System a minimum anaesthesia resource in these hospitals should reflect the two by two model of emergency cover, as recommended in the maternity strategy.¹¹⁷ Deficiencies in staffing and facilities in existing neurosurgical units will need to be addressed in advance of implementation of the Trauma System.

The advent of a Trauma System for Ireland adds an additional impetus for developing the advanced role of the nurse in trauma care. It is imperative that the HSE undertake a review of the current specialist and advanced nursing roles across trauma services, to determine the required numbers and service, based on population health needs, taking account as appropriate of the Policy on Graduate, Specialist and Advanced Practice. Trauma Clinical Nurse Specialists and Advanced Nurse Practitioner services should be developed, and evidence-based assessment tools and frameworks employed for development of the trauma nursing workforce. The determination of the nursing workforce in acute trauma wards should have regard to the Framework for Safe Nurse Staffing and Skill Mix. The HSE should develop the role of the Trauma Nurse Coordinator setting out required knowledge, competence, skills, role and responsibilities to ensure a coordinated trauma service from first point of contact (Reception and Intervention) through to Rehabilitation.

In order to establish 24 hour consultant cover there will be a requirement to increase consultant numbers in all Trauma & Orthopaedic Surgery subspecialties significantly. To ensure consultant delivered care to patients, the consultant patient ratio must be addressed. Currently there are ninety Trauma & Orthopaedic Surgery consultants in public practice in Ireland; this is a ratio of 1:52,000. The recommended minimum number of Trauma & Orthopaedic Surgery consultants for a Major Trauma Centre is twelve.

Patients with neurological deficit present along a spectrum of urgency. The most urgent cases include those patients with worsening neurological deficits from cauda equina syndrome, spinal tumour and traumatic spinal cord injuries who require immediate access to MRI scanning and surgery. Spine surgery is particularly under resourced with consultant staffing. The recommended minimum number of spine surgeons for a Major Trauma Centre is six.

The Major Trauma Centres will require plastic surgeons with particular subspecialist interests. Examples are craniofacial surgery, hand surgery, lower limb reconstruction and burns. These centres will require approximately twelve plastic surgery consultants as a minimum depending on the volume of referrals and staffing levels from other disciplines that contribute to these subspecialties.

Older people have limited physiological reserve and require specialist input in trauma care, therefore they will benefit from more integrated trauma care with the specialty of orthogeriatrics.

The health and social care professionals service should have a gap analysis carried out to determine staffing requirements for the pathway components of the major trauma service.

The ongoing Pharmacy Care Career Structure review provides an opportunity to identify specialist pharmacist roles and staffing levels, as do impending Hospital Pharmacy Standards which are under development by the Pharmaceutical Society of Ireland.

Whilst there is a skilled, experienced and committed multidisciplinary workforce, the legacy of the staffing moratorium has resulted in a severe shortage of staff right across the spectrum. While full implementation of the Trauma System will be phased, it is important that workforce planning commence as soon as possible. Implementing a Trauma System offers an opportunity to build multidisciplinary workforce teams with the required skill-mix to deliver high quality trauma care.

To maximise the likelihood of the success of the major Trauma System for Ireland, proposals should be underpinned by detailed workforce and financial plans with supporting service improvement strategies. A review of potential Major Trauma Centre, Trauma Unit with Specialist Services, Trauma Unit and network resources will be necessary to identify the most significant workforce issues.

The Department of Health, in collaboration with the HSE and cross-sectoral partners, is currently developing a National Strategic Framework for Health Workforce Planning which aims to support the recruitment and retention of the right mix of staff in the Irish health service to meet planned and projected service need. A key element of delivering the proposed model of trauma care is having the necessary staff in the right places - whether at national, regional or local levels. The draft Strategic Framework sets out a 5 step approach for workforce planning which includes consideration of education and training requirements. It is envisaged that 2-3 priority workforce planning projects, relating to key national health policy or clinical strategy developments, will be identified in order to test, evaluate and refine the 5 step approach.

Recommendation 31

The Department of Health and HSE should consider the introduction of a Trauma System for selection as one of the priority workforce planning projects. In this context, consideration should be given to the development of the following:

- A mapped patient pathway, to clearly identify all staff, roles, competencies and skills now compared to those required for every member of the future multidisciplinary Trauma Network teams;
- A Strategic Integrated Workforce Plan for the Trauma Network so that we have defined multidisciplinary team model(s) into the future;
- An Education and Training Framework for all members of the multi-disciplinary team together with a plan for how workforce development and optimisation opportunities can be maximised so that all staff can work to their full potential;
- A technology and innovation enablement work stream that can ensure the workforce model(s) developed are future proofed as much as possible.

Recommendation 32

In tandem with Recommendation 31, the determination of the nursing workforce across acute trauma wards should have regard to the Framework for Safe Nurse Staffing and Skill Mix.

7.6.5 Training and Education

The focus must be to support the newly developed and evolving Trauma System, and the necessity of providing early education for the healthcare staff engaged in the delivery of the trauma service.

Recommendation 33

The HSE National Office for Trauma Services should establish a formal trauma training committee and the HSE will appoint a dedicated lead for trauma education.

The trauma team leaders should have relevant training in, and competence assessment in, crew resource management, team leading and the assessment and management of major trauma –it would be appropriate to initiate a bespoke course covering all of these areas to assure the certification of competence in the specific context of leading a trauma team in a Major Trauma Centre.

There is a need for enhanced trauma training for surgeons in the proposed system. This should include up-to-date ATLS certification, participation in an advanced trauma course (such as Definitive Surgical Trauma Skills programme), ongoing trauma CME, trauma leadership and trauma team training.

Recommendation 34

The HSE will ensure that enhanced trauma training and education for surgeons and members of the multidisciplinary team providing major trauma care will include up-to-date Advanced Trauma Life Support certification, participation in an advanced trauma course (such as Definitive Surgical Trauma Skills), ongoing trauma continuing medical education, trauma leadership and trauma team training.

A dedicated trauma education portfolio as part of the Trauma System, under the auspices of the RCSI would bridge the gap between a solid surgical training background and the lack of exposure to high volume, complex trauma. In addition to a formal trauma training committee, a dedicated lead for trauma education should be appointed.

In respect of education and development as they apply to Health and Social Care Professionals (HSCPs), the HSE aims to develop a strategic framework to guide the future focus and work of the HSE with regard to the education and training of (HSCPs). It is also the aim of the HSE to work with professional staff, professional bodies, Higher Education Institutes, HSE Services, Government Departments and other key stakeholders in relation to undergraduate and post graduate education of Health and Social Care Professionals (HSCPs). This needs to encompass career development for HSCPs. Several of the pertinent National Clinical Programmes have outlined the need to develop advanced practice roles to provide alternative pathways of care as developed very successfully in other countries. HSCPs at an advanced level have competencies and skills to deliver HSCP led services and provide cost-effective alternatives.

The successful implementation of trauma care requires a skilled and competent nursing workforce, with a range of roles to meet patient needs across the spectrum of care. Higher Education Institutes should urgently review the current specialist nursing post graduate orthopaedic education and training curriculum, to take account of the proposed changes to trauma care and its impact to ensure a suitably prepared specialist trauma nurse. This should take appropriate account of the Policy on Graduate, Specialist and Advanced Nursing and Midwifery Practice. In addition the HSE should develop Trauma Clinical Nurse Specialist and Advanced Nurse Practitioner services (not just individual CNS/ANP roles).

Recommendation 35

Higher education institutes should review the current specialist nursing post graduate orthopaedic education and training curriculum to ensure the proposed changes to trauma care are appropriately reflected.

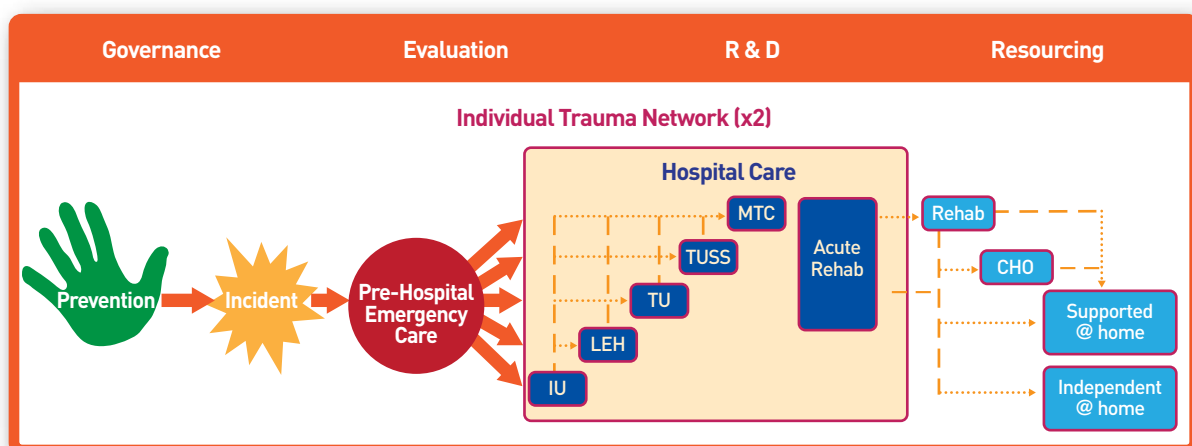
Chapter 8

Governance

Healthcare governance has evolved and is now more commonly referred to as integrated governance, through which organisations are accountable for continually improving the quality of services and safe guarding high standards of patient care by creating an environment in which excellence in clinical care will prevail. Essential elements include education and training, clinical audit systems, assessment of clinical effectiveness, research and development, committees and processes and risk management. There must be openness to enable frank discussions about safety and quality matters while respecting confidentiality of patients and providers.

Trauma services must be appropriately resourced, underpinned by strong and effective leadership, management and governance arrangements and delivered by a skilled and competent workforce. Services along the trauma care pathway in each network will be delivered by a range of different providers with high levels of interdependencies between organisations.

INCLUSIVE TRAUMA SYSTEM



Governance arrangements for the national Trauma System and the regional Trauma Networks require careful consideration^j. They must take account of the range of different organisations involved in the delivery of trauma services and the need to deliver integrated care to patients along the trauma care pathway.

The two Trauma Networks will operate across multiple Hospital Groups, Community Health Organisations and other service providers all of which have existing governance, accountability and reporting arrangements. Governance of individual services provided to patients along the trauma care pathway will remain the

^j There is also the need for bi-directional flow between the components of the trauma care pathway, whereby patients have pathways for readmission where necessary.

responsibility of the individual organisation providing the service. Governance of the Trauma System must also take account of the ongoing work of the relevant HSE National Clinical Programmes.

While recognising the existing corporate and clinical governance arrangements in place for the delivery of individual trauma services it is necessary to develop and implement specific Trauma System and regional Trauma Network governance arrangements to ensure the cohesive operation of the Trauma Networks.

8.1 Trauma System Governance

Hospital Groups, Community Healthcare Organisations, the National Ambulance Service and other service providers will have a role in delivering an effective inclusive Trauma System. Governance arrangements are required which will ensure integration across organisational boundaries, as well as to provide distinct national leadership. Trauma System governance arrangements will need to be established both at national level and at network level.

Strong and effective leadership, management and governance arrangements are essential to create and sustain a safe and high quality trauma service. Effective governance of the Trauma System and Trauma Networks, in addition to existing structures and reporting arrangements in place for individual services, requires:

- effective representation of and engagement with all Trauma Network members;
- strong communication between service providers across each network;
- co-ordination of trauma services provided by Trauma Network members;
- collaboration between Trauma Network members;
- all protocols and policies to be developed, agreed, implemented and reviewed in a collaborative manner with all Trauma Network members;
- agreeing respective roles and responsibilities of each Trauma Network member within the network;
- supporting Trauma Network members to fulfil their roles and responsibilities effectively;
- development of network performance management frameworks in a collaborative manner;
- strong linkages with organisations with responsibility for the prevention of trauma;
- adapting to local and regional changes in the demand for trauma services over time;
- promoting the active involvement of all relevant medical and health and social care professionals across the network.

8.2 National Clinical Lead for Trauma Services and National Office for Trauma Services

A National Clinical Lead for Trauma Services (NCLTS) will be appointed by the HSE to lead a National Office for Trauma Services (NOTS). The NCLTS will have responsibility for ensuring that effective governance mechanisms are put in place to support the establishment and development of the Trauma System and individual Trauma Networks. He/she will take the lead in driving progress and improvement in trauma service quality.

He/she will have a demonstrated history and competency in change management, leading health system reform and will have professional experience in delivering one of the components of the trauma care pathway. He/she will provide overall clinical and operational leadership for the establishment and implementation of the trauma system, and, will take the lead in driving progress and improvement in trauma service quality, by ensuring that effective governance mechanisms are put in place.

The NCLTS will work closely with the Department of Health, the HSE, Hospital Groups, CHOs, pre-hospital care providers and training, accreditation and professional bodies to achieve these aims. They will work closely with all Trauma Network members to lead service re-organisation and to ensure that integrated pathways are provided for all trauma patients. The NCLTS will oversee the establishment of the Trauma Networks with robust governance arrangements, clear roles and responsibilities and a strong clinical governance framework.

The National Office for Trauma Services will be established within the HSE, reporting initially to the National Director for Acute Hospital Services, pending the appointment of a Chief Clinical Officer. The staff in this new office will support the NCLTS in aligning systems and process already in place in the healthcare system in Ireland with components of the trauma care pathway as a number of essential elements of the pathway already exist across a number of other divisions. This cross-linking approach will ensure that all components of the trauma service, whether at the prevention stage, pre-hospital, individual hospital, network, or CHO level, will be developed in a coherent, coordinated and inclusive manner. The NOTS should establish a Trauma Patient Advisory Committee to provide input into the development of the Trauma System. Membership of this Committee will reflect the diversity of patients living with the effects of trauma.

In collaboration with other stakeholders the NCLTS will develop programmes to promote best practice in trauma care, including workforce planning and education/training programmes.

This role will include responsibility for identification and delivery of corporate clinical priorities (at national and regional level), and supporting the establishment of Trauma Networks, pre-hospital care, Major Trauma Centres, Trauma Units with Specialist Services and Trauma Unit services.

A key component of the role will be to lead and support policy and strategy teams in the successful design and delivery of the suite of tools to support system, professional and care pathway changes at a national and network level. The new way of delivering trauma services will require collaboratively working with network team members to ensure there is coherent guidance for all stakeholders involved in the redesign of trauma services within Ireland. For example, he/she should establish a group to plan system wide development of rehabilitation services. Early identification of Trauma Network rehabilitation directors to work with the NCLTS to deliver this would be important in this regard.

The NCLTS will also contribute to defining various outcome measures, based on international best practice as part of the governance of the entire Trauma System. In the initial phase of implementation the NCLTS will work with HSE HR to analyse the multi-professional staffing requirement arising from the redesign. Preparation of a workforce plan to build capacity and carry out a training needs analysis to build capability to deliver the new model of trauma service will be essential. Should other ad hoc issues such as advice to support parliamentary accountability arise the NCLTS will address these.

