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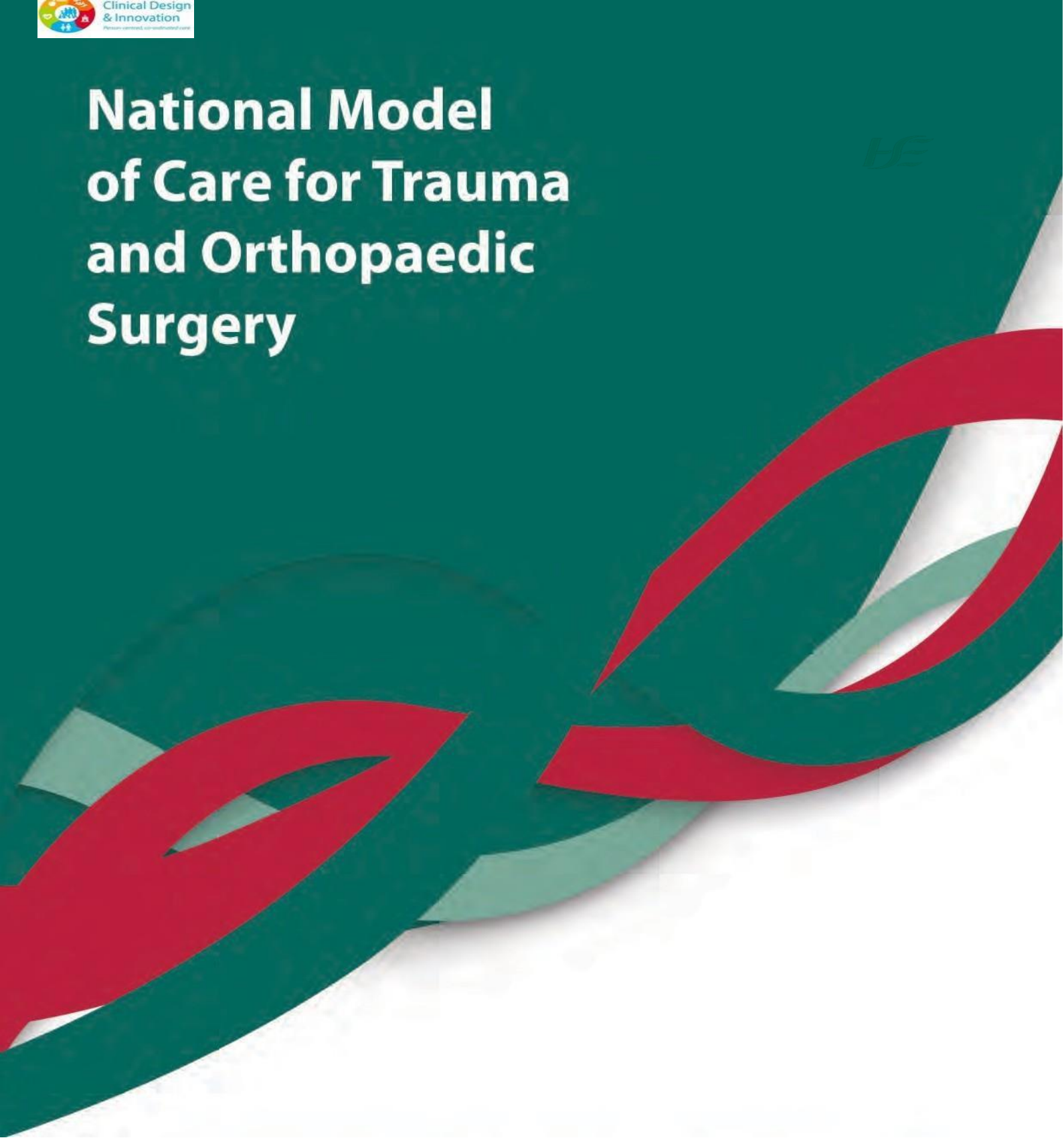
Clinical Design & Innovation

National Model of Care for Trauma and Orthopaedic Surgery



National Clinical Programme for Trauma and Orthopaedic Surgery

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HealthService Executive

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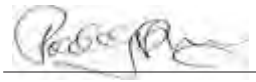
Foreword

The National Clinical Programme for Trauma and Orthopaedic Surgery is pleased to publish this Model of Care, which is focused on further strengthening the health system, specifically in trauma and orthopaedic surgery. The Model of Care was developed to increase the safety and accessibility of trauma and orthopaedic care to patients through robust, streamlined care implemented consistently across the service. This Model of Care is published in the context of an Irish health service that is in reform in terms of funding and reconfiguration, which presents opportunities for development. In addition, trauma and orthopaedic surgery is constantly evolving and developing the treatments it can offer to patients, which necessitates constant re-examination of the model of care delivery in order to ensure that contemporary approaches meet with patient and service expectations. Patients' expectations are also justifiably increasing.

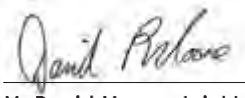
This Model of Care complements the work already completed by the National Clinical Programme in Surgery (NCPS), which published models of care for elective and acute surgery. The aim of this document is to build on those models, with specific emphasis on the patient journey along the trauma and orthopaedic surgical pathway. Each National Clinical Programme, including, trauma and orthopaedics, has been charged with defining priority areas and agreeing targets, in addition to developing a model of care, as well as guidelines and pathways. Musculoskeletal disease and injuries continue to account for a large proportion of the acute and planned workload nationally, all at a time when resources are limited across the health service. These challenges present opportunities to examine innovative ways of delivering an excellent trauma and orthopaedic service. Standardising pathways of care will lead to improvements in access, quality and value. These are basic principles which must never be compromised, and it is essential that service inadequacies are identified and dealt with appropriately. Good healthcare involves a continuum from education, prevention and rehabilitation which optimise's outcomes, all with the aim of ensuring that patients return to and maintain a good quality of life. As Professor Don Berwick, National Advisory Group on the Safety of Patients in England has stated: "Appreciate that your responsibility is not only to your patients but also to help continuously improve the healthcare system in collaboration with others" (DH, 2013).

The treatment of trauma and orthopaedic patients is dependent on a wide range of staff who work closely with surgeons to provide integrated, safe care. It is the intention that the best practice principles set out in this document will provide guidance and support to all who are essential to the delivery of an improved service.

Throughout this document we will refer to planned orthopaedic surgery, as the orthopaedic clinical programme believe that using the term elective may indicate that the procedure is discretionary. We acknowledge and express our gratitude to all those who contributed to the development of this document.



Mr Paddy Kenny, Joint Lead



Mr David Moore, Joint Lead

National Clinical Programme for Trauma and Orthopaedic Surgery

Executive Summary

The National Clinical Programme for Trauma and Orthopaedic Surgery was established to develop change initiatives that will improve and standardise the quality of care, improve access for patients, and provide a framework for the HSE, hospital managers, clinicians and multidisciplinary teams caring for patients. The delivery of cost-effective, evidence-based healthcare is in the best interests of patients. The National Clinical Programme in Surgery has developed and published models of care for planned and acute surgery, and the standards set out in these documents have had a significant impact on how surgical care is delivered. Clinicians, healthcare staff and managers now have clear guidelines on how to deliver best practice care to surgical patients. The Productive Operating Theatre (TPOT) programme is working nationally to improve the patient's peri-operative journey, resulting in improved efficiencies and cost savings. This document builds on both of the surgery models of care.

Musculoskeletal disorders are the leading cause of disability and working days lost worldwide. (Arthritis Reserch UK, 2014). There will be an ever-increasing demand for orthopaedic care, in line with an increase in the ageing population, coupled with increased life expectancy and other factors such as obesity. Musculoskeletal injuries account for one-third of the acute surgery workload and one-third of the bed days used in Irish hospitals annually. The specialty of trauma and orthopaedics is therefore an integral part of the Irish healthcare system. As such, guidance is required on how to deliver a safe, high-quality and efficient service. Patients should be confident that they will be seen, and treated, by the appropriate healthcare professional, and that they can access the appropriate healthcare facility in a timely and equitable manner that best suits their needs.

The main tenet of this model of care is that equity must apply across healthcare. Patients who require planned surgery are entitled to access to services, as are patients who require emergency care. Both are equally important and, despite the many challenges facing healthcare teams, they have a responsibility to ensure that resources are provided for both. Equally, patients have a responsibility to participate in their own care and, in order to do so, they must be treated with dignity and respect, and provided with clear and comprehensive health information at all times.

Access to timely care for orthopaedic patients is imperative. The practice of cancelling planned surgery patients due to large volumes of emergency referrals disadvantages a large cohort of patients. Patients waiting for planned procedures are often in constant pain, and are so significantly disabled that their condition has a serious impact on their quality of life.

This document is divided into sections covering planned care, trauma care, rehabilitation, outpatient care, training and education, consultant manpower, nursing, support staff and health and social care professionals.

Audit is an integral part of measuring the quality of care that is delivered. Initiatives such as the Irish Hip Fracture Database (IHFD) have enabled clinicians to audit practice against international standards for a particularly vulnerable group of patients. The Irish National Joint Registry (INOR) will define the epidemiology of joint replacement surgery in Ireland and will provide timely information on the outcomes of joint replacements in addition to identifying risk factors for a poor outcome.

Integrated care is frequently used to refer to a package of preventive and curative health interventions for a particular population group. Integrated care pathways are structured multidisciplinary care plans which detail essential steps in the care of patients with a specific clinical problem. The development of a National Integrated Care Pathway for patients who sustain a neck of femur fracture (HSE, 2015) is an example of how the clinical programmes, working collaboratively, can improve the provision of integrated care. Continued cross-programme collaboration and support for the integrated care agenda is supported and encouraged by the National Clinical Programme for Trauma and Orthopaedic Surgery.

Trauma and orthopaedic care in hospitals is delivered by a multidisciplinary team called the Trauma and Orthopaedic Services Team (TOST). It is a consultant-led service and aspires to be a consultant-delivered service, although consultant numbers would currently mitigate against this happening. Multi-disciplinary team meetings (MDMs) are associated with improved patient outcomes across all workstreams. They are also valuable for education. Close collaboration between members of TOST and other programmes of care will ensure efficient and appropriate transit through the patient's journey, from primary care through to secondary care and rehabilitation. General practitioners (GPs), for example, are essential members of the healthcare team, and close co-operation and communication between primary and secondary care is critical to having a fully integrated service that serves patients at all stages of their

journey. Guideline-controlled direct access to MRI for GPs would help drive efficiency in orthopaedic outpatient service delivery, but requires adequate resourcing. Health and Social Care professional staffing is an important consideration in achieving the desired outcomes throughout the patient's journey. Pathways to Specialist Multidisciplinary Pain Management are also important for patients who suffer chronic pain as part of their injury or disease.

There is significant scope for treating more patients within the current system by standardising treatment pathways and ensuring that appropriate facilities are designated at the right time to the right patient. Not all patients require hospital treatment and, in order to ensure that patients are referred to the appropriate healthcare professional, primary and community care pathways need to be further developed.

A very clear example of how this works is the musculoskeletal physiotherapy clinic model. Developed in conjunction with the National Clinical Programme for Rheumatology, enhanced scope physiotherapists (ESPs) have been successfully running these clinics since 2012. Consultant leadership has been critical to ensuring the success of this model. Patient satisfaction with the service received at the musculoskeletal clinics is very high. The extension of this model to primary care with the involvement of additional health and social care professionals (HSCP) would be an excellent way to treat patients in the community. Referral guidelines from primary to secondary care will provide GPs with a standardised pathway for referring patients.

The interventions taking place at an orthopaedic outpatient clinic can vary from a relatively short time requirement for fracture diagnosis and treatment to a considerable time requirement for complex cases, or for explanation of diagnosis and treatment options to patients, and agreement on the treatment plan. In many hospitals, orthopaedic outpatient clinics have large attendance figures. Moreover, they frequently overrun the expected timeframe, thus resulting in lengthy delays for patients and inefficient service delivery. Overcrowding at trauma and orthopaedic outpatient clinics is endemic nationally. As a result, patient safety is compromised and patients are not afforded the appropriate access to, or time with, their treating consultant. The Irish Institute of Trauma and Orthopaedic Surgery (IITOS) has published safe clinic guidelines (IITOS, 2011), and national implementation of these guidelines is recommended.

Waiting lists and waiting times for initial orthopaedic outpatient appointments in Ireland are too long, demonstrating a mismatch between supply and demand. Remedial action to address this imbalance is urgently required. The Virtual Fracture Clinic (VFC) concept is an example of a proven method of ensuring that only patients who require follow-up appointments at fracture clinics are given such appointments. The National Clinical Programme for Trauma and Orthopaedic Surgery will be working with clinicians to further develop this initiative.

There are many ways in which we can improve the delivery of care to trauma and orthopaedic patients. There must be timely access to radiology examinations and other diagnostic investigations on an outpatient basis. Designated and protected beds, both for inpatients and day cases, where possible, must be made available. Admitting patients as inpatients is inappropriate when the procedure could be performed as a day case.

The provision of safe care within hospitals must be delivered, in order to ensure that trauma and orthopaedic surgical patients are not exposed to infection by being admitted to a ward with mixed specialities. Patients expect that surgical services are designed to promote improved health, and to prevent further illness or injury to the patient.

Nursing staff and health professionals, including all support staff experienced in the care of trauma and orthopaedic patients, are essential for the delivery of good quality safe care. Timely access to theatre sessions is important, particularly for the safe delivery of trauma care, yet this is not available in every hospital. Eighty percent of orthopaedic trauma emergencies can be operated on within normal working hours, if sufficient theatre access is available. Pre-operative length of stay is unnecessarily high in some hospitals and should be shortened.

Throughout the world, injury is a major public health problem. In many countries, this is unrecognised, due to the lack of reliable statistics. In order to improve inadequacies in the organisation and delivery of trauma services, the collection of clinical and epidemiological data is essential and aids the development of trauma services. The Trauma Audit and Research Network (TARN) is a vital component of a trauma system, as it provides a tool for auditing patient care at the individual hospital level. This includes the effectiveness of the trauma system for improving patient outcomes across the entire continuum of care from pre-hospital to rehabilitation. Major trauma describes serious and often multiple injuries where there is a strong possibility of death

or disability. These might include serious head, chest, abdominal and skeletal injuries sustained as a result of accidents, sport or violence. Major trauma is the main cause of death for people under the age of 45 and is a major cause of debilitating long-term injuries. There is no shortage of international evidence to support the development of trauma networks as a way to reduce mortality and morbidity in patients who are unfortunate enough to sustain these injuries. The development of the hospital groups is an ideal opportunity to reorganise how trauma care is developed in Ireland. 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 the ambulance should bypass these hospitals. This Model of Care strongly recommends that a national approach should be taken, in order to ensure that a system of trauma networks and major trauma centres is developed as a matter of urgency.

The National Clinical Programme for Trauma and Orthopaedic Surgery is very confident that if the recommendations in this Model of Care are implemented, and if staff with the appropriate skills and experience are retained, a truly world- class trauma and orthopaedic service will be delivered to patients.

Key Recommendations

1 Development of a system of trauma networks.

2 Development of an integrated national spine surgery service with required pathways of care.

3 Establish clearly defined governance and accountability structures, with clearly defined roles and responsibilities, in order to enable the health service to achieve its objectives.

4 Continued development of outcome measures similar to the Irish Hip Fracture Database (IHFD).

5 Implementation of robust, standardised approaches to workforce planning, in order to ensure correct consultant to patient ratios to facilitate a consultant-delivered service.

6 Implementation of robust workforce planning for all elements of orthopaedic services.

7 Separation of acute (trauma) and planned (elective) surgical streams.

8 Dedicated access to theatre, appropriate access to diagnostics, and designated wards for trauma and planned orthopaedic patients.

9 Access to diagnostic radiology (especially CT and MRI), and interventional radiology.

10 Implementation of sustainable, long-long term strategies to address the historical waiting list problem for orthopaedic patients.

11 Implementation of a hospital bypass protocol for trauma and orthopaedic patients, and immediate bypass protocol for fractured neck of femur patients.

12 Re-engineering and implementation of innovative strategies across the spectrum of care, from primary care through to acute care and rehabilitation including early supported discharge for patients with fractures.

13 Develop nationally standardised guidelines for referral from general practitioners (GPs).

14 Develop interface clinics with HSCPs and expand the existing acute hospital and community musculoskeletal physiotherapy services.

15 Implementation of a nationwide fracture liaison service.

16 National implementation of the orthopaedic safe outpatient clinic guidelines.

17 Commitment to continued education and training.

1. Planned Orthopaedic Surgery

1.1 INTRODuCTION

Musculoskeletal diseases (MSD) are characterised by pain and physical disability. As described by Oortwijn et al. (2011), musculoskeletal diseases contribute to the burden of disease in the working age population. Although musculoskeletal diseases are rarely fatal, they add to the number of years a person must live with a disability. In addition, life expectancy may be reduced in patients with specific conditions; such conditions include rheumatoid arthritis and the consequences of osteoporotic fractures.

While musculoskeletal diseases are rarely a cause of death, and are not as high profile as heart problems, respiratory problems and cancer, they are more prevalent. They are a major cause of pain and reduced quality of life, and they are also a cause of inactivity due to restricted movement, which in turn leads to increased morbidity in this group of patients. An increase in the percentage of the population who are overweight or obese, increases the number of people with musculoskeletal conditions.

In 2005, 107.7 million adults in the United States, i.e., one in two of the population aged 18 years and over, reported suffering from a musculoskeletal condition lasting three months or longer during the past year. This is nearly twice the number of people who reported any other medical condition (Gordin, 2011).

"MSDs have significant healthcare and social support costs. Musculoskeletal problems relating to occupational disease and accidents at work form a high proportion of occupational diseases. A greater understanding and evidence of the impact of these common, disabling conditions will support the development of strategies and policies for their effective prevention and management" (Eumusc.net, 2013).