The NCLTS will be expected to provide strategic direction and leadership, drive improvement and foster a learning culture in trauma services that focuses on quality and patient safety.

The NCLTS should be given authority, autonomy and accountability for developing trauma services in a coherent and coordinated manner. The establishment of the respective roles, responsibilities and accountabilities of the office of the NCLTS should be developed in collaboration with relevant stakeholders, including the Department of Health; the HSE and other academic bodies. Funding for the development and incremental implementation of trauma services should be identified and protected for this purpose.

Having regard to the need for necessary co-ordination and linkages between adult and paediatric trauma services, and paediatric service providers, the NCLTS and the NOTS will engage with the National Clinical Programme in Paediatrics and the paediatric service delivery system in the development of integrated paediatric trauma services.

The NCLTS and the team in the NOTS should be provided with a structured and intensive programme of support in the initial period of their appointment, and with ongoing access to professional development and mentoring throughout their tenure. It is envisaged that the role of the NCLTS will require a minimum of four days per week commitment.

The NCLTS and HSE HR should ensure that leadership capacity is developed throughout the trauma services by the establishment of a developmental programme, for staff who aspire to a leadership role. It is essential that all healthcare workers delivering the trauma service should be aware of their respective responsibilities, authority and accountability and work towards achieving optimal outcomes for patients.

Recommendation 36

The HSE should appoint a National Clinical Lead for Trauma Services reporting to the proposed Chief Clinical Officer once appointed, and the National Director of Acute Hospital Services in the meantime, to lead a National Office for Trauma Services and manage the implementation and oversight of the Trauma System.

Recommendation 37

The HSE National Office for Trauma Services should establish a Trauma Patient Advisory Committee to provide input into the development of the Trauma System. Membership of this Committee will reflect the diversity of patients living with the effects of trauma.

8.3 Governance of Trauma Networks

While some features of each network may be varied according to local network requirements, certain core principles and core organisational components will be required to be reflected in network structure and functioning.

Good governance flows from a shared culture and operating within a model of collaboration and cooperation. The model below describes the principles around which each network should operate and which, in turn,

should inform the Trauma System as a whole. Collaboration and cooperation are the principles on which all others are built.

Operational components within each network which will need to be addressed include:

- Executive/Oversight group(s) identified in network/regional structure with clearly defined responsibilities;
- Purpose and remit of network clearly identified;
- Network boundaries identified;
- Network organisational structure designed and approved;
- Process of appointment for network management team confirmed with HR support;
- Terms of reference for all network groups written and approved with agreed timescale for rollout;
- Patient and Public Involvement strategy developed and implemented.

Certain posts and structures will need to be common to each of the Trauma Networks to ensure effective cross-network liaison as well as top-down accountability with the national system management.

Common roles and features of Trauma Network organisational arrangements should include:

- Trauma Network Committee with appropriate multidisciplinary representation;
- Trauma Network Manager;
- Trauma Network Clinical Director;
- Trauma Network Rehabilitation Director;
- Nominated Trauma Director for each Major Trauma Centre and Trauma Unit within the network.

Given the numerous agencies/governance structures that provide services across the rehabilitation component in particular, the co-ordination of rehabilitation services and associated movement through the network will need dedicated attention in terms of governance and implementation. The appointment of the Trauma Network Rehabilitation Director will be critical in this regard.

Recommendation 38

The HSE National Office for Trauma Services should oversee the establishment of an appropriate governance framework for the Trauma System which supports a safe and high quality Trauma System.



Chapter 9

Quality Assurance and Quality Improvement

Care of major trauma often presents a unique combination of characteristics with implications for risk management and quality assurance:

- time critical injuries occurring often in rural areas and outside core working hours;
- transfer between facilities;
- diagnostic uncertainty;
- immediate involvement of many disciplines;
- complex and multiple interventions;
- prolonged rehabilitation, without certainty of full recovery.

Within this high-risk context, the potential for errors to occur is frequent. Australian data shows that critical decisions in trauma resuscitation occur every 72 seconds and, on average, 2.5 errors are made in the treatment of severely injured patients¹¹⁸. More than any other condition, traumatic injury relies on well-coordinated integrated systems of care to allow the best chance of survival and recovery. The need for strong investment in safety and quality systems in trauma is important to manage the high degree of risk, associated with trauma management, to contain the cost of providing care and ultimately to improve the outcome and quality of life for injured patients¹¹⁹.

Quality assurance will be a key component of the governance of the Trauma System, reflecting the maintenance of a high quality of health care by continually measuring the effectiveness of the organisations that provide it. It will consist of a performance framework, participation in the Major Trauma Audit and quality improvement programmes.

Recommendation 39

The HSE should ensure that each Trauma Network and trauma service provider within the networks puts in place a quality assurance system framework, inclusive of clinical audit and performance measurement at national, network and local levels that links to the governance framework and participate in the Major Trauma Audit.

A quality improvement programme is the continuous evaluation of a Trauma System and its providers through structured review of the process of care including outcomes, (both quantitative and qualitative). In the absence of an established quality improvement programme, the effects of quality improvement initiatives on long-term patient outcomes, in addition to a quantification of healthcare and other service requirements remain unknown.

9.1 Performance Framework for Trauma Services

In the UK, a performance framework is employed which defines all key performance indicators, sentinel events, processes for scheduled and unscheduled review, sanctions and incentives that apply to the Trauma System. It acts as a key instrument for quality improvement, drawing on national and international standards. Networks report annually on their performance.

In Ireland, the Department of Health recognises patient safety as the cornerstone to quality healthcare and the recently established National Patient Safety Office will focus on leading key patient safety policy initiatives. Its brief is to ensure safe health services are informed by good data and supported by legislation; commence surveillance of patient safety information to inform and direct patient safety improvements for hospital and community care; develop a model for a new national patient advocacy service; and extend the national clinical effectiveness framework to promote evidence based healthcare. Within the HSE, the Quality Assurance and Verification Division has a brief which includes the promotion of evidence-based care, quality assurance and audit.

Following a review of international best practice it is recommended that a national performance framework, which reflects and encompasses the recommended trauma care pathway, is established to support delivery of enhanced major trauma care in Ireland.

Recommendation 40

The HSE National Office for Trauma Services should introduce a peer review system for all components of the Trauma System based on agreed quality measures and publish reports to provide accessible information about the quality of trauma services.

9.2 Major Trauma Audit

Accurate and effective audit is fundamental to a functioning Trauma System. The care of the severely injured patient requires a multidisciplinary team, often working across more than one hospital. Fundamental processes of care received from time of injury (including pre-hospital care) to recovery dictate outcomes for patients suffering major trauma. Therefore a robust audit system is required to show whether or not processes are working effectively and efficiently and that patient outcomes are being optimised¹²⁰. Data collected for trauma audits is risk adjusted for a range of variables including; age, injury severity, co-morbidities, length of stay, etc. to allow accurate comparisons with other hospitals for benchmarking both nationally and internationally. Trauma audit is one of the mandatory requirements for Major Trauma Centre designation in most jurisdictions, in addition to providing a data source for injury linked reimbursement.

The Trauma Audit and Research Network (TARN) collects and processes data on moderately and severely injured patients in England and Wales. TARN has been in operation since the 1990s and has been at the forefront of quality and research initiatives in major trauma care. It is the largest major trauma registry in Europe. TARN facilitates review of trauma care at both organisational and national level, thereby quality assuring and ultimately improving major trauma care.

As set out in section 1.2, the National Office of Clinical Audit (NOCA) has implemented Major Trauma Audit (MTA) in Ireland using TARN methodology. NOCA funds the TARN license fees for hospitals, coordinates training and provides audit governance. In December 2016 the Major Trauma Audit became the first NCEC National Clinical Audit. The Minister for Health has endorsed the audit for national implementation and has informed the Director General of the HSE and service and professional regulators of this status.

The MTA data will be used to support trauma audit in Ireland through quarterly reports which focus on:

- highlighting individual cases of unexpected deaths or unexpected survivors that occur;
- a chosen particular specialist area of trauma management and compares performance with evidence based standards / guidelines or, where robust evidence is lacking, agreed best practice guidelines as determined by experts or expert bodies, developed in line with NCEC Standards for Clinical Practice Guidance;
- comparative outcomes between hospitals with the identification of 'outliers' with either very good or very poor trauma outcomes.

9.3 Performance Indicators

Central to the assessment of the Trauma Network performance will be the use of a continuous audit, based around a set of key performance indicators (KPIs). These would include markers of both clinical and non-clinical performance. Such parameters should be system specific, evidence based and subject to regular review. In Ireland there are large elements of this framework already in place in the form of the TARN Database. HIQA's Guidance on Developing Key Performance Indicators and Minimum Datasets to Monitor Healthcare Quality¹²¹ would also provide a useful resource in this regard.

Measuring the performance of the Trauma System using key performance indicators (KPIs) can help to identify areas where improvement is required or achieved in terms of both process and outcomes. KPIs can provide useful information to patients, clinicians, managers and funders as well as facilitate comparison of performance between the two Trauma Networks.

It is proposed that detailed KPIs will be developed for the different components of the trauma care pathway. This report provides an example of detailed KPIs for rehabilitation (Appendix 7). The HSE National Model of Care for Trauma and Orthopaedic Surgery provides KPIs for spine surgery centres. However, the development of high level KPIs for the Trauma System are also important to provide visibility of the Trauma System and monitor its performance overall.

Different approaches have been adopted in the selection of high level KPIs for Trauma Systems. Risk-adjusted trauma mortality rates and preventable death rates have been used as KPIs for some Trauma Systems. The sole use of inpatient outcome measures is inadequate for several reasons. In-hospital mortality is a feasible and reliable outcome, but it is considered a crude quality indicator of trauma care

with little indicated of the quality of survival. There are significant problems with interpreting survival as an outcome for hospital and system benchmarking purposes¹²²; preventable trauma deaths may occur before reaching hospital, during inter-hospital transfer or during convalescence from the acute hospital stay; therefore, in-hospital deaths represent only part of the overall picture.

More recently developed trauma KPIs in other countries have focused on access, timeliness and patient experience, e.g. pain reduction. A number of high level KPIs have been proposed by for the Scottish Trauma System which are concerned with management of trauma care. These cover pre-hospital care (3 indicators), early hospital care (10 indicators) and ongoing hospital care (3 indicators). In New South Wales, Australia, the performance of the Trauma System is measured using outcome data on missed injuries and unexpected readmission to ICU.

Trauma prevention activities can also be measured, e.g. the proportion of patients admitted with alcohol- or drug-related trauma receiving risk-reduction interventions¹²⁴. Trauma care also lends itself to the use of composite indicators which involve using data from several elements of the trauma care pathway, e.g. total time to haemorrhage control. Composite indicators may be particularly helpful for underlining the importance of integrated care for trauma patients.

Applications for funding to develop the Trauma Networks can be assessed and prioritised on the basis of how it will support the achievement of the trauma KPIs. Trauma KPIs may change over time, e.g. KPIs that focus on the longer term outcomes for patients may be feasible when suitable data becomes available.

Recommendation 41

The HSE National Office for Trauma Services in conjunction with the Major Trauma Audit Committee should develop an agreed set of high level key performance indicators for the Irish Trauma System to be used as part of the HSE's performance monitoring framework.

9.4 Quality of Life Outcomes

The sole use of inpatient outcome measures is inadequate for several reasons. First, severely injured patients rarely achieve a steady state by the time they are discharged from hospital, and status at discharge fails to take into account the care provided and improvements made after discharge from an acute hospital. Inpatient mortality and function at discharge are affected by discharge practices, availability of rehabilitation beds and patient case mix. Mortality over one year after injury is likely to be more meaningful than inpatient mortality¹²³. Functional outcomes, after trauma, such as quality of life, level of neurological function, reliance on continual support and return to work are also important to recognise and measure as they are potentially more discerning, yet often neglected outcomes compared with overall mortality, which is a crude quality indicator of overall trauma care. For example, structured telephone follow-up interviews of patients after major trauma is routinely performed in the state of Victoria, Australia with very high data capture; the UK is working on capturing similar functional and quality of survival data.

Patients have diverse goals for rehabilitation, and there is a range of measures available, reflecting this diversity. The British Society of Rehabilitation medicine has published a "basket of measures": Improved independence in basic activities of daily living is measured at the simplest level by the Barthel index,

while the Functional Independence Measure (FIM) adds a communication/ISS rating. The Spinal Cord Independence Measure (SCIM) replaces the FIM for spinal cord injuries. The Functional Assessment Measure adds 12 further items addressing cognitive and psychosocial issues.

A national clinical audit has commenced in the UK of specialist rehabilitation for patients with complex needs following major trauma. It is a three-year programme with tri-partite partnership with the aim of providing a national comparative assessment of the organisation, quality, outcomes and efficiency of specialist rehabilitation services (<https://www.tarn.ac.uk/>). Similar robust audit could be employed in Ireland. Measuring long term outcomes for patients will be essential for evaluating the performance of the Trauma System.

Recommendation 42

The National Office of Clinical Audit will develop the TARN dataset to collect functional and quality of life outcome data for all components of the major trauma care pathway.

9.5 Incentivising Best Practice through Activity Based Funding

Since January 2016, a system of funding Irish acute hospitals known as Activity Based Funding has been applied to inpatient and daycase activity in the 38 largest public hospitals in the country. This has involved moving away from block grant budgets to a new system where payments are based on national rates for specific patient types, as measured by the relevant Australian Refined-Diagnosis Related Groups to which each case treated belongs. The Activity Based Funding Programme aims to improve patient access to care together with the overall quality and safety of care they receive and establish and facilitate an evidence-informed system of healthcare resourcing that drives transparency, equity and efficiency.

Activity based funding has been used in other countries to incentive best practice in patient care and “reward” adherence to agreed guidelines and protocols for trauma care.

In the UK a major trauma best practice tariff was introduced in 2012 for Major Trauma Centres. Hospitals are incentivised to optimise their Major Trauma Audit compliance through best practice tariffs measured through the audit. When certain criteria are met in the delivery of care to trauma patients a best practice tariff is paid to the Major Trauma Centre. These criteria are captured by the TARN data set. The level of the Major Trauma best practice paid is based on the ISS assigned to each patient, details below.

Level 1: Patients with ISS >8

- Complete patient data submitted to TARN within 40 days of patient discharge/death;
- Rehabilitation Prescription completed and core elements recorded within the TARN Electronic Data Collection System (eDCR).

Level 2: Patients with ISS >15

- Complete patient data submitted to TARN within 40 days of patient discharge/death;
- Rehabilitation prescription completed and core elements recorded within the TARN eDCR;
- Patient received by a trauma team led by a consultant within 30 minutes of arrival and recorded within the TARN eDCR;
- If the patient is transferred as an urgent transfer (non-emergency), then the transfer should take place within two calendar days recorded within the TARN eDCR.