This Model of Care recognises that many musculoskeletal health conditions can be managed effectively in primary care by GPs. When conservative treatment has failed, and severe pain and disability impacts a patient's life, then referral to a consultant orthopaedic surgeon for assessment and or treatment becomes necessary. Historically, there seems to have been an overemphasis on managing emergency services without addressing the hospital system in its entirety. The National Clinical Programme for Acute Medicine as well as the National Clinical Porgramme for Surgery aimed to address these issues. The publication of this Model of Care addresses specific issues relating to trauma and orthopaedic surgery.

Competing demands for acute care beds often leave patients with musculoskeletal conditions at a disadvantage whereby non-emergency planned procedures are cancelled in order to cope with increased emergency care demand. However, it is critical to acknowledge that once a patient requires surgery for a planned orthopaedic procedure, then care must be provided in a consistent manner, so as to ensure equity and fairness in respect of access.

"It is crucial that elective surgery and scheduled diagnostic and therapeutic access for patients is managed and protected, and that waiting times are informed, based on patients' needs. It is imperative that hospitals, the HSE and the Special Delivery Unit (SDU) implement and monitor efficiency strategies to actively manage timely patient access to scheduled and unscheduled care" (HIQA, 2012). How service providers who wish to maintain both planned and emergency services manage both is an issue of organisational efficiency and capacity.

Optimising productivity in a mixed trauma and planned surgery environment is challenging. Disruption to planned operating schedules can be multifactorial, with causes including the re-allocation of operating time to acutely ill patients, and bed shortages, which in part arise from acute admissions. Against a backdrop of increased national targets, the ability of hospitals to optimise the delivery of planned surgery could be affected by developments such as increases in the numbers of medical patients and surgical patients presenting acutely ill – increases which in turn are a consequence of population growth and a 20% growth in the ageing population in Ireland. There is, therefore, a greater need than ever before to consider how surgical resources can best be configured and delivered.

Planned orthopaedic surgery is defined as a non-emergency surgical procedure, although it can be urgent. Planned orthopaedic surgery may extend life or improve a patient's quality of life physically and/or psychologically. It includes sports injuries, degenerative diseases, infections, tumours, and congenital disorders. Most consultant orthopaedic surgeons have a subspecialty interest and expertise in a particular

anatomical region of the body including the following:

Orthopaedic Subspecialties:

Total Joint Reconstruction (Arthroplasty)	Foot and Ankle	Hand and Wrist
Complex Revision (Arthroplasty)	Shoulder and Elbow	Soft Tissue conditions
Bone Tumour Surgery	Spinal conditions	Sports Surgery

Planned orthopaedic surgery covers a broad spectrum of conditions and procedures. The most common orthopaedic condition is osteoarthritis. Other common conditions include bone and joint deformities, repetitive use injuries, joint instability, nerve compression, and bone and joint infection. Orthopaedic care may also include the treatment of long-term problems caused by a previous trauma injury. The treatment of orthopaedic injuries and conditions may involve either surgical or non-surgical treatment.

Non-surgical treatment includes pain relief medication, weight loss, exercise, physiotherapy, injection therapy, and the use of orthotics (such as braces, splints or special footwear).

Surgery may include:

Arthroscopy (minimally invasive surgical procedure on a joint)	Osteotomy (re-alignment of a bone)
Joint Replacement: hip, knee, shoulder, wrist, elbow, knuckle, ankle	Sports Surgery e.g. anterior cruciate ligament (ACL) reconstruction
Revision Joint Surgery	Joint Arthrodesis (surgical fusion of a joint with the goal of pain relief)
Soft Tissue Release e.g. Tenotomy	Bone Tumour Surgery
Fasciotomy (surgical procedure to cut the fascia (connective tissue) to relieve pressure or tension)	Foot and Ankle Surgery
Removal of a bony or soft tissue lump	Upper Limb surgery such as Shoulder Stabilisation and Elbow surgery
Hand and Wrist surgery	Limb Lengthening
Spine Surgery e.g. Discectomy (surgical removal of a herniated disc)	Spinal Fusion
Correction of Scoliosis	Nerve decompression, such as carpal tunnel decompression.

1.2 PLANNED ORTHOPAEDIC WORKLOAD ANALySIS

Eighty six percent of orthopaedic inpatients have a surgical primary procedure during their stay in hospital and 69% of this activity is lower limb surgery. Day case patients (37%) are less likely to have an operation. Upper limb and lower limb day case surgical volumes are evenly balanced and account for a combined 78% of surgical day cases.

Planned activity summary in 2013	Inpatient						DayCase		Total num	Add'l Wrk Load Non
Trauma orthopaedic sub---specialties	Num	BDU	AvLOS	PreBDU	PreAvLOS	DOSA	Num	DC %	Prime Pro	Prime Procs
Lower limb surgery	8,880	43,789	4.93	3,526	0.40	74.6%	4,032	31.2%	12,912	1,183
Other trauma orthopaedic surgery	769	3,532	4.59	734	0.95	69.1%	2,839	78.7%	3,608	706
Spinal surgery	577	4,053	7.02	645	1.12	41.8%	45	7.2%	622	256
Upper Limb surgery	1,948	3,302	1.70	510	0.26	80.3%	4,230	68.5%	6,178	325
Prorata unmapped proc's (< 20 PerA)	733	2,701	3.69	374	0.51	72.3%	193	38.2%	926	
Sub---total --- have surgery	12,907	57,377	4.45	5,789	0.45	73.5%	11,339	46.8%	24,246	
Trauma Orthopaedic admit --- non surgery primary procedures										
Non---surgical common proc (20 or more PerA	1,363	16,769	12.30	2,148	1.58	47.6%	3,913	74.2%	5,276	
Non---surgical Trauma Orthopaedic	233	694	2.98	166	0.71	69.1%	12,260	98.1%	12,493	3,230
No primary Procedure coded	319	918	2.88				2,979	90.3%	3,298	
Prorata unmapped proc's (< 20 PerA)	115	425	3.69	59	0.51	72.3%	332	38.2%	447	
Sub---total --- do not have surgery	2,030	18,806	9.26	2,373	1.17	44.0%	19,484	90.6%	21,514	
Grand Total	14,937	76,183	5.10	8,162	0.55	69.5%	30,823	67.4%	45,760	

Table: Planned discharges in 2013 having a designated procedure or being admitted under the care of orthopaedic clinicians for other primary care.

Columns display subspecialties; number of inpatients discharged who stayed at least one night in hospital on a calendar date greater than their admission date; bed days used by inpatients; average length of stay for each inpatient; number of pre-operative bed days used by inpatients; average pre-operative length of stay; percentage of patients admitted on day of surgery (DOSA); number of patients admitted and discharged on the same calendar date; total number of patients discharged; and additional surgical procedures for the subspecialty performed as secondary procedures.

Subspecialties are groupings of procedures performed more than 20 times a year, which have been assigned by the national clinical leads to the subspecialty (lower limb procedures, upper limb procedures, spinal procedures, other surgical procedures, non-surgical procedures, non-surgical common procedures and those who do not have a procedure). Discharges are included in a subspecialty if the primary procedure for an episode of care is one of these subspecialties procedures. Activity for procedures performed fewer than 20 times a year nationally is allocated pro rata between the subtotal who have surgery and the subtotal who do not have a recognised surgical procedure.

Arthroplasty of the hip and knee are the most commonly performed operative procedures, while removal of pins and screws is the most commonly performed day case activity.

2013 Top 20 Surgical procedures report for										Add'l Wrk Load Non
Planned most common procedures	Inpatient						DayCase		Total num	
Procedure	Num	BDU	AvLOS	PreBDU	PreAvLOS	DOSA	Num	DC %	Prime Proc	Prime Procs
Total arthroplasty of hip, unilateral (4931800)	3,489	19,697	5.65	1,294	0.37	71.5%	##	0.1%	3,494	11
Total arthroplasty of knee, unilateral (4951800)	2,206	12,261	5.56	562	0.25	78.2%	##	0.1%	2,209	##
Removal of pin, screw or wire, NEC (4792700)	214	481	2.25	57	0.27	79.9%	1,870	89.7%	2,084	107
Release of carpal tunnel (3933101)	50	83	1.66	20	0.40	70.0%	1,594	97.0%	1,644	34
Arthroscopic debridement of knee (4955800)	126	164	1.30	17	0.13	89.7%	1,039	89.2%	1,165	34
Arthroscopy of knee (4955700)	101	199	1.97	26	0.26	91.1%	714	87.6%	815	25
Arthroscopic meniscectomy of knee (4956003)	57	72	1.26	8	0.14	86.0%	579	91.0%	636	13
Removal of plate, rod or nail, NEC (4793000)	131	374	2.85	50	0.38	77.1%	439	77.0%	570	64
Arthro meniscectomy knee, debride/plasty (495610	50	61	1.22	##	0.06	94.0%	477	90.5%	527	14
Revision of total arthroplasty of hip (4932400)	358	3,439	9.61	600	1.68	59.2%	##	0.0%	358	12
Release of tendon sheath of hand (4636300)	8	14	1.75	##	0.25	75.0%	278	97.2%	286	43
Arthro decomp subacrom space (4895100)	163	205	1.26	23	0.14	85.9%	115	41.4%	278	##
Closed rdctn fracture distal radius IF (4736302)	99	157	1.59	35	0.35	71.7%	175	63.9%	274	##
Cor h---valgus osteotmy 1st metarsl uni (4983300)	198	262	1.32	21	0.11	90.9%	75	27.5%	273	28
Arthroscopic reconstruction of shoulder (4896000)	205	306	1.49	20	0.10	91.2%	47	18.7%	252	7
Palmar fasciectomy Dupuytren's, 1 digit (4637200)	28	48	1.71	8	0.29	75.0%	213	88.4%	241	##
Open rdctn fracture distal radius w IF (4736602)	91	159	1.75	50	0.55	65.9%	131	59.0%	222	##
Exc debridement skin & sbc tissue (9066500)	109	1,531	14.05	429	3.94	41.3%	108	49.8%	217	208
Arthroscopic reconstruction of knee (4953900)	207	272	1.31	36	0.17	82.6%	##	1.4%	210	23
Open rdctn fx ankle IF diats/fib/malus (4760001)	162	345	2.13	92	0.57	63.0%	40	19.8%	202	##

Table: Top 20 most commonly performed planned primary procedures discharges in 2013. Procedures are described using the official ICD 10 V6 / ACHI description with procedure code in brackets. See column descriptions above. (## - less than 5 cases performed)

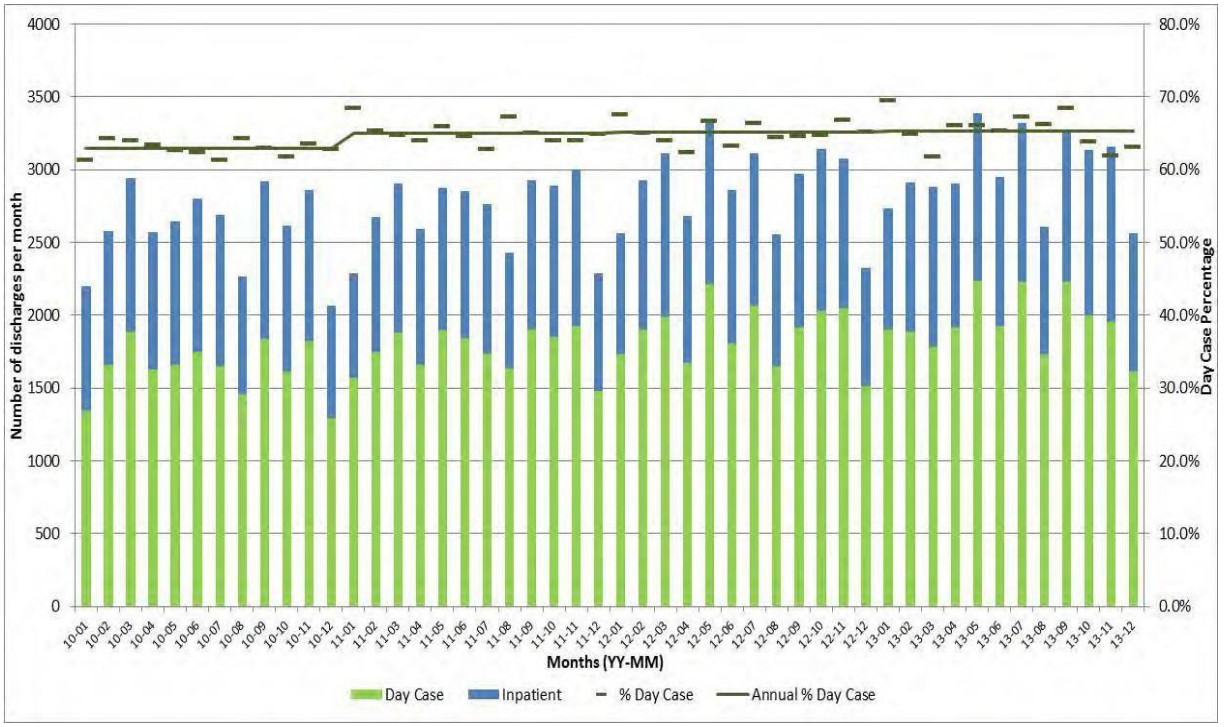
Planned day case discharge trends

The majority of planned patients are seen and treated as day cases (i.e., 65.4% in 2013) and over half of these patients had non-operative orthopaedic procedures, such as an injection or knee arthroscopy procedure.

	Year 2010			Year 2011			Year 2012			Year 2013		
	#DC	#Inpat	%DC	#DC	#Inpat	%DC	#DC	#Inpat	%DC	#DC	#Inpat	%DC
Lwr Limb Surg	3,830	7,941	32.5%	4,061	7,885	34.0%	4,279	8,572	33.3%	4,032	8,880	31.2%
Upr Limb Surg	3,324	1,944	63.1%	3,651	1,871	66.1%	4,092	2,003	67.1%	4,230	1,948	68.5%
Spine Surg	33	492	6.3%	30	523	5.4%	54	479	10.1%	45	577	7.2%
Other Surg	3,355	858	79.6%	3,254	783	80.6%	2,981	780	79.3%	2,839	770	78.7%
NonSurg TO procs	9,045	331	96.5%	10,116	315	97.0%	11,144	259	97.7%	12,260	233	98.1%
Sub---total	19,587	11,566	62.9%	21,112	11,377	65.0%	22,550	12,093	65.1%	23,406	12,408	65.4%

Planned day case rate table: Annual discharge volumes for patient having a designated planned procedure. Displays annual number of day case, inpatients and percentage day case for the subspecialties (lower limb procedures, upper limb procedures, spinal procedures, other surgical procedures and for non-surgical procedures).

Planned day case (admitted and discharged on the same date) show indications of systematic seasonality, with decreased activity levels in January, August and December each year.



Planned day case rate chart: Monthly day case and inpatient discharge volumes as stacked bars with monthly and annual percentage day case shown a green dash and line respectively.

Planned inpatient trend

From 2010 to 2013, planned inpatient AvLOS and pre-operative AvLOS demonstrated a significant downward trend, reducing by 25% and 56%, respectively. This reduction was most pronounced in lower limb planned procedures, where the reduction in AvLOS was 30%. Without these improvements, an additional 18,860 bed days would have been required to deliver the 2013 levels of planned surgery.

	Year 2010			Year 2011			Year 2012			Year 2013		
	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS
Lwr Limb Surg	7,941	7.03	1.12	7,885	6.21	0.78	8,572	5.43	0.47	8,880	4.93	0.40
Upr Limb Surg	1,944	2.08	0.52	1,871	1.86	0.42	2,003	1.76	0.26	1,948	1.70	0.26
Spine Surg	492	7.29	1.32	523	6.65	1.11	479	7.33	1.17	577	7.02	1.12
Other Surg	858	5.32	1.19	783	4.90	1.14	780	4.84	1.02	770	4.59	0.95
NonSurg TO procs	331	3.48	0.96	315	3.31	1.07	259	3.64	0.88	233	2.98	0.71
Had Surgery	11,566	5.98	1.03	11,377	5.34	0.77	12,093	4.82	0.50	12,408	4.46	0.45

Table: Annual discharge volumes for inpatients having a planned procedure with average length of stay and pre-operative length of stay for each of the orthopaedic subspecialties.

Each year, monthly planned surgery discharge volumes tend to fall in January, August and December compared with discharge volumes in other months during the year.