While the Activity Based Funding system in Ireland is still under refinement, consideration has already been given to implementing the best practice tariffs in a number of areas. When the necessary data systems are in place to determine if major trauma care criteria have been met in Irish Major Trauma Centres, consideration should be given to the introduction of a best practice tariff for trauma. The ongoing development of the Major Trauma Audit will be of assistance in that regard.

Currently in the UK, hospitals are incentivised to optimise their MTA compliance through best practice tariffs measured through the audit. TARN submission currently serves as the equivalent of an invoice for services rendered in trauma centres in the UK.

Recommendation 43

The HSE should consider the introduction of a best practice tariff for major trauma under Activity Based Funding.

Chapter 10

Implementation

The proposed structure of the Trauma System and recommendations for trauma care set out in this report will be implemented on a phased, incremental basis, taking into account planned service developments in the health service. A fully-functioning Trauma System cannot be put in place overnight – it will require a period of transition and change as revised structures and practices are agreed and introduced in a collaborative manner.

All service providers within the trauma care pathway will have a role to play in the implementation of a Trauma System for Ireland as well as agencies with responsibility for preventing and reducing the severity of injuries. A number of critical success factors have been identified, informed by experience of health system change in Ireland and abroad, which need to be factored in to the implementation approach.

Leadership: Strong leadership is required to articulate the need for change and drive change.

Reconfigure: There must be a commitment to changing the existing configuration of services and existing roles both within and across Hospital Groups and Community Health Organisations to take account of Trauma System requirements.

Maintain existing capability during change: Existing services for all trauma patients must be maintained while services are being restructured or enhanced.

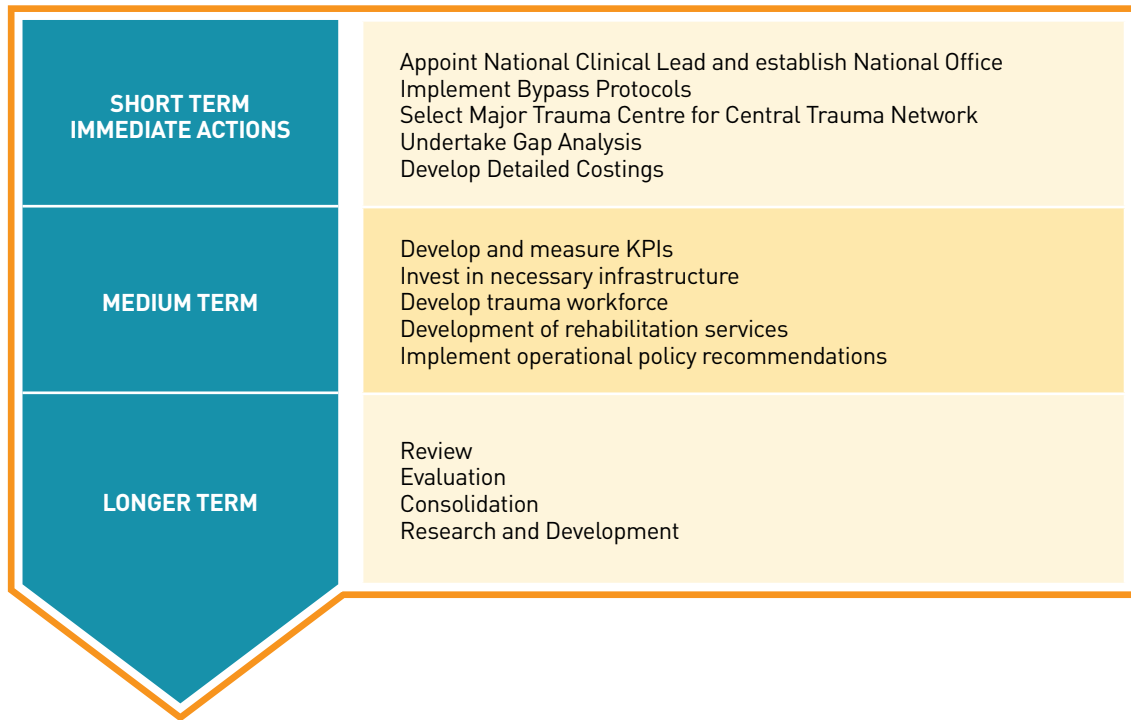
Resource correctly: A strong commitment is required to putting in place the necessary specialist capability and facilities for an integrated Trauma System.

Clear communication and information for the public: The reasons for any changes should be clearly explained and information provided to the public on the most appropriate location for the treatment of different types of trauma.

10.1 Phased Approach to Implementation

Figure 12 below summarises the high level phasing and prioritisation for implementation of key actions.

FIGURE 12: PHASED IMPLEMENTATION OF ACTIONS



The Trauma System will be introduced in Ireland on a phased basis. There are four immediate actions that must be commenced within the first three months of implementation.

Recommendation 44

An interim HSE implementation group, to include representation from the Department of Health, should be formed immediately following the adoption of the report, to commence the four immediate actions within the first three months of implementation and to ensure a seamless transfer of responsibility to the National Clinical Lead for Trauma Services once appointed, and to the National Office for Trauma Services.

The National Office for Trauma Services will develop a detailed implementation plan which sets out the phasing for the implementation of the actions required to introduce a Trauma System in Ireland.

Immediate Action 1 A National Clinical Lead for Trauma Services (NCLTS) will be appointed by the HSE to lead a National Office for Trauma Services and manage the implementation and oversight of the Trauma System.

The recruitment and appointment of a National Clinical Lead for Trauma Services, with a clinical background and relevant trauma clinical leadership experience, and establishment of a National Office for Trauma Services within the HSE will be the first step towards implementing a Trauma System for Ireland.

The Clinical Lead will, as a matter of priority:

- undertake a gap analysis, to determine, nationally and for each Trauma Network, the existing capacity and range of services available along the entire trauma care pathway and the additional services that will be required to ensure best outcomes for trauma patients. The results of the gap analysis will assist the costing and prioritising of funding, operational and capacity changes required to facilitate the effective functioning of the Trauma System;
- develop a detailed, costed implementation plan with appropriate key performance indicators, which will help to ensure that the transition from the current configuration to the recommended configuration of services is planned and managed effectively.

The detailed implementation plan will group initiatives by short, medium and long term goals with a timeframe of within 1 year; 2-4 years and 6 years. A risk analysis will be applied to the detailed implementation plan and a detailed risk register identified for each stage, together with risk control, and mitigation strategies and responsibilities. The detailed proposals developed by each of the Working Groups will inform the development of the detailed implementation plan by the National Clinical Lead for Trauma Services.

This work will involve:

- A feasibility analysis against system level criteria applied to all the initiatives which included requirements for workforce, recurrent funding, infrastructure, technology, and influences such as stakeholder support and time dependent initiatives;
- A ranking process which will allow prioritisation of the initiatives by those most feasible (within current resources; time, cost and establishment) to not feasible at all.

In order to inform the implementation plan, key stakeholders in terms of executive authority, leadership and accountability at each level of the health service will be identified for each initiative.

Immediate Action 2 Implement bypass protocols for patients with orthopaedic trauma injuries and major trauma patients

Currently, patients with orthopaedic injuries are taken to the nearest hospital, regardless of whether or not there is an orthopaedic service on site. This is not best practice, and a first essential step should be to formally agree that for patients with orthopaedic trauma injuries, bypass protocols should be put in place immediately. Bypass has commenced in a number of areas for patients who have suffered a fractured neck of femur, in addition protocols should be developed, implemented and adapted over time by the National Ambulance Service in line with the development of the Trauma Networks to ensure that all major trauma patients are brought to the most appropriate place for treatment. This may have an impact on the National Ambulance Service and additional resourcing may be required.

Pre-hospital triage and inter-hospital transfer protocols guidance will be introduced, with the main aim of reducing pre-hospital times and identifying patients with life-threatening injuries who should be taken directly to the Major Trauma Centre. These guidelines can be introduced as informal, non-binding criteria initially before being officially mandated.

Immediate Action 3 Select Major Trauma Centre for Central Trauma Network

Hospital Groups in the Dublin region should be invited by the Department of Health and the HSE to submit proposals for nominated hospitals to be considered for designation as the Major Trauma Centre for the Central Trauma Network. Such proposals should set out how services may be reorganised and capacity created to meet the proposed designation criteria for the Major Trauma Centres (Appendix 6). Decision criteria will include:

- Current hospital capacity, in terms of staffing, specialties and facilities, which meet the designation criteria;
- Additional resources required, in terms of staffing, specialties and facilities, to meet the designation criteria;
- Resources that can be transferred from other hospitals within the Hospital Group to meet the designation criteria;
- Additional cost of providing the additional services required to meet the designation criteria;
- Potential to act as a centre of excellence, integrated with the rest of the Trauma Network and with an ethos of achieving optimum outcomes in care of the critically injured patient;
- Proposals for education and training of hospital staff linked with education and training of other staff in the Central Trauma Network;
- Participation in and actions arising from Hospital Group engagement in the Major Trauma Audit.

Candidate Major Trauma Centres should demonstrate how they may create capacity and achieve Major Trauma Centre designation criteria and trauma organisation. This is expected to require collaboration and agreement across hospitals for service re-organisation requirements, as well as Hospital Group collaboration and co-ordination. Based on the consultation process, it is expected that a number of Hospital Groups will express an interest in hosting the Major Trauma Centre for the Central Trauma Network.

It is anticipated that international expertise will be required in the evaluation of proposals and recommendation of a hospital for designation as a Major Trauma Centre.

Immediate Action 4 Develop Costings for the Trauma System

Implementing evidence-based and targeted prevention programmes based on our understanding of the causes of trauma in Ireland will decrease the demand for trauma care.

The proposed Trauma System will involve a redistribution of some patients, treating more cases of major trauma centrally in the two Major Trauma Centres, and ensuring other patients are treated in Trauma Units as appropriate. Our system of Activity Based Funding ensures that money follows the patient. Any

redistribution of trauma care activity will result in a redistribution of funding. Economies of scale, with major trauma being treated in designated Major Trauma Centres and Trauma Units, may result in lower average costs for treating patients with severe injuries.

Implementing the recommendations of this report will require funding to provide:

- Support for cost-effective trauma prevention initiatives;
- Additional staff and vehicles to deliver the pre-hospital care recommendations;
- Additional staff in Trauma Units and Major Trauma Centres to meet the designation criteria;
- Additional facilities in Trauma Units and Major Trauma Centres to meet the designation criteria;
- Additional staff and facilities to deliver rehabilitation services;
- Additional staff to manage and administer the Trauma Networks;
- Further development of the Major Trauma Audit and put in place quality assurance measures.

The development of detailed costings for the proposed Trauma System must take account of current resources (both staff and facilities) available for treating trauma in both pre-hospital, hospital and community settings, in terms of workforce and facilities. A gap analysis is required in order to estimate total funding requirements. In this regard the capacity review of the health sector, which is already underway, will assist the costing exercise. The capacity review will determine capacity in primary care and current bed stock broken down by specialty, function, category, etc.

The cost of existing trauma services is also unknown. The Major Trauma Audit, NCEC National Clinical Audit No. 1, published in December 2016 contains an analysis to approximate the direct cost of major trauma in Ireland based on analysis undertaken by the UK National Audit Office in 2010. This implies that Ireland's expenditure on major trauma could be between €57 and €76 million. This estimate is caveated due to the difference in structure between the two health systems and potential differences in the incidence of major trauma. It should be also noted that significant reforms in trauma care were introduced in the UK since 2010. As part of the costing exercise, further analysis will be undertaken to determine the typical cost of some types of trauma care using the Hospital Inpatient Enquiry activity data in conjunction with the Activity Based Funding cost data. The impact of additional resources for trauma care on activity costs must also be considered.

Many key decisions remain which will influence the total cost of implementing the Trauma System including:

- The total number of Trauma Units in each Trauma Network;
- The ability to reconfigure services within and across Hospital Groups;
- Ongoing investment in and development of health services which benefit a wider cohort of patients, e.g. therapy services in primary and community care and the Programme for Government commitment to increase the number of critical care beds;
- The success of prevention measures in driving down the incidence of major trauma.

One feasible approach to determining costs is to cost each individual element of the proposed Trauma System. For example, Cork University Hospital can be designated as a Major Trauma Centre for the South Trauma Network if it develops its capacity to meet the Major Trauma Centre designation criteria. The current shortfalls, e.g. lack of acute rehabilitation services, can be identified and costed. Other stand-alone elements include the additional costs associated with the management and administration of the Trauma

System, the additional resources required to implement bypass protocols for patients with orthopaedic trauma injuries and major trauma patients. For example, recent analysis on the cost of implementing a Hip Fracture Bypass Protocol, which is a bypass protocol for patients with a specific type of orthopaedic trauma injury, estimated costs of €2.1m for 39 additional whole time equivalents and €1.4m for capital investment¹²⁵.

The cost of individual hospitals meeting Trauma Unit designation criteria will be calculated on a case by case basis.

The benefits arising from improved trauma care and better outcomes for patients can also be identified and calculated in some instances. A recently published study on the introduction of a Trauma System in Arkansas demonstrated a 9-fold return on investment¹²⁶. Potential savings include reductions in workdays lost through injury, lower average lengths of stay for trauma patients, reduced clinical claims related to trauma care and lower insurance premiums.

The implementation of the Trauma System will be incremental and requires prioritisation of funding. The development of high level KPIs will assist in the prioritisation of investment in the Trauma System. Cost-effective changes which are most likely to lead to improvements in trauma care performance should be prioritised for funding.

Short Term Implementation

The focus in this stage will be on implementing the immediate actions set out above and planning for the later implementation stages. Clinicians will be intrinsically involved and in many cases lead the change planning process for elements of the trauma care pathway. Patients and members of the public will be invited to participate in the transition and implementation planning.

A Trauma Advisory Committee (TAC) can be established, a voluntary group of clinical stakeholders experienced in trauma care, to provide clinical leadership at network level and provide advice to the National Clinical Lead for Trauma Services.

Medium Term Implementation

A key focus for the implementation of the Trauma System in the medium term will involve “filling the gaps” to ensure that hospitals designated as Major Trauma Centres and Trauma Units are appropriately resourced to provide evidence-based care in line with recommendations. Trauma care capabilities will need to be upgraded and enhanced to reach the specified designation criteria in some cases. Other gaps may be filled by service reconfiguration.

Parallel to developments in acute hospital services, the post-acute rehabilitation services provided to trauma patients must be developed to meet patient needs and reduce the medium and long term burden of trauma. The NCLTS will adopt a whole system approach by ensuring that protocols and agreed procedures for care along the trauma care pathway will be bedded-down and bring about real changes in how trauma patients are treated. This includes guidelines as to who should be sent to rehabilitation facilities after discharge from acute care hospitals. National standards, guidelines and clinical practice guidance will be developed in line with NCEC’s *Standards for Clinical Practice Guidance* and the *HSE Framework for Policies, Procedures, Protocols and Guidelines*¹²⁷.

Longer Term Implementation

Once the fundamental components of the trauma system have been established through Major Trauma Centre and Trauma Unit designation and the standardisation of triage and transfer protocols, the review, evaluation and consolidation of the trauma system will begin. The Trauma System's effects on mortality and morbidity will be evaluated using actual national data. A system of Peer Review will also be developed. Detailed models of care for categories of trauma patients can also be developed to ensure patients receive the most appropriate care within the trauma system.