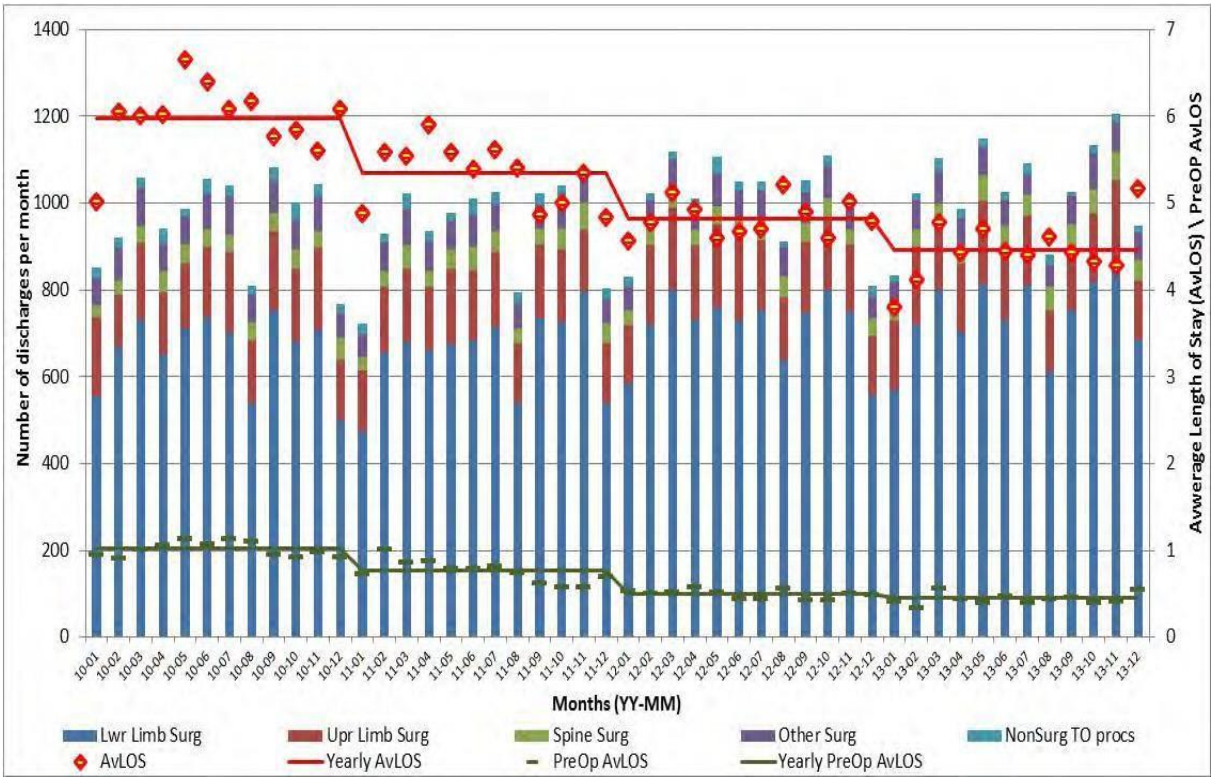


Chart: Monthly discharge volumes, AvLOS and Pre-Op AvLOS for discharges following a planned procedure. Monthly Discharge volumes for the sub specialties are shown as a stacked bar chart, monthly AvLOS is represented by a red diamond, annual AvLOS as a red line, monthly pre-op AvLOS as a green dash and annual pre-op AvLOS as a green line.

There are distinct differences in AvLOS values for different age groups, with children staying in hospital for the shortest periods, and people in the 85 years and older age group staying the longest. There has been significant year-on-year improvement in planned admission AvLOS values, including marked AvLOS reduction for people aged over 65.

Hospitals with the highest average case complexity in their casemix do not always have the highest lengths of stay or the highest rate of acute re-admission within 30 days of discharge.

The hospitals with the lowest and highest average relative surgical procedure complexity have similar AvLOS in the Model 4 and Model 3 type hospitals, whereas AvLOS decreases with increasing relative complexity in the elective Model 2 hospitals. Rate of acute re-admission to hospital within 30 days of a planned procedure provides a proxy for quality of care. Interestingly, for Model 4 and Model 3 hospitals, those with the highest re-admission rates also have higher than average AvLOS values and do not have high relative complexity levels.

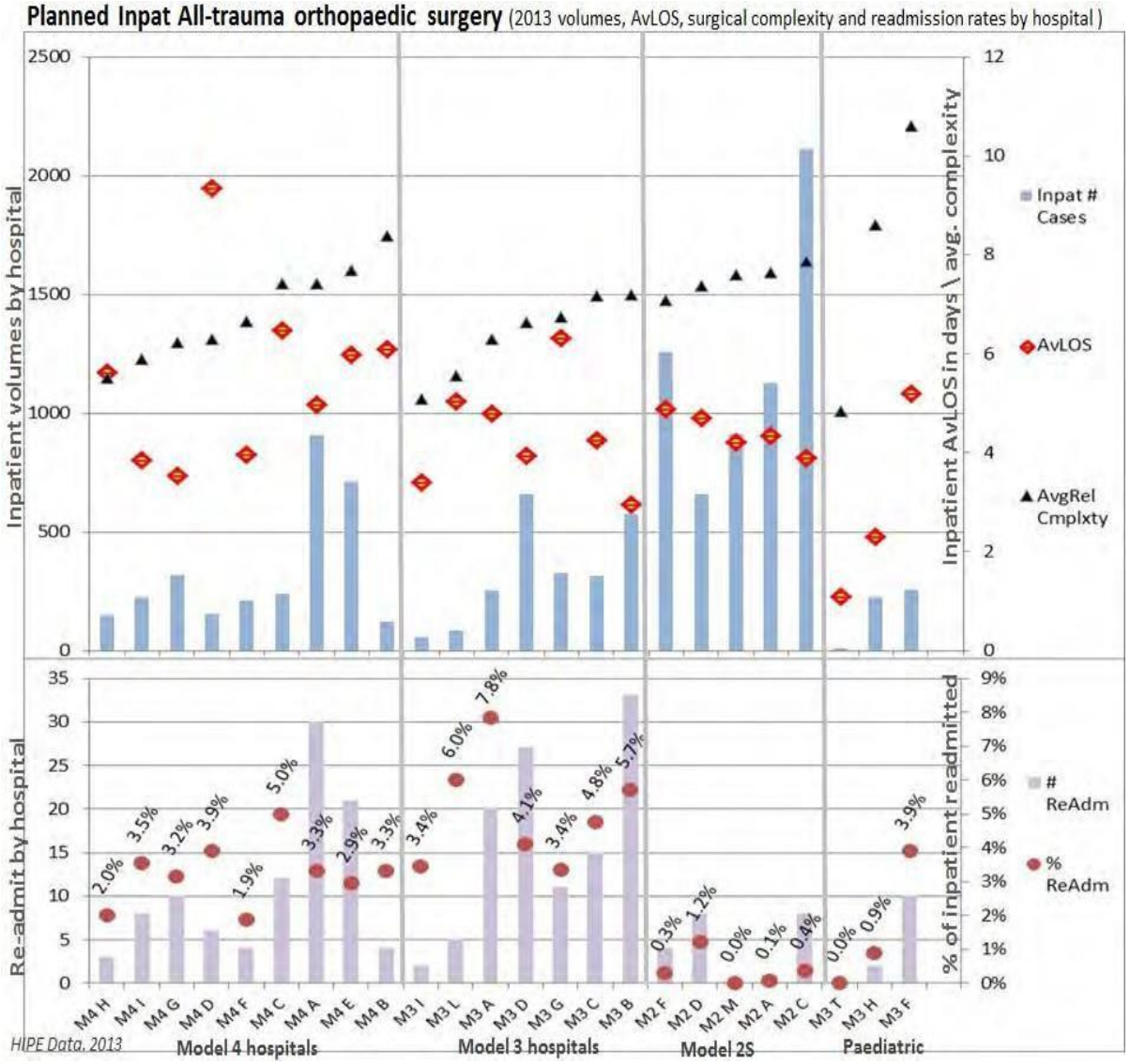


Chart: Displays volume of planned discharge as blue vertical bars, AvLOS as red diamonds and average relative surgical procedure complexity as black triangles by hospital in the top chart. The lower chart shows the volume and rate of those discharges who return to the same hospital acutely within 30 day of their original discharges. Hospitals are ordered from lowest to highest average relative procedure complexity within hospital model type. See Appendix 8 for further explanation of relative surgical procedure activity.

The National Clinical Programme in Surgery (NCPS) describes how planned surgery can best be delivered by surgeons, anaesthetists and other health care professionals and administration staff in partnership with their patients, so that such surgery is safe, efficient and cost effective. This Model of Care continues this journey.

Separating planned care from trauma care through the use of dedicated beds, theatres and staff has been shown to create efficiencies, as well as provide a better patient experience and enhanced patient outcomes.

The model of separation must:

- be based on a detailed analysis of projected demand
- be flexible enough to accommodate ebbs and flows in trauma presentations
- be clinically led, so as to achieve the necessary change in surgical and hospital culture
- be supported by good processes along the peri-operative pathway
- include full clinical risk assessment and clinical governance
- in acute hospitals involve the designation of theatre

sessions, beds and workforce for each trauma and planned activity
- within the same facility involve the setting aside of dedicated operating theatre time, beds and workforce for each type of activity.

The separation of acute (trauma) and elective (planned) surgical streams has been endorsed nationally by the NCPS and the IITOS and internationally by the British Orthopaedic Association (BOA) and the Royal Australasian College of Surgeons (RACS). If planned surgery waiting lists are to be reduced and best practice maintained, the separation of surgical streams should be introduced wherever possible. This can be achieved with minimal extra cost; moreover, experience indicates that it also leads to cost saving efficiencies. Significantly, no Australian or New Zealand hospital that has made this change has ever opted to revert to previous arrangements.

The case for the separation of elective and emergency surgery (RACS, 2011) describes the range of benefits that can be achieved. These benefits have also been reported elsewhere by a number of sources, such as Biant et al. (2004), Haddock et al. (2001), Lowthian et al. (2011), Middtun and Martinussen (2005) and the Royal College of Surgeons of England (2007).