10.2 Resources

The implementation of the four immediate actions will be funded through a budget ring fenced for trauma in the HSE Service Plans for 2018.

Resources required to implement the other key actions will be determined by the development of a detailed, costed, implementation plan.

Recommendation 45

The Government should commit to providing annual development funding for this trauma policy across all of its components – prevention, pre-hospital care, hospital care and rehabilitation.



Membership of the Steering and Working Groups

The membership of the Trauma Steering Group was as follows:

1. Professor Eilis McGovern (Chair), Director, National Doctors Training and Planning, HSE
2. Ms Fionnuala Duffy, Principal Officer, Acute Hospital Policy Unit 2, Department of Health
3. Dr Colm Henry, National Clinical Adviser & Group Lead for Acute Hospitals, HSE
4. Dr Cathal O'Donnell, Medical Director, National Ambulance Service (Consultant in Emergency Medicine at UL Hospital)
5. Mr Paddy Kenny, Joint Lead, Trauma and Orthopaedics Programme (Orthopaedic Surgeon, Connolly and Cappagh)
6. Dr Gerry McCarthy, Lead, Emergency Medicine Programme (Consultant in Emergency Medicine Cork University Hospital)
7. Dr Jacinta Morgan, Lead, National Rehabilitation Programme (Consultant in Rehabilitation Medicine, NRH) (until December 2015)
8. Ms Dervilla Danaher, Physiotherapy Manager, Mater Misericordiae University Hospital (replaced Dr Jacinta Morgan)
9. Professor Colette Cowan, Group CEO, UL Hospital Group
10. Professor Mary McCarron, Dean of Faculty of Health Sciences, Trinity College Dublin
11. Dr Philippa Ryan Withero, Deputy Chief Nursing Officer, Department of Health
12. Dr Máirín Ryan, Director, Health Technology Assessment, Health Information and Quality Authority
13. Mark Ryan, Advocacy Rep /Member of the public
14. Ciara Pidgeon, Principal Officer, Acute Hospital Policy Unit 4, Department of Health (from March 2017)

External Advisor - Prof Chris Moran

NHS National Clinical Director for Trauma, Professor of Orthopaedic Trauma Surgery, Nottingham University Hospital

The Steering Group was supported in its work by Ms Sinead Quill and Ms Edel O'Connor, Department of Health and Ms Catherine Farrell and Ms Niamh Keane, National Clinical Programme for Trauma and Orthopaedics, RCSI.

The Trauma Steering Group was complemented by five Working Groups that considered Network Organisation, Pre-hospital Care and Retrieval, Reception and Intervention, Reconstruction and Ongoing care, and Rehabilitation.

The membership of the Working Groups was as follows:

Pre-hospital Care and Retrieval Working Group

Dr Cathal O'Donnell (Chair)	Medical Director, National Ambulance Service (NAS)
Dr John McAdoo	Lead, Retrieval and Transport Medicine Programme
Mr Macartan Hughes	Head of Education and Competency Assurance, NAS
Dr George Little	Consultant in Emergency Medicine, Naas General Hospital, Emergency Medicine Programme nominee
Ms Sharon Heffernan	Statistician, Road Safety Authority
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Mr Alan Mulligan	Patient Representative
Prof Conor Deasy	Deputy Medical Director NAS & Chair Major Trauma Audit, NOCA

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Reconstruction and Ongoing Care Working Group

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Ms Ciara Rowan	Acquired Brain Injury Clinical Nurse Specialist, Neurocent Directorate, Beaumont Hospital, Dublin
Ms Elaine Whelan	Speech and Language Therapy Manager, St Camillus's Community Neurorehabilitation Team, Limerick
Mr Ger Scully	Patient representative and Board Member of Irish Wheelchair Association
Ms Yvonne Rossiter	Director of Rehabilitation Services, Acquired Brain Injury Ireland
Dr Nicky Scaramuzzi	General Practitioner, Wicklow Board Member, Disabled Drivers' Medical Board of Appeal
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Network Organisation Working Group

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Mr Morgan McMonagle	Vascular Surgeon, Waterford Regional Hospital
Ms Bridie O’Sullivan	Group Director of Nursing, South/South West Group
Dr Peter Wright	Health and Wellbeing Ireland

Appendix 2

Summary of Trauma Policy Consultation Process

One of the critical success factors in implementing the Trauma System in the UK was the extent of consultation and consensus building that took place with key stakeholders (political, clinical and public) throughout the policy development process. Therefore, the Steering Group adopted a three pronged, phased approach to consulting with a variety of stakeholders as follows:

- Phase 1 - Public Consultation Process
- Phase 2 - 'Air and Test' Consultations
- Phase 3 - Trauma System Emerging Model Consultations

Phase 1 - Public Consultation Process

The public consultation process took place in Autumn 2015 using an online questionnaire and captured a wide range of both individual and organisational perspectives on trauma services in Ireland, with 199 responses in total.

While some examples of good practice were noted in submissions, a number of **shortcomings** in trauma care were identified under the following themes:

- No dedicated Major Trauma Centre with all specialties
- Access to trauma services not standardised nationally
- Inadequate physical structure of trauma receiving hospitals
- Inadequate levels and types of staffing
- Lack of trauma-specific training
- Need for enhanced pre-hospital care

Suggestions for improvement of **trauma prevention** included:

- Better road safety measures
- Better and earlier education and awareness raising
- More focus on workplace safety
- Alcohol related measures
- Establish a Trauma Network

Suggestions for improvement of **pre-hospital care** for trauma patients included:

- Requisite staffing in ambulances
- More helicopters
- Enhance number and condition of ambulances
- Enhanced and more frequent training
- Quicker response times
- More efficient dispatch system
- Better public awareness of the role of ambulances
- More efficient handover at hospitals

Suggestions for improvement of **reception and intervention** of trauma patients included:

- Recommended composition of trauma team
- Better access to imaging and diagnostics
- More efficient triage/pre-alert/handover
- Need for protocols
- More staff and beds (ICU)

- Number and Location of Major Trauma Centre
- Training
- Resolve Emergency Department issues
- More efficient transfers
- Better internal processes

Suggestions for improvement of **reconstruction and ongoing care** included:

- More comprehensive access to rehab
- Better availability of multidisciplinary team
- Develop definitive care pathways for trauma patients
- More staff/wards/beds (ICU)
- Better family involvement and support
- 24/7 access to imaging and diagnostics
- Better follow up in community
- Better mental health support to assist with the psychological consequences of trauma

Suggestions for improvement of **rehabilitation services** for trauma patients included:

- More standardised availability throughout the country
- Enhanced provision of community based rehab services
- More availability of specialist staff across a range of disciplines
- More consistent development of rehab plans
- Co-location of rehab with Major Trauma Centre
- More timely transfers to rehab
- More family involvement
- Facilities should match requirements

Phase 2 - 'Air and Test' Consultations

Phase 2 of the consultation process provided an opportunity to begin to 'air' and 'test' some of the different options for the development of a Trauma System and their implications. This phase of the consultation process did not involve discussion about specific details of any proposed model or blueprint, as these were still in development.

Consultation sessions were held with:

- The six regional Hospital Group CEOs (who were generally accompanied by a Clinical Director or other appropriate representatives)
- The HSE Acute Hospitals Division
- The National Ambulance Service
- The Pre-Hospital Emergency Care Council

The messages and feedback received can be grouped into strategic design implications and practical implementation issues.

Strategic Design Implications

Network Organisation

- The specific implications for Hospital Groups and other stakeholders will depend largely on the configuration of the proposed Trauma System.
- A national strategic approach is essential to ensure that services are managed and delivered in an integrated and cohesive way across the whole care pathway

- The implications of the Trauma System for Hospital Groups operating in Dublin were somewhat different to the implications for Hospital Groups outside Dublin.
- The National Ambulance Service, as currently configured and resourced, could not deliver the service required of a national Trauma System.
- Rehabilitation services are widely regarded as the most 'neglected' and under resourced component of the trauma service pathway.

Governance Arrangements

- The governance arrangements needed to support the effective implementation of a Trauma System are not clear. Clear ownership, accountability and sponsorship are needed to support effective implementation.
- The introduction of a Trauma System will have implications for Hospital Group strategies. Hospital Group CEOs will need a good understanding of the details of the proposed Trauma System configuration to inform the development of the Hospital Group strategies.

Change Management

- The complexity of this change management challenge lies in bringing all of the components of the system together, so that each part works effectively in its own right, but is also suitably connected with other relevant components of the Trauma System.

Messaging

- Making the case for 'saving lives', not losing services, will be crucial. Clinical leadership will be essential to selling the case for change.

Practical Implementation Issues

A national Trauma System must be planned, resourced and managed appropriately. This will require detailed planning of resource requirements, staffing implications and the investment needed.

Resource Implications

- Detailed capacity planning will be required to develop the overall business case for investment. This will include a detailed costing exercise of all the necessary resources, including those specifically ring-fenced for trauma services (beds, diagnostics, theatre space, etc.).

Staffing Implications

- Investment in the development of structured career pathways for trauma specialists, additional training for ambulance crews and the roll-out and implementation of new processes and protocols will be needed across the system.

Process Integration

- A clear pathway for trauma services that is underpinned by cohesive processes and is integrated with related specialty services is required to maximise patient outcomes.

The Quality Agenda

- As patient outcomes are the main drivers for the new network approach to trauma services, the appropriate data systems and processes to monitor and track progress in this regard should be established from the outset.

Phase 3 – Trauma System Emerging Model Consultations

Phase 3 of the consultation process consisted of a series of consultation sessions with the six regional Hospital Groups, the Pre-Hospital Emergency Care Council and trauma patients.

The consultation sessions focused on the following key themes and issues:

1) **Trauma System features, shape & levels**

- A collaborative approach between 2 hospitals within Hospital Groups was suggested for Major Trauma Centre in Dublin
- Question as to why Galway couldn't be a Major Trauma Centre (is similar to Dublin hospitals in that regard)
- Question as to where Injury Unit fit into equation
- Specificity re: Shapes and levels - need to be clearer (Saolta and elsewhere) about where exactly the TUSs, TUs would be and what services that they would have

2) **Network functioning:**

- The networks have to transcend Hospital Groups for policy to work and there will be a need for protocols in relation to which hospitals to bypass
- In the absence of an emergency paramedic who can stabilise the patient adequately initially (e.g. Intubate, cannulate etc.), then the patient is better off going straight to the Major Trauma Centre even if takes longer
- It was noted that there can be an effect on outcomes if an ambulance stops off at a Trauma Unit before heading on to a Major Trauma Centre

3) **Pre-hospital care:**

- Strict ambulance bypass and 'no refusal' protocols to be in place
- Pre-hospital advanced practitioner essential for initial optimal stabilisation
- Advanced paramedics to provide co-ordination of whole process regarding on scene and with the hospital
- Need immediate contact with the 24/7 Consultant regarding Triage
- Increased requirement for Critical Care Paramedics (Advanced Care paramedics with increased skills) to enhance critical care transfers—the further away from hospital the greater the need would be
- Introduce an e-PCR to capture all critical trauma care in the pre-hospital emergency care services and incorporate the triage screens into receiving hospitals and the trauma desk at ambulance control

4) **Rehabilitation:**

- Significant under-resourcing and deficits for some Hospital Groups with NRH being so far away
- Need to scope/map out what's already there
- Community side is slowest to develop so Rehab (tail end of the system) could slow the whole thing down
- Quality of Life Survivorship is important
- Importance of Rehab being considered from the beginning of the care pathway
- Importance of home adaptations/care packages etc. being considered and implemented in a timely way

5) **Implementation Planning**

- Need to be clear up front about the 'price' being paid now through lack of Trauma System
- Concern regarding reality of full implementation of the Policy - how it will happen
- Detailed gap analysis required regarding Staffing/Resources/Training needs/Capital investment requirements etc.

- Increased theatre capacity, critical care facilities, beds, Emergency Department access, consultant capacity, specialist staffing, paramedic training, rehab services, psychological supports will be required
- Timing and process for 'competitive bid' for Dublin Major Trauma Centre important both for time for adequate preparation and investment planning
- Challenge for the Major Trauma Centre and implications of capacity and capability required to take on 250/300 acute major trauma patients and huge implications on critical care and rest of hospital functioning
- Need centralised budget for funding the health and social needs of patients and families following sustaining a traumatic injury (especially for stage of re-integration back into community)

6) Governance:

- Question as to Governance of the entire Trauma System and how it would be managed nationally in addition to the NTL, where Hospital Groups fit in and accountability of the Group in that context.
- Consideration to be given as to how reporting mechanisms work regarding Network Manager and hospitals – Does hospital end up reporting to 2 separate structures? Is there someone who is Lead and has Executive control with a budget?
- Clinical Leadership at Network level very important
- Acknowledged the critical importance of the National Trauma Lead post needing to be strategic and operational - needs to be structured to attract the right person and shaped so first allegiance is to Trauma

7) Considerations/Challenges for the Trauma System

- Data need to be reflective of the geographical area (West/North West – questionable whether East of England data appropriate) or that population will be hugely disadvantaged
- Lack of helicopter landing sites
- Need to ensure that existing services which have trauma & orthopaedics are retained
- Preserving theatre capacity is vital given need for trauma access
- Importance of maintaining surgeon in core expertise, while ensuring trauma service availability
- Protection of elective surgery is essential
- Huge training and additional capacity over time needed to ensure availability of specialists

Patient Focus Group

In June 2016, a focus group with six trauma service users (with spinal cord injuries) and two family members was conducted in the National Rehabilitation Hospital.

The importance of the rehabilitation phase of trauma care being considered at the beginning of the care process was highlighted. The importance of bringing patients to the hospital that best suits their requirements was also noted. The need for better non-clinical support as well as psychological support for both the patient and their family to aid coming to terms with diagnosis at acute stage of spinal cord injury was also raised.

Deficits in community rehabilitation were highlighted. The lack of community services was seen to be a cause of blocks in the system, whereby patients in the National Rehabilitation Hospital who were considered suitable for discharge could not go home due to a lack of supports in their communities. It was noted that the challenges for patient and family accessing home care packages can be hugely stressful, particularly given that funding comes from both the health 'pot' and the 'social care' pot. It was also suggested that a centralised budget for community rehab be established. The timeline for completion and cost of implementation of the Trauma System was also raised.

Appendix 3

Trauma Systems in Other Countries

United States

In 1966, the US National Academy of Sciences published the influential report titled *Accidental Death and Disability: The Neglected Disease of Modern Society*, more commonly known as The White Paper. This landmark report was vital in the development of the emergency medical services system in the US, leading to significant improvement in pre-hospital care, co-ordination of care within Trauma Systems, as well as a focus on functional rehabilitation.