The greatest benefits to the patient are the reduction in hospital-initiated cancellations and better delivery of care. Cancellation of surgery creates great hardship for patients who plan their working and family lives around proposed operation dates. Most cancellations occur with less than 24 hours' notice. Cancellations in either scheduled or unscheduled care break efficiency streams in theatre and are also costly (RCS, 2007).

1.3 SPECIALIST HOSPITALS

In some regions there is geographic separation of the acute and planned orthopaedic pathways by way of stand-alone orthopaedic hospitals. Currently, there are six stand-alone orthopaedic hospitals delivering a range of services.

Elective Orthopaedic Hospitals

National Orthopaedic Hospital, Cappagh	South Infirmary Victoria University Hospital, Cork	University Hospital Galway Merlin Park University Hospital
Our Lady's Hospital, Navan	Orthopaedic Hospital, Kilcreene	Croom Orthopaedic Hospital

Continued reductions in orthopaedic waiting time targets provide a further imperative for reaching early solutions that will reduce waiting times in a sustainable manner. As discussed previously, planned orthopaedic procedures are often perceived to be discretionary, and this can lead to cancellation of these operations. The impact on patients is rarely recognised outside the surgical community, the patients, their families and their GP. There is no doubt that stand-alone elective orthopaedic units provide highly efficient patient care and have many advantages (Barloe et al., 2013).

A disadvantage, however, is that patients with significant co-morbidities may be deemed unsuitable for admission to a stand-alone orthopaedic hospital. If patients develop serious complications post-operatively, they have to be transferred to the nearest model 3 or 4 hospital. This places increased demands on an already busy acute service. Orthopaedic units for planned surgery should be developed, so as to enable them to function independently with regard to the provision of inpatient beds and theatre, nursing, anaesthetic therapy and diagnostic services. Continued investment in existing stand-alone hospitals will be required. A time will come when these hospitals will need to be replaced, and when that happens, they should be sited on the campus of a Model 4 hospital. Specialist orthopaedic hospitals require dedicated consultant musculoskeletal radiologists at a manpower ratio of one to every three consultant trauma and orthopaedic surgeons (WTE). This particular model of hospital will have all the appropriate services and expertise. Thorough analysis of workload and resource requirements will be essential, in order to ensure that planned orthopaedic activity levels are maintained.

In line with DOH/HSE 'Securing the future of Smaller Hospitals: A Framework for Development document sets out (DoH, 2013) and the NCPS's models of care for acute and elective surgery, the approach that the National Clinical Programme for Critical Care has taken in its Model of Care (HSE, 2014), is to separate undifferentiated care from differentiated care. It is clear that undifferentiated care is directed to Model 3 or Model 4 hospitals as appropriate. Both Model 3 and Model 4 hospitals have Critical Care Services (ICU/HDU) where the needs of the deteriorated, critically ill patient requiring Level 2 Critical Care (HDU) or Level 3 Critical Care (ICU) can be met.

On the other hand, the smaller hospital framework sets out the scope of the Model 2S hospital to provide safe, effective care to elective 'low-risk, differentiated' patients 'not likely to require full resuscitation'. It is clear that the Model 2S hospital does not provide a Critical Care Service (Level 2 HDU or Level 3 ICU). Whereas the Model 2S hospital provides anaesthesia on call, it does not provide on-site anaesthesia out of hours. It is important to recognise that the condition of some patients undergoing procedures appropriate to a Model 2S hospital may deteriorate. Where a differentiated patient is deemed to be at risk of deterioration, the Smaller Hospital Framework provides a surgical observation unit in a Model 2S hospital where a patient may be admitted and observed. The level of care provided in a surgical observation unit is Level 1, which is appropriate to a differentiated patient at risk of deterioration and requiring observation. Where a differentiated patient deteriorates and becomes critically ill, the surgical team are the first responders in line with the skill, competency and capability provided by CCrISP (Care of the Critically Ill Surgical Patient) certification, Royal College of Surgeons in Ireland (RCSI). It is important to anticipate an infrequent event involving a critically ill patient arising in a Model 2S Hospital. Following immediate resuscitation, the acutely ill or critically ill patient needs to be transported to a HDU/ICU in a Model 3 or Model 4 hospital. It is anticipated that a national retrieval service will provide this transport in due course. Accordingly, the Framework, the National Clinical Programmes in Surgery and Critical Care Models of Care describe a hospital framework within which safe, effective care can be scheduled and delivered.

1.4 THE REFERRAL PROCESS FOR PLANNED ORTHOPAEDIC SURGERY

In the UK, it is estimated that one in four of all GP consultations relate to musculoskeletal conditions (Audit Scotland, 2010). In October 2012, the Director General of the Health Service Executive (HSE) requested that the Health Information and Quality Authority (HIQA) undertake a series of health technology assessments (HTAs) of scheduled surgical procedures. This was in the context of evaluating the potential impact of introducing clinical referral or treatment thresholds for selected high-volume procedures. HTAs are of benefit to hospital managers, consultants, nurses and health and social care professionals, as they indicate the most appropriate pathway for the patient. The National Clinical Programme for Trauma and Orthopaedic Surgery collaborated in the HTA process by nominating members of the IITOS to become members of the Expert Advisory Group for musculoskeletal conditions.

Phase Two of the process included surgeries primarily associated with the treatment of hand and spine conditions; these HTA reports were published in December 2013 (HIQA, 2013).

Phase Three of the process focused on four orthopaedic procedures: hip and knee arthroplasty, and knee and shoulder arthroscopy. The HTA reports were published in July 2014 (HIQA, 2014). Orthopaedic patients are usually referred initially by their GP and are seen as an outpatient in an orthopaedic clinic. A patient may, however, be seen first by a musculoskeletal physiotherapist in a musculoskeletal clinic.

A study carried out in University Hospital Limerick (UHL) by Gilmore and Lenehan, who investigated inter-observer and intra-observer variability in the assessment of urgency of GP low back pain referrals to an orthopaedic spinal service, found that there is currently a lack of direction on appropriate content of referrals of patients with musculoskeletal disorders (MSDs) from primary to secondary care in Ireland (Gilmore et al). Between 15% and 27% of primary care presentations relate to MSDs, thus making them the second most common cause of presentation to primary care. Since referrals contain variable quantity and quality of information pertaining to the patient, the receiving clinicians in secondary services struggle to accurately triage these referrals in line with HSE policies to offer referred patients urgent appointments within 12 weeks, and routine appointments within nine months. The results of this study appear to suggest that there is a lack of agreement among clinicians receiving referrals as to which patients are to be seen urgently and which are appropriate for routine assessment. Agreed referral guidelines, a standardised referral form for primary care practitioners and a standardised reply letter for secondary care clinicians would be of benefit in this instance.

Nationally developed guidelines for referral and subsequent treatment, which are endorsed by the National Clinical Programmes and the clinical advisory group, will ensure that patients are seen in an appropriate timeframe and receive the appropriate treatment for their condition. These guidelines will provide greater clarity in situations within the primary/secondary interface of care. To advance the development of these guidelines, the National Clinical Programme for Trauma and Orthopaedic Surgery is collaborating with the Outpatient Services Improvement Programme, in addition to collaborating with members of the Irish Institute of Trauma and Orthopaedic Surgery, health and social care professionals (HSCPs), and GPs. A working group has been formed to develop a suite of referral guidelines for orthopaedic conditions.

The Outpatient Services Improvement Programme states:

"A standard referral form is used to facilitate the provision of sufficient information to enable safe assessment by the clinician. This referral must contain, at a minimum, the data set out by HIQA (2011) in OP Guidance 003, the HIQA Minimum Data Set for Outpatient Referrals". The National Clinical Programme for Trauma and Orthopaedic Surgery recommends that these guidelines should be implemented nationally, and that education should be provided to improve referral quality (HIQA, 2014).

Referral should usually only be considered when other pre-existing medical conditions have been optimised, and where there has, if necessary, been evidence of weight reduction to an appropriate weight. Patients who are overweight should be encouraged and supported to reduce their body mass index (BMI) to below 25. Traditional referral patterns have been under review in recent years, and one excellent example of innovation is the musculoskeletal physiotherapy clinic model.

In 2012, as part of a joint initiative between the orthopaedic and rheumatology National Clinical Programmes, a number of clinical specialist musculoskeletal physiotherapists were employed nationally to aid reduction of lengthy outpatients department (OPD) waiting lists and improve long-term musculoskeletal referral management. Twenty four musculoskeletal physiotherapists were appointed, resulting in significant reductions in OPD waiting lists.

Musculoskeletal clinic review data 2015:

Total removed off Ortho and Rheum wait lists end of May 2015			
Orthopaedics		**Rheumatology**	
NP	33,092	NP	7,550
Returns	5039	Returns	1,284
NP DNA	6,532	NP DNA	1,105
Discharges	25,917	Discharges	5417
% D/C rate	78%	%D/C rate	81%
Total removed	39,624	Total removed	8,655
In total: 48,279 removed since programme started			

Table: musculoskeletal physiotherapy clinic metrics (NCPR programme manager RCPI)

Referrals to secondary care could be reduced by getting patients on the right pathway through expansion of clinical specialist musculoskeletal physiotherapist clinics in the community setting. The development of interface clinics is a proven method of treating patients in their own community.