Trauma centres in the US are ranked by the American College of Surgeons, from Level I (comprehensive service) to Level III (limited-care). The different levels refer to the resources available in a trauma centre and the number of patients admitted yearly. These are categories that define national standards for trauma care in hospitals. Level I and Level II designations are also given adult and/or pediatric designations. In the US, the earliest organised systems of trauma care were founded on two principal components: (1) Trauma care was concentrated within centres dedicated to the care of those with major trauma; and (2) Pre-hospital bypass protocols were in place to ensure that patients with major trauma were transported to the dedicated trauma centre, and not to the closest facility.

These systems typically served population-dense urban areas such that the designation of a relatively few number of Level I or II centres was sufficient to address local needs. With the increasing recognition of the burden of injury associated with trauma outside of these major metropolitan areas, including suburban and rural environments, it became evident that this 'exclusive' approach to trauma care was inadequate. To better serve the needs of the entire population, systems with an inclusive configuration were implemented.

Europe

Country	Population	Population Density	Major Trauma Centres
Ireland	4.7 million	67 per sq./km	0
Norway	4.9 million	15 per sq./km	4
England	65.5 million	413 per sq./km	27
Scotland	5.2 million	67.2 per sq./km	4 proposed
Victoria	4.9 million	25 per sq./km	3

Norway

In terms of population size, Norway, with a population of 4.9 million, bears some similarities to Ireland. However, it has a significantly lower population density (15 per sq./km) and a wide variation in same.

There are four Major Trauma Centres in Oslo and 37 smaller acute care hospitals. Because the population is so dispersed, the acute care hospitals, rather than the Major Trauma Centres, see the vast majority of trauma patients.

Geographic challenges necessitate extensive integration of ground, rotary-wing and fixed-wing ambulance services. Emergency Medical Communicating Centres (EMCS) triage patients to ground ambulances, air ambulances and on-call primary care doctors. The national air ambulance service consists of 12 primary air ambulance helicopters, which are manned by an anaesthesiologist, pilot and a paramedic. Seven fixed-wing aircraft are also available for use.

Most hospitals have a Trauma Team Activation system (TTA) to assess injured patients who meet specific physiological criteria. In Major Trauma Centres, this activation system shortens the time between arrival at the hospital and definitive care of patients that are critically ill. However, activation criteria differ greatly between individual hospitals and there is a lack of clarity on criteria for transfer to Major Trauma Centres. That said, the Norwegian system has produced good outcomes in a crisis situation (terrorist attacks in July 2011).

England

A number of reports have highlighted the need for better and more organised trauma care in the UK and in 2010 Trauma Networks were introduced, initially in London, followed by the roll-out of regional networks by NHS England in 2012. It is an inclusive system that is based on international guidelines. The key elements of this system are as follows:

- The **Trauma Network** is the name given to the collaboration between the providers commissioned to deliver trauma care services in a specific geographical area. There are 27 Trauma Networks serving a population of 65.5m. Each of the Trauma Networks includes all providers of trauma care, particularly: pre-hospital services, other hospitals receiving acute trauma admissions, and rehabilitation services. The Trauma Networks also have appropriate links to the social care and the voluntary/community sector.
- A **Major Trauma Centre is the hub of** each Trauma Network. The Major Trauma Centres are multi-specialty hospitals, on a single site, optimised for the provision of trauma care. They manage all types of injuries, providing consultant-level care. Each Major Trauma Centre is optimised for the definitive care of injured patients. The Major Trauma Centres provide all the major specialist services relevant to the care of major trauma, i.e. anaesthesia, general surgery, emergency medicine, vascular, orthopaedic, plastic, spinal, maxillofacial, cardiothoracic, neurosurgery and interventional radiology, along with appropriate supporting services, such as critical care. They also provide a managed transition to rehabilitation and the community. There are 27 Major Trauma Centres in England. Of these:
 - 11 treat both adults and children
 - 11 treat adults only
 - 5 treat children only
- **The Trauma Unit** is a hospital within a Trauma Network that provides care for most types of injuries. Depending on the injuries sustained, major trauma patients can be taken to these hospitals for definitive care rather than to the Major Trauma Centre.
- **The Local Emergency** Hospital is a hospital within a Trauma Network with an Emergency Department that does not have the required range of services or expertise to comprehensively manage every type of trauma patient. It treats other injuries and non-trauma related illnesses requiring urgent treatment.

Scotland

Trauma care in Scotland is similar to that in Ireland – it has a population of 5 million which is concentrated around four large cities and is serviced by approximately 30 acute care hospitals.

The Cabinet Secretary for Health and Sport set out a clear commitment in May 2016, to implement a bespoke Scottish Trauma Network (STN) comprising of an inclusive network of hospitals, four Major Trauma Centres and integrated network infrastructure. This commitment was subsequently included as a key outcome in the Programme for Government in 2016.

Over the next 3 to 5 years, the Scottish Government is to provide NHS Boards with significant additional investment to establish a Trauma Network in Scotland. It is proposed that the Scottish Trauma Network (STN) will be delivered through four regional networks, supported by an enhanced pre-hospital retrieval and transfer capacity. The STN will comprise four Major Trauma Centres that will offer the highest level of trauma care with dedicated trauma ward and specialist workforce capacity.

A network of Trauma Units (TU) will continue to manage moderate trauma across Scotland. Additionally, where patients are outside the 45 minute access threshold to a Major Trauma Centre (i.e. 14% of the population), they will be taken to the nearest Trauma Unit and if required, transferred to a Major Trauma Centre; 93% of the population of Scotland can reach a Major Trauma Centre or Trauma Unit within 45 minutes by road.

The enhanced pre-hospital component of the STN will ensure patients reach definitive trauma care more rapidly. It is also proposed that a single national triage tool will be used to help early identification of trauma patients and ensure that the care for trauma patients is coordinated through a 24/7 trauma desk within ambulance control centre.

Victoria (Australia)

The population of the State of Victoria is 4.9 million and although population density is highest in urban areas, the incidence of trauma is most prevalent in rural areas due to increased travel distances and poor road conditions. Victoria introduced the Victoria State Trauma System in 2000. The system is based on the designation of two adult hospitals and one paediatric hospital as Major Trauma Centres, with other Victorian hospitals assigned to levels within a tiered structure that reflect their different capabilities in trauma management. Key elements of this system include

- Co-ordination of pre-hospital and acute care service
- defined triage guidelines for transporting patients to Major Trauma Services hospitals
- statewide system of major trauma response through Adult Retrieval Victoria and Paediatric Infant Perinatal Emergency Retrieval
- a Ministerial committee and subcommittee to oversee the Trauma System

The Adult Retrieval Service operated by Ambulance Victoria (Metropolitan Ambulance Service, Air Ambulance Victoria and Rural Ambulance Victoria) coordinates critical care services in the state together with patient retrieval and transfer to other units, as appropriate.

Appendix 4

Studies on the effectiveness of Trauma Systems and Major Trauma Centres

Study & Year	Country	Topic Area	Findings
Brown et al 2016	USA	Trauma System Effectiveness	Aim: To evaluate the association of trauma centre volume change over time with mortality Increasing volume was associated with improving outcomes, whereas decreasing volume was associated with worsening outcomes. High-level trauma centre infrastructure seems to facilitate the volume-outcome relationship
Cameron et al 2008	Australia	Trauma System Effectiveness	Aim: To determine whether the state wide system of trauma care introduced in 2000 has resulted in improved in-hospital mortality for all major trauma patients in Victoria, Australia. All patients with a severity score above 15 were included. It was found that there was a significant reduction in the risk of death for patients treated in the Trauma System.
Celso et al 2006	USA	Trauma System Effectiveness	Aim: systematic review to assess if outcomes from severe traumatic injury is improved for patients following the establishment of a Trauma System The results of the meta-analysis showed a 15% reduction in mortality in favour of the presence of a Trauma System.
Cohen et al 1999	USA	Trauma System Effectiveness	Aim: To determine the impact of a dedicated trauma service on cost and quality of care in an urban teaching college. The trauma service resulted in a significant increase in the severity of injuries, a highly significant increase in the mean probability of death but no actual change in mortality, i.e. a positive impact on the quality of care.
Cornwell et al 2003	USA	Major Trauma Centres	Aim: To determine if the implementation of a program commitment at a trauma centre is associated with improvements in process of care and patient outcomes. The implementation of a full-time trauma service in a level 1 trauma centre is associated with improved timeliness of triage and therapeutic interventions and improved patient outcomes.
Davenport et al 2009	UK	Major Trauma Centres	Aim: To determine if the institution of a specialist multidisciplinary trauma service and performance improvement programme resulted in improved outcomes for severely injured patients. Institution of a specialist multidisciplinary trauma service and performance improvement programme was associated with significant improvements in outcomes.
Demetriades et al 2005	USA	Major Trauma Centres	Aim: To investigate the effect of trauma centre designation and trauma volume on outcome in patients with specific severe injuries. Level 1 trauma centres have better outcomes than lower-level centres in patients with specific injuries associated with higher mortality and poor functional outcomes. The volume of major trauma admissions does not influence outcome in either level 1 or level II centres.

Study & Year	Country	Topic Area	Findings
Dinh et al 2015	Australia	Trauma System Effectiveness	Aim: To estimate the cost-effectiveness of trauma service funding enhancements at an inner city Major Trauma Centre. A trauma quality improvement program initiated at an Australian Major Trauma Centre was found to be cost-effective over 12 years with respect to years of life saved in road trauma patients.
Durham et al 2006	USA	Trauma System Effectiveness	Aim: Determine if treatment at a trauma centre versus a non trauma centre improves survival, is the Trauma System cost effective and is access to the Trauma System equitable? Treatment at a trauma centre was found to be associated with an 18% reduction in mortality. Cost/life year saved was favourable when compared with societal expenditures for other health problems.
Gabbe et al 2011	Australia and UK	Trauma System Effectiveness	Aim: To compare outcomes following major trauma involving serious head injury managed in an inclusive system (Victoria, Australia) and a setting with no Trauma System (UK) – Timeframe of study 2000-2006 Management of the severely injured patient with an associated head injury in England and Wales, where an organised Trauma System was absent, was associated with an increased risk-adjusted mortality.
Haas et al 2009	USA	Major Trauma Centres	Aim: Examine the relationship between trauma centre care, rapidity of assessment and intervention, and mortality among trauma patients with indications for immediate operative intervention. Risk of death is considerably lower among patients requiring early operative intervention if they are treated at a designated Level 1 trauma centre
Haider et al 2013	USA and France		Aim: To compare mortality outcomes between patients treated at a trauma centre in France and matched patients in the United States. Trauma patients admitted to a single French trauma centre had an equal chance of survival compared to similarly injured patients treated at U.S. trauma centres.
Henderson et al 2000	USA		Aim: To analyse if the process of care may improve quality of care within a trauma system. The time to emergency trauma laparotomy may be used effectively as an audit of process for the clinical governance of a trauma system.
Hipps et al 2015	England	Trauma System Effectiveness	Aim: To determine how the introduction of the Trauma Network affected patient flow, hospital finances and orthopaedic trauma training across a region. The overall pattern of trauma distribution was not greatly affected, reflecting the relative rarity of major trauma in the UK

Study & Year	Country	Topic Area	Findings
Kuimi et al, 2015.	Canada	Trauma System Effectiveness	Aim: to evaluate the influence of access to an integrated Trauma System on in-hospital mortality and length of stay. Results provide evidence that in a health system with an integrated mature Trauma System, access to specialised trauma care is high and the small proportion of patients treated outside the system have similar mortality and length of stay compared to patients within the system.
Lansink et al 2013	Netherlands	Major Trauma Centres	Aim: to present the outcomes of patients treated during the course of further maturation of a level 1 trauma centre. Maturation of the trauma centre and the Trauma System resulted in improved patient outcomes. A significant increase in unexpected survivors was noted, and shorter hospital stay and ICU stay were achieved.
Liberman et al 2005	Canada	Trauma System effectiveness	Aim: To understand the association between various components that make up a Trauma System and outcome Pre-hospital notification protocols and performance improvement programs appear to be most associated with decreased risk-adjusted odds of death.
MacKenzie et al 2006	USA	Major Trauma Centres	Aim: To examine the effect of care in a trauma centre on risk of death. After adjustment for differences in the case mix between trauma centres and non-trauma centres, the risk of death within one year after injury was significantly lower when care was provided in a trauma centre than when care was provided in a non-trauma centre.
MacKenzie et al 2010	USA	Cost-effectiveness	Aim: To estimate the cost-effectiveness of treatment at a Level 1 trauma centre compared with a non-trauma centre. Treatment at a trauma centre was cost-effective. Cost-effectiveness was more favourable for patients with injuries of higher versus lower severity and for younger versus older patients.
Metcalfe et al 2014	England	Major Trauma Centres	Aim: to evaluate how a regional Trauma Network affected trends in admissions, case mix and outcomes of injured patients. Limitation: timeframe was six months before and after launch of new Trauma Network There were no significant differences in total duration of hospital stay, critical care requirements or mortality. There was a significant increase (55.5% to 62.3%) in the proportion of patients coded as having a “good recovery” at discharge.
Minei et al 2014	USA	Major Trauma Centres	Aim: To investigate the relationship between trauma centre volume on outcome Increased trauma centre volume was associated with increased survival, more ventilator free days and less severe organ failure. Trauma System planning and implementation should avoid unnecessary duplication of services.

Study & Year	Country	Topic Area	Findings
Nathans et al 2001	USA	Trauma System Effectiveness	Aim: to evaluate the effectiveness of state Trauma Systems in reducing injury-related mortality in the USA. Injury mortality rates were compared between states with trauma systems and states without. States with Trauma Systems had lower mortality rates than states without Trauma Systems.
Nathans et al 2001	USA and France	Major Trauma Centres	Aim: To evaluate the association between trauma centre volume and outcomes of trauma patients A strong association exists between trauma centre volumes and outcomes, with significant improvements in mortality and length of stay when volume exceeds 650 cases per year. The benefits are only evident in patients at high risk for adverse outcomes.
Rotondo et al 2009	USA	Cost-effectiveness	Aim: To examine the price of commitment and outcomes at a Level 1 Trauma Centre Resources for programme development significantly reduced mortality. Cost per saved life \$87,000
Sampalis et al 1999	Canada	Trauma System effectiveness	Aim: to evaluate the impact of trauma care regionalisation on the mortality of major trauma patients. The integration of trauma care services into a regionalised system reduces mortality. The results showed that tertiary trauma centres and reduced pre-hospital times are the essential components of an efficient trauma care system.
Séguin et al 1999	Canada	Cost-effectiveness	Aim: To determine the average cost per QALY gained of treating trauma victims at a tertiary trauma hospital and to determine the cost-effectiveness of trauma care at this centre. The results suggest that tertiary trauma care is cost-effective and less costly than treatment programs for other disease conditions.
Spijkers et al 2010	Netherlands	Major Trauma Centres	Aim: To compare outcomes of trauma patients during two separate time periods in a Level 1 trauma centre, before and after obtaining trauma centre status The implementation of a trauma centre reduces mortality, shortens hospital stay, and decreases the number of intensive care unit admittances.
Twijnstra et al 2010	Netherlands	Trauma System effectiveness	Aim: To evaluate the effect of the introduction of a regionalised Trauma System. Implementation of an inclusive Trauma System in the Netherlands results in a more efficient triage system of trauma patients among hospitals and is associated with a substantial and statistically significant risk reduction (16%) of death.

Study & Year	Country	Topic Area	Findings
Ursic et al 2009	Australia	Major Trauma Centres	<p>Aim: To evaluate the association between implementation of a single, dedicated trauma admitting service at an urban trauma centre and subsequent patient outcomes.</p> <p>The implementation of a full-time trauma service in this hospital was associated with a reduction in death rate among the most severely injured patients, and a decrease in LOS in patients with an ISS < 15.</p>
Utter et al 2006	USA	Trauma System Effectiveness	<p>Aim: To compare the rates of triage to a regional trauma centre and inpatient death in inclusive states relative to exclusive states, while adjusting for patient and state level factors.</p> <p>Severely injured trauma patients have greater inpatient survival in inclusive Trauma Systems even though they are no more likely to be hospitalized at a regional trauma centre.</p>
Westhoff et al 2003	Germany	Description of Trauma System	<p>Aim: To describe the trauma system in Germany</p>
Zarza et al 2010	USA	Cost-effectiveness	<p>Aim: to evaluate the cost per 2-year survivor stratified by age after moderate-to severe-nonneurologic injury.</p> <p>Although costs are similar by age at time of discharge, cost per 2-year survivor increases as age increases.</p>

Appendix 5

Hospitals by Model Type

Hospital	Model
BEAUMONT HOSPITAL	4
CORK UNIVERSITY HOSPITAL	4
GALWAY UNIVERSITY HOSPITAL	4
LIMERICK REGIONAL HOSPITAL	4
TALLAGHT HOSPITAL	4
MATER HOSPITAL	4
ST JAMES'S HOSPITAL	4
ST VINCENT'S HOSPITAL	4
WATERFORD REGIONAL HOSPITAL	4
CAVAN/MONAGHAN HOSPITAL	3
CONNOLLY HOSPITAL	3
DROGHEDA HOSPITAL	3
KERRY HOSPITAL	3
LETTERKENNY HOSPITAL	3
MAYO HOSPITAL	3
MERCY HOSPITAL	3
MULLINGAR HOSPITAL	3
NAAS HOSPITAL	3
PORTIUNCULA HOSPITAL	3
PORTLAOISE HOSPITAL	3
SLIGO HOSPITAL	3
SOUTH TIPPERARY HOSPITAL	3
ST LUKE'S HOSPITAL KILKENNY	3
TULLAMORE HOSPITAL	3
WEXFORD HOSPITAL	3
NAVAN HOSPITAL	3
BANTRY HOSPITAL	2
DUNDALK HOSPITAL	2
ENNIS HOSPITAL	2
LOUGHLINSTOWN HOSPITAL	2
MALLOW HOSPITAL	2
NENAGH HOSPITAL	2
ROSCOMMON HOSPITAL	2
SOUTH INFIRMARY/VICTORIA HOSPITAL	2
ST JOHN'S HOSPITAL	2
ST MICHAEL'S HOSPITAL	2

Model Type

Model 1 (community/district hospital)

Model 2 (ambulatory care, diagnostics, selected medical inpatients, medical assessment and local injuries unit)

Model 2S (as for Model 2 plus intermediate elective surgery)

Model 3 (undifferentiated acute medical and surgical patients, Emergency Department and intensive care)

Model 4 (University Teaching Hospital – as for Model 3 plus tertiary referral and higher-level intensive care)

Specialty Hospital (stand-alone maternity, orthopaedic or other specialty hospital)

Appendix 6

Recommended Designation Criteria for Major Trauma Centres and Trauma Units

1.	<p>Trauma Team Leader</p> <p>In relation to the position of team lead, there should be a roster whereby appropriately trained and credentialed consultants working in the network can opt in or out of the roster. It is important that sufficient consultants in a Major Trauma Centre agree to fulfil the role of trauma team leader in order to maintain sustainability of the roster and maintain designation of the hospital as a Major Trauma Centre.</p> <p>The Major Trauma Centre trauma team lead roster should be made up of Consultants from Emergency Medicine, Trauma and Orthopaedics, General Surgery, Anaesthesia or Critical Care.</p>
2.	<p>Trauma Team Leader Training</p> <p>The trauma team leaders should have relevant training in, and competence assessment in, crew resource management, team leading and the assessment and management of major trauma – courses are currently delivered in each of these areas but it would be appropriate to initiate a bespoke course covering all of these areas to assure the certification of competence in the specific context of leading a trauma team in a Major Trauma Centre.</p>
3.	<p>Trauma Nurse</p> <p>Registered Advanced Nurse Practitioner and Clinical Nurse Specialist Services should commence in the Reception and Intervention phase with deployment of these services across the trauma care pathway.</p> <p>There should be a designated Trauma Nurse Coordinator (Minimum Grade CNM3) to ensure a patient focused coordinated trauma service from first point of contact (Reception and Intervention) through to Rehabilitation.</p> <p>The trauma team should include a minimum of three Emergency Department experienced nurses, at least one of whom should be of CNM2 grade or higher, familiar with the particular resuscitation room environment and the location, setup and use of equipment to perform such procedures, a healthcare assistant and a porter.</p>

4.	<p>Trauma Team Activation Protocol</p> <p>There should be a pre-alert system with effective communication between pre-hospital and in-hospital teams as part of a region-wide network, including documented criteria for trauma team activation and patient handover.</p> <p>There should be scalable criteria for the activation of trauma teams, to ensure that executive authority is given to the appropriate staff to form a trauma team, at an appropriate level of experience and numbers, whilst attempting to minimise trauma team activation where it is clearly unnecessary. This is entirely different to deciding to “wait and see when the patient arrives” after the receipt of an appropriate pre-hospital alert.</p> <p>All Major Trauma Centres should have a specific trauma service, whereby the patient admitted following trauma team activation is admitted under a named consultant who is responsible for overseeing their optimal care until or unless agreement is reached with another consultant that the nature of the patient’s injuries makes it appropriate for their admission under a particular specialty. The named trauma receiving consultant would be as per an agreed roster for the trauma service, separate to all other on-call rosters.</p> <p>All Major Trauma Centres should have a specific ward receiving area (the size of which would be dictated by the anticipated workload), including appropriate provision for a high dependency area, for patients admitted following a trauma team activation who do not need to be admitted to an intensive care unit. It is essential that this ward receiving area is not used for the admission of patients other than those who have been the subject of trauma team activation.</p> <p>A Radiologist should be alerted of trauma team activation to advise on advanced diagnostic imaging and be available for its interpretation as soon as possible.</p> <p>The Assistant Director of Nursing / Divisional Nurse Manager (including out of hours) for Critical Care and Operating Theatres should be included in the trauma team activation to prioritise preparation for patient reception as appropriate.</p> <p>A member of clerical staff should also be included in the trauma team activation, to expedite the acquisition of a unique medical record number identified patient, even before their identity is known. This optimises the speed with which investigations can be performed and blood products administered. Laboratory staff should be included in the notification of trauma team activation. Laboratory work needs to be prioritised for the trauma patient.</p>
5.	<p>24/7 Surgical and Resuscitative Thoracotomy Capability</p> <p>There should be a surgical and resuscitative thoracotomy capability within the trauma team and available 24/7.</p>
6.	<p>24/7 CT Scanner Facilities and on-site Radiographer</p> <p>The Trauma team consultant lead should identify the requirement for all diagnostic imaging other than plain x-rays. If the trauma team leader is otherwise occupied the request for CT studies or other complex Radiology examinations can be delegated to another consultant from the Trauma team. All requests for Radiology examinations (except plain films) should be made on a consultant-to-consultant basis in MTCs in the Radiology Dept is a consultant-only delivered service (i.e. without Radiology trainees). The call should be made as close to the resuscitation as possible, to allow the trauma team leader to respond to any queries from the radiologist.</p> <p>There should be a CT scanner in the Emergency Department, with the necessary support to allow immediate availability.</p>

7.	<p>CT Reporting</p> <p>Rapid turnaround of radiology reporting should be available (electronically if necessary, with the issuing of a finalised report within one hour of completion of the scan).</p>
8.	<p>24/7 MRI Scanning Facilities</p> <p>MRI should be available 24/7 within the MTC (high spec machines)</p>
9.	<p>24/7 Access to Emergency Theatre and Surgery</p> <p>There should be 24/7 immediate availability of fully staffed operating theatres</p> <p>Neurosurgical and Cardiothoracic surgery capabilities, including facilities to place the patient on cardiopulmonary bypass should be available 24/7. An operating microscope must also be available at all times.</p>
10.	<p>Transfusion Protocol</p> <p>There should be a protocol for the management of massive transfusion in patients with significant haemorrhage.</p>
11.	<p>Damage Control Training for Emergency Trauma Consultant Surgeons</p> <p>All general surgeons who are on the emergency surgery rota should be trained in the principles and techniques of damage control surgery</p>
12.	<p>24/7 Access to On-site Surgical Staff and Consultant Specialists</p> <p>A trauma team should include members of each of the specialties of emergency medicine, orthopaedics, general surgery and anaesthesia/intensive care 24/7 and prescribed response times for specialties that may or may not be needed; Neurosurgery; Spinal and spinal cord surgery; Vascular surgery; Cardiothoracic surgery; Plastic surgery; Maxillofacial surgery; Ear Nose and Throat surgery; Diagnostic Radiology, Interventional radiology; Intensive care (Senior trainees in all relevant specialties resident 24/7 and their consultants available for physical attendance within 30 minutes of call-out).</p> <p>The minimum number of other doctors on the trauma team should be four and they should include senior trainees or consultants appropriately credentialed in the management of major trauma. The team should be capable of providing advanced airway management, resuscitative thoracotomy and other bedside procedures relating to the immediate management of chest, abdominal, pelvic, head, spinal and limb trauma.</p> <p>In the case of Diagnostic Radiologists, the appropriate sub-specialists are those with special interest in Emergency Radiology or Musculoskeletal Radiology, and there should at least 4 whole time equivalents of these per MTC.</p> <p>The trauma team should include a Radiographer in the Emergency Department and CT radiographer on-site 24/7. A practitioner accredited to perform and interpret FAST ultrasound must be a member of the core trauma team.</p> <p>There should be 24/7 access to specialist trained, experienced operating theatre nurses.</p>

13.	<p>Dedicated Orthopaedic Trauma Operating Theatres</p> <p>Operating theatres should be promptly available to allow for emergency operative procedures such as open fracture debridement and stabilization, external fixator placement and compartment decompression.</p> <p>Sufficient and timely operating theatre access for semi-urgent surgical treatment of musculoskeletal injuries that do not require emergency care out-of-hours should be provided.</p> <p>There should be next day access to Health and Social Care Professionals (e.g. physiotherapists and occupational therapists) and early access to specialists in rehabilitation medicine.</p>
14.	<p>Provision of Surgeons and Facilities for Fixation of Pelvic Ring Injuries</p> <p>There should be specialist surgeons and facilities (theatre/equipment) to provide fixation of pelvic ring injuries within 24 hours.</p> <p>There should be cover arrangements in place for holidays and planned absences.</p>
15.	<p>Trauma Management Guidelines</p> <p>There should be a major trauma service led by consultants which takes responsibility for the holistic care and co-ordination of management of every individual major trauma patient on a daily basis.</p>
16.	<p>Critical Care Provision</p> <p>There should be designated ICU and ICU specialist nurses available for trauma in line with the Critical Care Programme model of care.</p>
17.	<p>24/7 Specialist Acute Pain Service</p> <p>MTCs should have a specialist acute pain service (ROC)</p>
18.	<p>Administration of Tranexamic Acid</p> <p>Patients with significant haemorrhage should be administered Tranexamic Acid within 3 hours of injury and receive a second dose according to CRASH-2 protocol.</p>
19.	<p>Infrastructure</p> <p>The MTC should have a dedicated trauma ward to facilitate admission of patients with a number of multisystem injuries when there is no single dominant injury mandating management in a specialised area for that injury.</p> <p>There should be a named, appropriately trained, consultant responsible for the trauma ward at all times</p> <p>There should to be adequately sized trauma bays in the resuscitation room, with beds of an appropriate type, with an adjacent hybrid suite, to allow immediate access to interventional radiology and/or surgical access to body cavities as required</p> <p>The MTC should have adequate equipment to deal with anticipated patient need, including rapid fluid infusers, body temperature control, intra-operative fluoroscopy and plain films, fracture fixation, bronchoscopy and gastrointestinal endoscopy.</p> <p>In MTCs, laboratory services should be immediately available on site 24/7, supported by a Transfusion Specialist / Haematologist. The blood bank must have adequate in-house supplies of red blood cells, fresh frozen plasma, platelets, cryoprecipitate and appropriate coagulation factors to deal with activation of an agreed Network Massive Transfusion Protocol. O-negative blood needs to be available in the Emergency Department resuscitation room.</p>

Reconstruction and Ongoing Care	
20.	<p>Major Trauma Centre Lead Clinician</p> <p>Within Major Trauma Centres, patients' care should be overseen and coordinated by a Trauma Service. All major trauma patients should be admitted under the primary care of one of the Trauma Service consultants.</p>
21.	<p>Major Trauma Service</p> <p>There should be a major trauma service led by consultants which takes responsibility for the holistic care and co-ordination of management of every individual major trauma patient on a daily basis.</p>
22.	<p>Major Trauma Coordinator Service</p> <p>Co-ordination of medical, nursing and rehabilitation packages of care is crucial. The Trauma Service should include a care and rehabilitation coordinator (Major Trauma Coordinator) who is responsible for co-ordination and communication regarding the patient's current and future care and rehabilitation.</p>
23.	<p>Major Trauma MDT meeting</p> <p>There should be a single daily multi-specialty meeting for the presentation and discussion of all new major trauma patients following admission.</p> <p>The meeting should include:</p> <ul style="list-style-type: none"> • a trauma coordinator • a physiotherapist • CNS/RANP • clinical staff for: <ul style="list-style-type: none"> – major trauma service – orthopaedics – general surgery – neurosurgery – critical care – radiology <p>Accommodation for the meeting should include facilities for:</p> <ul style="list-style-type: none"> – Video/teleconferencing – PACS
24.	<p>Dedicated Major Trauma Ward or Clinical Area</p> <p>The MTC should have a dedicated trauma ward to facilitate admission of patients with a number of multi-system injuries when there is no single dominant injury mandating management in a specialised area for that injury (RI).</p> <p>There should be access to dedicated, separate, fully resourced day-time operating theatres for trauma and reconstructive surgery.</p> <p>Hospitals with obstetric services should have a separate operating theatre staffed by anaesthetists who are not part of the general emergency on-call rota.</p>
25.	<p>Formal Tertiary Survey</p> <p>All major trauma patients should have a formal tertiary survey completed to identify missed injuries.</p>