We strongly recommend that this proven model be expanded both in the acute hospital division and at the community interface. If this expansion occurs, it will be necessary to employ additional extended scope physiotherapists and for occupational therapists and podiatrists to be included in this model.

1.5 ARTHROPLASTy

While arthritis can affect people at any age, it is more prevalent in older people, with evidence of osteoarthritis (OA) in more than 25% of Australians over the age of 65 (ACI, 2012).

"The condition affects 400,000 people in Ireland. There has been an increase in the number of people with osteoarthritis in Ireland for two reasons; our ageing population and more obese people putting an increased strain on their joints" (Irish Health Clinics, 2014).

There is a common misconception that osteoarthritis – a chronic, non-fatal condition – is an inevitable part of growing old. Osteoarthritis is the clinical and pathological outcome of a range of disorders that can result in structural and functional failure of joints. This progressive joint failure can cause pain, stiffness and loss of function. It will result in disability and compromised quality of life for almost one-third of those reporting the disease.

Although the standard of care for public patients requiring planned joint replacement surgery is high, a number of areas for improvement have been identified that would result in better patient pathways and outcomes, and a more responsive health system.

The National Health Service (NHS, 2006) Institute for Innovation and Improvement report *Delivering Quality and Value: Focus on Primary Hip and Knee Replacement* identified that the clinical pathway in the high-performing NHS trusts for hip and knee replacements were underpinned by six overarching characteristics, including:

- Patients' expectations are consistently managed
- Patients attend a pre-assessment clinic
- Patients are admitted on the day of surgery
- Patients' planned procedures are not cancelled
- Patients are mobilised as soon as possible after surgery

- Patients are discharged using a criteria-based system.

Hospital managers and clinicians must ensure that waiting lists are managed chronologically, balanced by and in addition to clinicians being allowed to triage patients according to clinical priority.

Total hip and total knee replacements have been one of the most successful innovations in modern medicine. In Ireland, more than 6,000 such operations were carried out in 2013 in public hospitals, and an estimated 5,000 operations were carried out in the private hospital sector. The National Joint Registry for England and Wales 9th Annual Report 2012 notes that 71,672 primary hip replacement procedures were undertaken in 2011. The average age of patients was 67.2 years, with an average BMI that increased from 27.35 in 2004 to 28.59 in 2011.

There were 79,516 primary total knee replacements recorded, and the average age of these patients was 67.4 years. Over the past eight years, there has also been an increase in BMI among patients undergoing primary knee procedures. This figure has progressively increased from 29.2 to 30.8 over the last eight years (National Joint Registry, 2012).

Given the similar demographic and population profile in Ireland and the UK, it is reasonable to suggest that the same patient profile applies in Ireland. The introduction of an Irish National Orthopaedic Register (INOR) will provide an efficient system to enable a timely review of patients, with the opportunity to collect important data for clinical and research purposes.
There is evidence to suggest that a protracted waiting time is associated with a decline in quality of life and physical function, an increase in joint-related pain and less optimal long-term outcomes. Considering the current evidence, waiting times for planned joint replacement surgery from time of referral should not exceed 180 days (Department of Health, Western Australia, 2010).

Planned individual procedure metrics 2013 HIPE DATA unilateral hip replacement – planned only

	Year 2010			Year 2011			Year 2012			Year 2013		
	#Pat	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**
Hsptl Group 1	795	6,926	8.71	829	6,491	7.83	833	5,195	6.24	893	4,468	5.00
Hsptl Group 2	309	2,710	8.77	317	2,298	7.25	439	2,686	6.12	423	2,290	5.41
Hsptl Group 3	13	144	11.08	23	328	14.26	31	328	10.58	43	435	10.12
Hsptl Group 4	441	3,439	7.80	452	3,384	7.49	468	3,292	7.03	517	3,300	6.38
Hsptl Group 5	743	6,429	8.65	716	5,369	7.50	791	4,984	6.30	865	5,006	5.79
Hsptl Group 6	615	5,398	8.78	676	5,409	8.00	621	3,971	6.39	748	4,198	5.61
Total	2,916	25,046	8.59	3,013	23,279	7.73	3,183	20,456	6.43	3,489	19,697	5.65

Table: Annual hospital group planned inpatient volumes, bed days used and AvLOS for discharged patients who received total hip replacement surgery.

The national AvLOS for patients having elective hip replacements fell by 34% between 2010 and 2013. If this reduction had not taken place, the health service would have required 10,273 additional bed days in order to provide the same number of hip replacements in 2013.

The national AvLOS for patients having planned hip replacement surgery fell significantly and in a sustained fashion in August 2011 and again in January 2013. Every month since then, a constant cohort of hospitals discharge patients even more quickly, where as a small number of hospitals retain patients for longer periods of time.

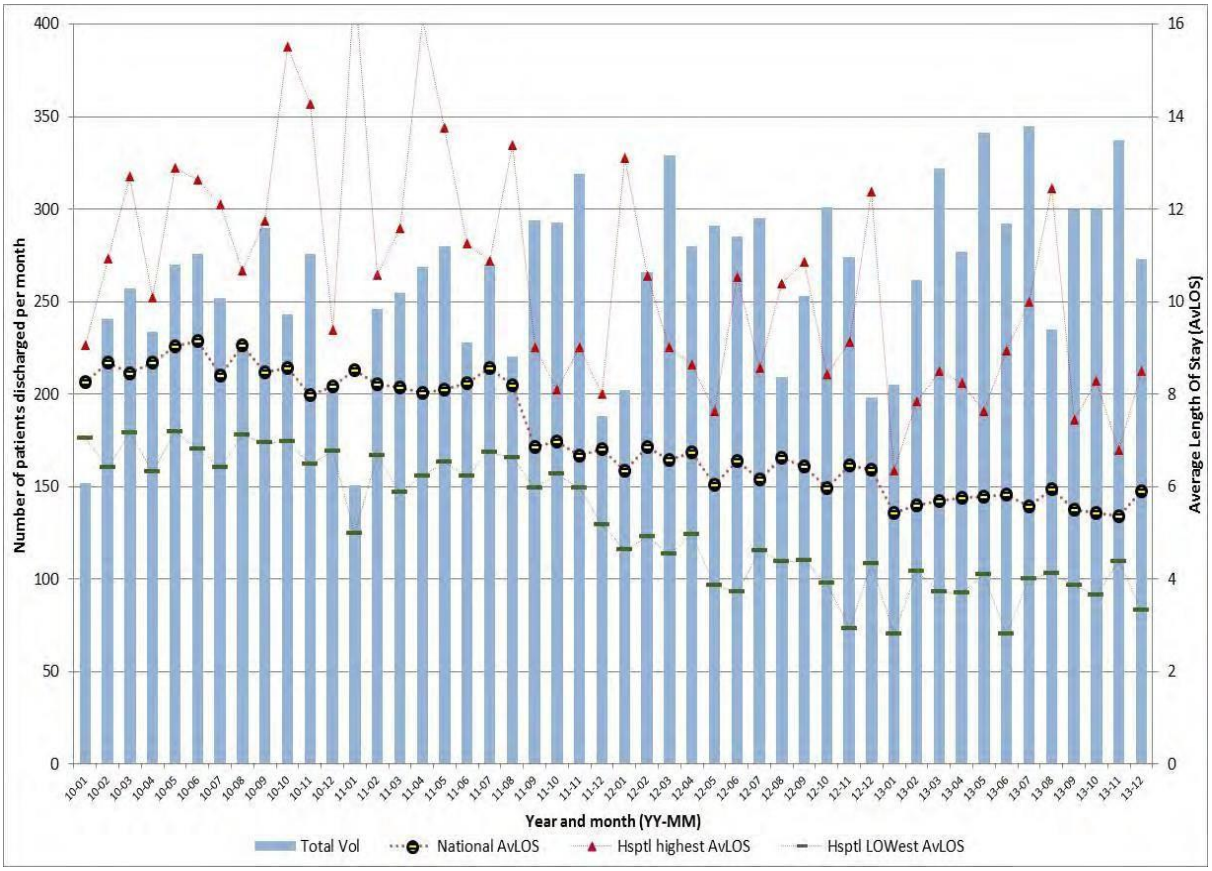


Chart: National monthly planned volumes for total arthroplasty of hip as blue vertical bars with AvLOS for national aggregate, hospital with shortest AvLOS and hospital with longest AvLOS. Excluded hospitals performing less than six per month from longest and shortest hospital selection process.

unilateral knee replacement – planned only

The national AvLOS for patients having planned knee replacement surgery fell by 37% between 2010 and 2013. If this reduction had not taken place, the health service would have required 7,130 extra bed days in order to provide the same number of knee replacements in 2013.