26.	<p>Nursing</p> <p>A critical mass of experienced, trained staff with appropriate skill-mix should be developed</p>
27.	<p>Radiology and Interventional Radiology</p> <p>24-hour access to CT, MRI, ultrasound, interventional radiology and angiography in should be provided in Major Trauma Centres.</p> <p>Universal access to PACS should be provided across networks, using compatible systems.</p>
28.	<p>Critical Care</p> <p>Critically ill patients should have timely and safe access to adequate critical care bed capacity and 24-hour care from dedicated intensive care consultants, supported by multidisciplinary staff, to achieve good outcomes.</p> <p>Critical care units should be part of critical care network and audited nationally.</p>
29.	<p>Pain management</p> <p>Analgesia should be initiated early in the pre-hospital phase, and on an ongoing basis throughout trauma management process.</p> <p>All hospitals taking trauma patients should have a specialist acute pain service, inclusive of CNS/RANP</p>
30.	<p>Management of Neurosurgical Trauma</p> <p>The prevention of complications arising from neurological compromise should begin immediately and involves all members of the multi-disciplinary team.</p> <p>Neurosurgical specialist care should be continuously available for all TBI patients and a consultant must be able to attend the MTC within 30 minutes of first contact.</p> <p>Consultant Neurosurgeons should be available for consultation to the Trauma Network 24 hours a day and ongoing care of patients with severe head should be managed in a neurosciences centre, irrespective of the need for surgical intervention.</p> <p>Patients requiring immediate neurosurgical intervention should have surgery within 2 hours of arrival in the MTC (or within 2 hours of deterioration), or sooner, depending on the competing needs of resuscitation, haemodynamic stability, coagulation status and management of other injuries.</p> <p>Traumatic brain injuries should be managed as per published recommendations. Opinions should be sought from neurology and neuroradiology with a clear definition of areas of clinical responsibility amongst the various neurological specialties.</p>
31.	<p>Management of Cranofacial Trauma</p> <p>Craniofacial trauma should be concentrated in Major Trauma Centres, usually co-located with neurosurgical units.</p>

32.	<p>Management of Spinal Injuries</p> <p>The prevention of complications arising from spinal instability should begin immediately and involves all members of the multi-disciplinary team. If there is significant spinal cord injury, early contact should be made with a spinal cord injury centre for advice and to plan strategy.</p> <p>Consultant spinal surgeons should be available for consultation to the Trauma Network 24 hours a day.</p> <p>Clearly defined protocols should be in place to facilitate the transfer of patients with spinal cord injury to a dedicated spinal cord injury centre.</p> <p>The spinal cord injury centre should have immediate availability of urgent neuraxial imaging-CT, MRI and plain films 24/7, as well as operating facilities with a spinal operating table, surgical navigation and spinal cord monitoring.</p> <p>Anaesthetists with experience in techniques of fiberoptic intubation and nursing and intensive care staff with experience of managing patients with spinal cord injury should be available.</p> <p>Given the common co-existence of spinal injury with major trauma, it would be ideal for the acute spinal service to be co-located with a Major Trauma Centre.</p>
33.	<p>Management of Musculoskeletal Trauma</p> <p>Operating theatres should be promptly available to allow for emergency operative procedures such as open fracture debridement and stabilization, external fixator placement and compartment decompression.</p> <p>There should be next day access to Health and Social Care Professionals (e.g. physiotherapists and occupational therapists) and early access to specialists in rehabilitation medicine.</p> <p>Facilities should exist that allow early definitive fixation of pelvic and long bone injuries.</p> <p>Treatment planning and surgery for complex intra-articular injuries should both be performed by an orthopaedic trauma specialist.</p> <p>Compliance with published standards for the management of open fractures should be facilitated by daily access to appropriate theatres that can be simultaneously staffed with both senior orthopaedic and plastic surgeons with the requisite skills to treat these challenging cases.</p> <p>Definitive planned surgery for amputations should be performed in consultation with rehabilitation and prosthetic services.</p> <p>In addition to the treatment of injuries, older people require specific age related considerations. Joint care with ortho-geriatric support is important. A consultant geriatrician with expertise in the management of the geriatric patient should evaluate the elderly trauma patient early following hospitalisation, and prior to complications developing.</p>
34.	<p>Management of Hand Trauma</p> <p>In relation to hand injuries, there should be expertise in microvascular surgery and the management of tissue loss. Major Trauma Centres should have a combination of plastic surgeons and orthopaedic surgeons in the hand surgery team. A hand therapy unit manned by specialist therapists is fundamental to achieving a good result following hand trauma.</p>

35.	Management of Complex Peripheral Nerve Injuries Complex peripheral nerve, such as brachial plexus injuries, should be managed in specialist units.
36.	Management of Maxillofacial Trauma Major Trauma Centres should provide round the clock consultant led care with immediate specialist maxillofacial technical support.
37.	Pneumothoraces, chest pain and tracheostomies Pneumothoraces, chest drain and tracheostomies should be managed in line with published guidelines. There should be twenty-four hour access to respiratory physiotherapy, including out of hours on call service.
38.	Vascular and Endovascular Surgery Facilities should be in place in Major Trauma Centres to provide major vascular and endovascular surgery. Injuries to the kidney and urinary tract are often complex and should be identified early and managed in conjunction with urologists as per published recommendations.
39.	Designated Specialist Burns Care The MTC should must be able to provide acute care for people All large burns (>10% TBSA) should be transferred to the National Burns Unit. Burn care should be managed through the designation of this specialist tertiary burns centre, supporting burns units and some local burns' services. Multi-professional outpatient burns services are essential to ensure optimum ongoing management and outcomes after discharge.
40.	Patient Transfer There should be cross network agreements and adequate resources to ensure that once specialist medical care has been completed, patients can be transferred to the care of a service which is able to meet their ongoing care and rehabilitation needs.
41.	Network Patient Repatriation Policy The MTC should agree the network policy for the repatriation of patients.
42.	Specialist Dietetic Support Policies for nutritional management should be in place in Major Trauma Centres.
43.	Rehabilitation Patients' rehabilitation needs should be established. MTCs should provide enhanced rehabilitation services to meet needs of complex trauma patients.

44.	<p>24/7 Access to Psychiatric Advice</p> <p>Neuropsychology and neuropsychiatry</p> <ul style="list-style-type: none"> Post-traumatic amnesia (PTA) screening and monitoring should be routine in all major trauma patients. <p>Psychosocial care</p> <ul style="list-style-type: none"> Psychosocial resilience of all patients should be sustained. <p>Mental Health Care</p> <ul style="list-style-type: none"> There should be more substantial interventions for selected patients who suffer more significant and/or persistent distress. Mental healthcare should be provided for those patients who have a pre-existing, or who have developed a mental disorder.
45.	<p>Patient Information</p> <p>The patient and or their family/carers should be provided with written information specific to the MTC about the facilities, care and rehabilitation.</p>
46.	<p>Patient Experience</p> <p>The MTC should participate in the TARN PROMS and PREMS</p>
47.	<p>Discharge Summary</p> <p>A discharge summary describing the patient's injuries, care received and ongoing needs and plans should be provided at the time of discharge or transfer from a Major Trauma Centre. This should include a rehabilitation prescription.</p>

Rehabilitation

48.	<p>Clinical Lead for Acute Trauma Rehabilitation Services</p> <p>A Trauma Network Director of Rehabilitation (TDR) should be appointed to ensure rehabilitation remains a priority for the network and that trauma patients receive appropriate levels of rehabilitation at all points along their care pathway in line with the principle of 'right treatment by the right person at the right time'.</p> <p>A Trauma Network Director of Rehabilitation with a relevant clinical background should be appointed to:</p> <ul style="list-style-type: none"> Provide clinical leadership and governance; Be responsible for the development of services towards an integrated care model; Carry out a services-review and establish baseline service and existing gaps; Lead audit development, to establish, monitor and analyse rehabilitation outcomes; Ensure a coordinated process whereby patients pass from acute care to rehabilitation services and onto primary, community and continuing care across the network; Ensure that rehabilitation requirements are prioritised. <p>Key areas of responsibility:</p> <ul style="list-style-type: none"> To ensure rapid access to specialist senior opinion (e.g. medical, surgical, nursing, therapy) as required; To ensure the timely movement of patients through the network as rehabilitation needs change; To develop a seamless pathway between hospitals, rehabilitation, community and continuing care; To lead the development of community-based rehabilitation services, including vocational rehabilitation, longterm independent community living supports and community based rehabilitation services.
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49.	<p>Specialist Rehabilitation Team</p> <p>Within a MTC, there should be an acute trauma rehabilitation team, which is part of the wider trauma Service. This team should be responsible for the organisation and delivery of rehabilitation services to trauma patients with multiple injuries or complex rehabilitation issues. It should include a rehabilitation medicine consultant and the appropriate representatives from medical, nursing and health and social care services, including:</p> <ul style="list-style-type: none"> • Specialist nurses • Care assistants • Physiotherapists • Rehabilitation medicine • Occupational therapists • Speech and language therapists • Dietitians • Psychiatry • Social workers • Clinical psychologists/ Neuropsychologists • Associated support staff & therapists
50.	<p>Rehabilitation Coordinator Post</p> <p>The Rehabilitation Coordinator (s) with experience in trauma and of multi-disciplinary management will coordinate rehabilitation activities and requires a commitment to interdisciplinary working, organising early multi-disciplinary team meetings, with the patient and their carer should be considered a mandatory element of patient care. These meetings should take place at appropriate frequency throughout a patient's care pathway¹⁸ and should be attended by the consultant accredited in rehabilitation medicine, the Trauma Coordinator, and the full acute rehabilitation multidisciplinary team.</p>
51.	<p>Specialist Rehabilitation Pathways</p> <p>There should be referral pathways for patients requiring specialist rehabilitation for;</p> <ul style="list-style-type: none"> • neurological injuries, including brain injuries • spinal injuries • complex musculoskeletal injuries • return to work (vocational rehabilitation) for patients with and without brain injury
52.	<p>Key worker</p> <p>A key worker approach should be adopted within the rehabilitation team, to promote an environment where the patient and family feel able to discuss any areas of concern/issues and be confident that action will take place as necessary. This role also supports the communication between the family (or chosen advocates) and the rehabilitation team.</p>
53.	<p>Rehabilitation Assessment and Prescriptions</p> <p>Rehabilitation should start in the critical care setting to allow the patient the best possible opportunity to achieve their physical, cognitive, psychosocial and functional potential. Every patient should undergo routine assessment of their rehabilitation needs within 48 hours of admission through the completion of a flexible rehabilitation prescription that should accompany all patients as they transition through the pathway.</p>
54.	<p>Rehabilitation for Traumatic Amputation</p> <p>There should be a rehabilitation program for patients with a traumatic amputation which includes:</p> <ul style="list-style-type: none"> • a linked prosthetics centre which provides an out-reach service to see patients with amputation; • pain management of acute amputation, including phantom limb pain.
55.	<p>Referral Guidelines to Rehabilitation Services</p> <p>The MTC should agree the network referral guidelines for access to rehabilitation services</p>

56.	<p>Clinical Psychologist for Trauma Rehabilitation</p> <p>The trauma rehabilitation service should include a clinical psychologist for the assessment and treatment of major trauma patients.</p> <p>Inpatient and outpatient clinical psychology services should be available.</p>
57.	<p>BSRM Core Standards for Specialist Rehabilitation in the Trauma Pathway</p> <p>For patients identified as having category A or B needs, & so potentially requiring specialist (Level 1 or 2) rehabilitation, the following datasets should be completed as part of the “Specialist Rehabilitation Prescription”, and should be completed by a consultant in Rehabilitation Medicine or their designated deputy:</p> <ul style="list-style-type: none"> • Patient Categorisation Tool or Complex Need Checklist; • RCS-E or RCS-ET (dependent on MTC & Network arrangements); • Northwick Park dependency Score; • Neurological & Trauma Impairment Set. <p>Where specialist rehabilitation is not provided at the MTC, and patients are transferred to TUs or other hospitals, the Specialist RP must be updated at the point of discharge from the MTC.</p> <p>The MTC should also participate in the National Clinical Audit of Specialist Rehabilitation for Patients Following Major Injury.</p>

RECOMMENDED DESIGNATION CRITERIA –TRAUMA UNITS

Reception and Intervention	
1.	<p>Trauma Team Leader</p> <p>The trauma team should be led by a Consultant from one of emergency medicine, orthopaedics, general surgery or anaesthesia/critical care. While the “counsel of perfection” would be to have the team led by a consultant who is physically present 24/7/52, it was recognised that this is not yet the case (in Trauma Unit equivalents) in other jurisdictions with established Trauma Networks, such as UK and Australia. It was agreed that the team could be led by a senior Registrar (5th / 6th year trainee) with a consultant available within 30 minutes of receiving notification of imminent arrival patient from pre-hospital alert.</p> <p>In relation to the position of TU team lead, there should be a roster whereby consultants can opt in or out of inclusion on the roster. It is important that sufficient consultants in any region agree to fulfil the role of trauma team leader in order to maintain sustainability of the roster and maintain designation of the hospital as a TU.</p> <p>The TU trauma team lead roster be made up of a mix of consultants from emergency medicine, orthopaedics, general surgery or critical care.</p> <p>TU trauma team Consultants are trained and deemed competent in team leadership/crew resource management and initial assessment of multi-system trauma, rather than the expertise specifically required to practise their parent specialty.</p> <p>Trauma Units should have a specific trauma service, whereby the patient admitted following a trauma team activation is admitted under a named consultant who is responsible for overseeing their optimal care until or unless agreement is reached with another consultant that the nature of the patient’s injuries makes it appropriate for their admission under a particular specialty. The named trauma receiving consultant would be as per an agreed roster for the trauma service, separate to all other on-call rosters.</p>
2.	<p>Emergency Trauma Nurse/ANP</p> <p>The trauma team includes senior nursing staff - an Emergency Department CNM 2 or 3 should be available as a member of the trauma team 24/7 who is experienced in trauma resuscitation, and teams should also include CNS/ANPs</p> <p>There should be a minimum of three trauma nurses, one healthcare assistant and a porter per trauma patient needing immediate assessment and resuscitation. Each of these staff should be familiar with the particular resuscitation room environment and the location, setup and use of equipment to perform such procedures as may be required. The team includes a nominated scribe (a doctor or experienced nurse).</p>

3.	<p>Trauma Team Activation Protocol</p> <p>At least one experienced general surgeon, orthopaedic surgeon and anaesthetist on-site 24/7 should respond to trauma team activation. In the Trauma Unit, this will be an experienced Non-consultant Hospital Doctor, with ready access to consultant advice as required.</p> <p>A Radiologist should be alerted of trauma team activation to advise on advanced diagnostic imaging and be available for its interpretation as soon as possible. The Trauma team consultant lead should identify the requirement for all diagnostic imaging other than plain x-rays. The call could be made by one of the other clinical members of the team if the trauma team leader is otherwise occupied. The call should be made as close to the resuscitation as possible, to allow the trauma team leader to respond to any queries from the radiologist. Urgent CT be available within thirty minutes of request.</p> <p>The Assistant Director of Nursing / Divisional Nurse Manager (including out of hours) for Critical Care and Operating Theatres should be included in the trauma team activation to prioritise preparation for patient reception as appropriate.</p> <p>The following personnel and services also should to be informed of a trauma team activation, as part of the extended team: Laboratory scientist who will prioritise the work arising from the trauma team activation; Critical care trained nurse; Operating Theatre nurse; Security officers; Chaplain or social worker as appropriate.</p> <p>The team should include a radiographer (available in-house 24/7), an airway competent doctor and a doctor capable of recognising patients who require damage control surgery and that this can be delivered in line with network protocols</p> <p>A Family/Patient Liaison Officer should also be included in the trauma team activation and be in a position to remain with the patient/family through the first several hours of treatment, wherever the patient is moved to within or outside the hospital.</p>
4.	<p>Agreement to Network Transfer Protocol from Trauma Units to MTCs</p> <p>The Trauma Unit should agree the network protocol for the transfer of patients from Trauma Unit to Major Trauma Centre.</p> <p>Determination of the integrated trauma nursing workforce must take account of transfer patterns and workload to ensure provision for safe transfer in addition to safe staffing levels remaining in the Trauma Unit</p>
5.	<p>24/7 CT Scanner Facilities</p> <p>The CT Scanner should be located in, or immediately adjacent to, the Emergency Department to facilitate quick patient access.</p>
6.	<p>CT reporting</p> <p>Rapid turnaround of radiology reporting should be available (electronically if necessary), with the issuing of a finalised report within one hour of completion of the scan. A CT capable radiographer should be available 24/7 to ensure that scanning begins within 30 mins of the patient arriving at the TU, with technical completion within 1 hour</p>

7.	<p>Interventional Radiology (RI)</p> <p>Interventional radiology should be promptly available 9am-5pm, Monday-Friday, on-site in all TU's, and outside these times at the network MTC via patient transfer in accordance with agreed protocols.</p>
8.	<p>Teleradiology Facilities</p> <p>TUs should also have access to fast teleradiology links via high-speed home link and laptop with wireless connectivity.</p> <p>Plain films should happen at the patient's bedside, unless the patient is deemed stable enough by the trauma team leader. And appropriately credentialed person should be immediately available to review, remotely if necessary. However, the performance of such investigations should not delay the performance of other diagnostic investigations that have been appropriately requested by the consultant lead of the trauma team.</p>
9.	<p>24/7 Access to Surgical Staff</p> <p>The following staff should be available within 30 minutes 24/7:</p> <ul style="list-style-type: none"> • a general surgeon ST3 or above, or equivalent NCCG; • a trauma and orthopaedic surgery surgeon ST3 or above or equivalent NCCG; • an anaesthetist ST3 or above or equivalent NCCG.
10.	<p>Dedicated Orthopaedic Trauma Operating Theatre</p> <p>Sufficient and timely operating theatre access for semi urgent surgical treatment of musculoskeletal injuries that do not require emergency care out-of-hours should be available.</p>
11.	<p>24/7 access to Emergency Theatre and Surgery</p> <p>There should be 24/7 access to a fully staffed and equipped emergency theatre.</p> <p>Patients requiring acute intervention for haemorrhage control should be in an operating room or intervention suite within 60 minutes.</p>
12.	<p>Trauma Management Guidelines</p> <p>The Trauma Unit should agree the network clinical guidelines.</p> <p>The Trauma Unit should include relevant local details.</p>
13.	<p>Transfusion Protocol</p> <p>There should be a protocol for the management of massive transfusion in patients with significant haemorrhage.</p>
14.	<p>Administration of Tranexamic Acid</p> <p>Patients with significant haemorrhage should be administered Tranexamic Acid within 3 hours of injury and receive a second dose according to CRASH-2 protocol.</p>

15.	<p>Dedicated Trauma Ward</p> <p>Trauma Units should have a specific ward receiving area (the size of which would be dictated by the anticipated workload), including appropriate provision for a high dependency area, for patients admitted following a trauma team activation who do not need to be admitted to an intensive care unit. It is essential that this ward receiving area is not used for the admission of patients other than those who have been the subject of a trauma team activation.</p> <p>The TU should have a dedicated trauma ward to facilitate admission of patients with a number of multi-system injuries that do not meet the criteria for transfer to a MTC.</p> <p>There should be a named, appropriately trained, consultant responsible for the trauma ward at all time</p> <p>There should be adequately sized trauma bays, with beds of the appropriate type, in the resuscitation room, with an adjacent hybrid suite, to allow immediate access to interventional radiology and/or surgical access to body cavities as required</p> <p>There should be 24/7 immediate availability of fully staffed operating theatres</p> <p>There should be designated ICU beds and ICU nurses available for trauma. The group recognised that there would be capacity issues with this. There is a need to consider the effect of this policy on ICU bed capacity. It was proposed that the National Critical Care Audit should be used to inform planning for individual hospitals.</p> <p>There should be appropriate and adequate nurse staffing and skill mix in the dedicated trauma ward, with nurses experienced in trauma care, having regard to the Framework for Safe Nurse Staffing and Skill Mix.</p> <p>All TUs should have adequate equipment to deal with anticipated patient need, including rapid fluid infusers, body temperature control, intraoperative fluoroscopy and plain films, fracture fixation, bronchoscopy and gastrointestinal endoscopy.</p>
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Reconstruction and Ongoing Care

16.	<p>Major Trauma Lead Clinician</p> <p>There should be a lead clinician for major trauma, who should be a consultant with managerial responsibility for the service and a minimum of 1 programmed activity specified in their job plan.</p>
17.	<p>Trauma Group</p> <p>The TU should have a trauma group that meets at least quarterly.</p> <p>The membership should include:</p> <ul style="list-style-type: none"> • major trauma lead clinician; • executive board representation; • Emergency Department medicine consultant; • trauma nurse coordinator; • Emergency Department nurse. <p>representation from:</p> <ul style="list-style-type: none"> • radiology; • surgery; • anaesthetics; • critical care; • trauma orthopaedic surgeons; • rehabilitation medicine.

18.	<p>Trauma Coordinator Service</p> <p>There should be a trauma coordinator service available Monday to Friday for the co-ordination of patients. The coordinator service should be provided by nurse or allied health professionals.</p>
19.	<p>Management of Spinal Injuries</p> <p>The Trauma Unit should agree the network protocol for protecting and assessing the whole spine in adults and children with major trauma.</p> <p>There should be a linked Spinal Cord Injury Centre (SCIC) for the MTC which provides an out-reach nursing and/or therapy service for patients with spinal cord injury within 5 days of referral.</p>
20.	<p>Management of Multiple Rib Fractures</p> <p>There should be network agreed local management guidelines for the management of multiple rib fractures including:</p> <ul style="list-style-type: none"> • pain management including early access to epidural; • access to surgical advice.
21.	<p>Management of Musculoskeletal Trauma</p> <p>There should be guidelines for:</p> <ul style="list-style-type: none"> • isolated long bone fractures; • early management of isolated pelvic acetabular fractures; • peri-articular fractures; • open fractures. <p>The guidelines should include:</p> <ul style="list-style-type: none"> • accessing specialist advice from the MTC; • imaging and image transfer; • indications for managing on site or transfer to the MTC.
22.	<p>Designated Specialist Burns Care</p> <p>Burns care should be managed through a designated specialist burns network.</p> <p>There should be a clinical guideline for the treatment of burns. This should include the referral pathway to the specialist burns centre.</p>
23.	<p>Trauma Unit Agreement to the Network Repatriation Policy</p> <p>The Trauma Unit should agree the network repatriation policy T16-1C-115</p> <p>There should be a protocol in place for identifying a specialty team to accept the patient. The protocol should include the escalation process in the event of there not being access to a specialty team.</p>
24.	<p>Patient Experience</p> <p>The TU should participate in the TARN PROMS and PREMS</p>

25.	<p>Discharge Summary</p> <p>There should be a discharge summary which includes:</p> <ul style="list-style-type: none"> • A list of all injuries • Details of operations (with dates) • Instructions for next stage rehabilitation for each injury (including specialist equipment such as; wheel chairs, braces and casts) • Follow-up clinic appointments • Contact details for ongoing enquiries.
26.	<p>TARN</p> <p>The Trauma Unit should participate in the TARN audit.</p> <p>The results of the audit should be discussed at the network audit meeting at least annually and distributed to all constituent teams in the network, the CCGs and area teams.</p>
Rehabilitation	
27.	<p>Rehabilitation Prescriptions</p> <p>Rehabilitation should start in the critical care setting to allow the patient the best possible opportunity to achieve their physical, cognitive, psychosocial and functional potential. Every patient should undergo routine assessment of their rehabilitation needs within 48 hours of admission through the completion of a flexible rehabilitation prescription that should accompany all patients as they transition through the pathway.</p>
28.	<p>Rehabilitation Team</p> <p>There should be a named lead for rehabilitation in each Trauma Unit. The rehabilitation team should include: Physiotherapists, Occupational therapists, Speech and language therapists, Dietitians, Social workers, Psychologists and associated support staff.</p>
29.	<p>Outreach</p> <p>Outreach sessions should be provided to Trauma Units by rehabilitation medicine consultants from the linked Major Trauma Centre. These sessions should provide support and assist in the management of patients with complex rehabilitation needs. Other senior clinical expertise should also be available (e.g. advanced nurse specialist, clinical nurse specialists, clinical specialist (with advanced practice remit) health and social care professionals.</p>
30.	<p>Special attention needs to be given to patients who require specialist care for challenging behaviour and patients with long-term ventilation requirements services. Patients, who are ventilator dependent, must be able to access a specialist rehabilitation facility with discharge to their local community under the supervision of a national domiciliary ventilation programme.</p>

Appendix 7

Sample Trauma Rehabilitation KPIs

Domain	Recommendation	KPI
Quality Person-centred stakeholder engagement	<ul style="list-style-type: none"> - This includes provision of timely information, education and a range of supports on the rehabilitation journey. - Self-management is a key area for development. 	<ul style="list-style-type: none"> - 100% of patients given information about their diagnosis and care pathway. - Appointment of case managers within first year. - 100% of patients given information on appropriate self-management services/ supports available based on their need.
Quality Governance & co-ordination	<ul style="list-style-type: none"> - Appointment of a Trauma Network Director of Rehabilitation (TDR). - Patient access to specialist senior opinion (medical, nursing, health and social care professionals). - Appointment of rehabilitation coordinators. 	<ul style="list-style-type: none"> - Appointment to key rehabilitation roles within first year of Trauma Network establishment. - Development of a job description for the Trauma Director of Rehabilitation (TDR) & coordinator posts.
Quality/Access Identifying the rehabilitation needs of a trauma patient	<ul style="list-style-type: none"> - All trauma patients should be able to access rehabilitation and have their rehabilitation needs assessed within 48 hours of admission to a MTC or a TU generating a flexible personal prescription for rehabilitation that should accompany all patients as they transition through the pathway. 	<ul style="list-style-type: none"> - Patients with estimated ISS ≤ 8 should have a rehabilitation needs assessment carried out within 48 hours with serial assessments at agreed intervals. - For patients with more complex rehabilitation needs (ISS ≥ 9) a specialist rehabilitation prescription should be completed within 48 hours by a senior clinical decision-maker. This will require the sign off from a rehabilitation medicine consultant or designate for entry onto the specialist or complex specialist rehabilitation pathway. - Rehabilitation should begin as early in the patient journey as possible including when patient is in ICU/HDU.

Domain	Recommendation	KPI
Rehabilitation provided in the most appropriate setting to meet patients' needs	Development of pathways of care to ensure 'right place, right time, right person' with appropriate transfer of care for specialist interventions.	<ul style="list-style-type: none"> - Patients with GCS \leq 8 should have access to level 3 neurocritical care, as appropriate, with neurosurgery as appropriate (recommendation from National Clinical Programme for Critical Care). - Patients with spinal cord injury should have access to the National Spinal Injuries Unit at the Mater Misericordiae University Hospital. - Patients with rehabilitation needs should be treated on either a) specific trauma ward by a dedicated rehabilitation team or b) on a rehabilitation specific ward. - Patients should be transitioned to post acute rehabilitation services as soon as they are deemed medically stable as per rehabilitation needs assessment / rehabilitation prescription.
Development of post acute rehabilitation services	<p>Post-acute specialist regional services should be developed (BSRM standards identify need for 60 beds per million of population).</p> <p>There should be coordinated development of community rehabilitation services and long-term support to meet the needs of all trauma patients within a Trauma Network.</p> <ul style="list-style-type: none"> - Gaps in community rehabilitation services should be reviewed with respect to international staffing ratios for community rehabilitation services and recommendations made as to how these gaps need to be addressed to ensure patient flow across the continuum of care. (This will be carried out by HSE social care division and while not a KPI specific for Trauma Network, without development of these teams, flow through the Trauma Network will be compromised). 	<ul style="list-style-type: none"> - Development of rehabilitation teams and services in each MTC and TU in line with best practice staffing ratios. - Identification of appropriate sites for post-acute rehabilitation services in year 1. - Development of post-acute rehabilitation services incorporated into the HSE service plan to include both capital planning and revenue costs. - Mapping of community services to be undertaken.
Vocational and educational rehabilitation	Many trauma patients are of working age and vocational & educational rehabilitation should be a key component of rehabilitation.	<ul style="list-style-type: none"> - 100% of patients with identified vocational and educational goals should be supported through referral to appropriate agencies to provide assessment for same.

Domain	Recommendation	KPI
Education and workforce skills	<p>All trauma rehabilitation staff should have training in the rehabilitation process, including integrated assessment, goal setting and the use of validated assessment and outcome measures. Vocational Rehabilitation principles should also be included.</p> <p>It is recommended that undergraduate programmes be reviewed, based on evidence from existing Trauma Networks in the UK that existing trauma.</p> <p>Each rehabilitation team should have senior non-rotating staff with specialist rehabilitation knowledge (post-graduate is advised) and experience in trauma care.</p>	<p>Development of appropriate suite of competencies for those working in the area of rehabilitation with annual assessment against these competencies.</p> <p>Development of supervision policies for basic grade staff being supervised by senior colleagues.</p>
Outcome following Major Trauma	<p>Commencement of early/hyper-acute rehabilitation.</p> <p>Align with UKROC published outcome measures, to include functional and participatory measures of outcome and QUALYs.</p>	<p>Commencement of early/hyper-acute rehabilitation within 48 hours.</p> <p>Presence of communication factors affecting activities should be added to TARN minimum data set (see Rehabilitation Technical Report).</p> <p>At least one outcome measure to be completed at each stage of the rehabilitation process.</p>
Development of funding structures	<p>The completion of a specialist rehabilitation prescription (SRP) should trigger the commencement of a planned release of funding to ensure timely care for those patients with severe and major injuries most at need of multiagency input, improve flow through the system and prevent unnecessary delays in transfers.</p>	<p>100% of SRP trigger release of funding</p>

Appendix 8

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