	Year 2010			Year 2011			Year 2012			Year 2013		
	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS
Hsptl Group 1	603	5,704	9.46	547	4,246	7.76	624	4,186	6.71	705	3,676	5.21
Hsptl Group 2	228	2,060	9.04	282	1,817	6.44	395	2,373	6.01	325	1,643	5.06
Hsptl Group 3	10	118	11.80	10	91	9.10	17	231	13.59	16	152	9.50
Hsptl Group 4	210	1,568	7.47	229	1,672	7.30	217	1,471	6.78	253	1,639	6.48
Hsptl Group 5	405	3,316	8.19	479	3,295	6.88	575	3,389	5.89	579	3,222	5.56
Hsptl Group 6	306	2,725	8.91	263	2,195	8.35	288	1,845	6.41	328	1,929	5.88
Total	1,762	15,491	8.79	1,810	13,316	7.36	2,116	13,495	6.38	2,206	12,261	5.56

Table: Annual hospital group planned inpatient volumes following total knee replacement surgery, bed days used and AvLOS for discharges who received total knee replacement surgery. The Children's hospital group is excluded.

The national AvLOS for patients having planned knee replacement surgery fell significantly and in a sustained fashion around July/August 2011 and again in January 2013. Every month since then, a constant cohort of hospitals discharge patients even more quickly, whereas a small number of hospitals retain patients for longer periods of time.

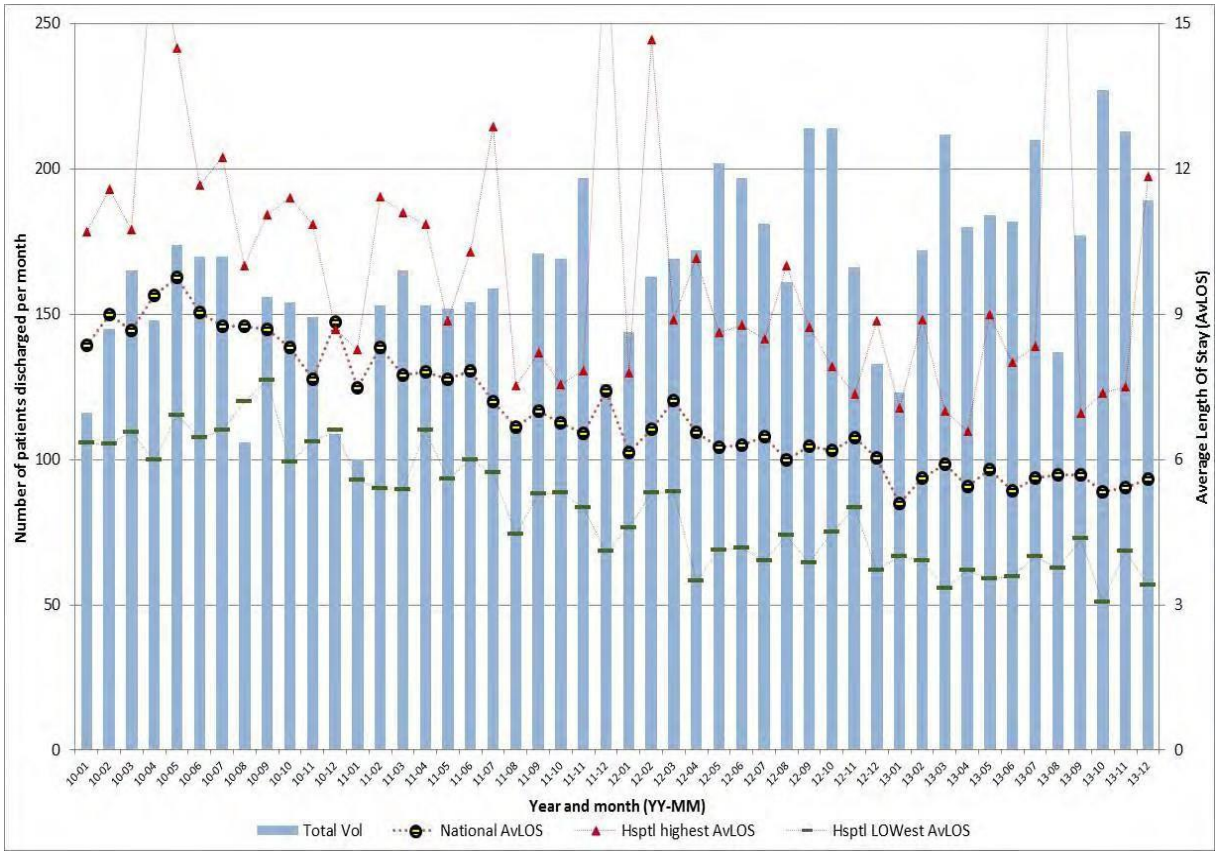


Chart: National monthly planned volumes for total arthroplasty of knee with AvLOS for national aggregate, hospital with shortest AvLOS and hospital with longest AvLOS. (Note: Excluded hospitals doing less than six per month from longest and shortest hospital selection process).

1.6 ACTIVITy-bASED FuNDING (AbF)

Activity-based funding is a method of funding hospitals whereby payment is made for the number and mix of patients treated. If a hospital treats more patients, it receives more funding. Obviously, some patients are more complicated to treat than others, and ABF takes this into account.

The prospective funding project for primary total hip and total knee replacements commenced as a pilot for activity-based funding in 2011. This initiative implemented prospective funding for primary hip and knee replacements (four diagnosis-related groups (DRGs)) in seven hospitals initially, with a further five hospitals joining six months later as a result of the success of the initial pilot. The hospital budget was reduced by an amount of money related to the four DRGs, and this portion of the budget was 'earned' back, based on work carried out in the hospital.

The prospective funding project represented the beginning of a fundamental change in the delivery of healthcare within hospitals. In simple terms, the funding arrangement moved from the historical "block funding" basis to one of activity-based funding. By creating a single price for the individual case (DRG), the responsibility moved to the hospital, so as to ensure that its costs were managed within this price. This required greater clinician engagement, enhanced financial management in hospitals and the development of sustainable "patient-level costing" processes (Casemix Ireland, 2012). The success of the prospective funding initiative led by the National Clinical Programme for Trauma and Orthopaedic Surgery demonstrated the savings and efficiencies that could be delivered. Over 9,000 bed days were saved in a one-year period.

In England, a similar system, Payment by Results (PbR), is the payment system by which commissioners pay healthcare providers for each patient seen or treated, taking into account the complexity of the patient's healthcare needs. The two fundamental features of PbR are nationally determined currencies and tariffs. Currencies are the unit of healthcare for which a payment is made. They can take a number of forms, covering different time periods from an outpatient attendance or a stay in hospital to a year of care for a long-term condition . Tariffs are the set prices paid for each currency.

The introduction of Best Practice Tariffs (BPTs) (NHS, 2012) in 2010-11 started the process of ensuring that tariffs are determined by best clinical practice rather than average cost. The first wave of BPTs included fragility hip fracture, and made an additional payment for providing rapid surgery and orthogeriatric care. The second wave of BPTs in 2011-12 included primary total hip and knee replacements, in order to encourage best clinical management of patients and minimal lengths of stay. In 2012-13 major trauma was added, in order to encourage best practice treatment and management of trauma patients within a regional trauma network. BPTs incentivise improvements in the quality of acute hospital care, and they must be structured so that they adequately reimburse high-quality and cost-effective care, and also remove any barrier in the tariff to the delivery of such care. BPTs focus attention on an area of clinical practice and, when aligned with a strong clinical drive nationally and locally, can help bring about significant improvement in patient care, as shown by progress on fragility hip fractures. We fully support the introduction of activity-based funding and, eventually, the introduction of BPTs.

1.7 THROMbOEMbOLISM AND INFECTION

There is an increased risk of thromboembolic disease associated with surgery. Individual hospitals should have thromboprophylaxis guidelines in place that are consistent with national and international guidelines.

Ultimately, the decision and responsibility to implement thromboprophylaxis and duration of treatment remains with the surgeon, particularly with respect to weighing the efficacy of pharmacological intervention against the risk of other complications. The IITOS has published suggested guidelines for thromboprophalyxis in patients undergoing primary total hip and total knee replacement surgery. These guidelines will be reviewed annually, and updated to ensure that they reflect advances in the field (IITOS, 2014).

A critical factor in delivering a safe planned care service is the prevention of infection. Deep infection after surgery can be catastrophic for the patient, leading to further surgery, disability, and risk of mortality. It also significantly increases costs for the health service to treat these patients.
Joint replacement surgery carries an additional risk of periprosthetic infection. To minimise this risk, it is important that a broad spectrum antibiotic agent is administered before incision at least 20 minutes before the application of a tourniquet, and during the first 12 hours post-operatively. Comprehensive guidelines are available in the consensus document Recommendations of the Working Group of the Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection (International Consensus Group, 2013).

The models of care for acute (NCPS, 2013) and elective surgery (NCPS, 2011) provide guidance on the patient journey from the decision to have surgery to discharge through the following workstreams:

- average length of stay or AvLOS
- audit

- theatre journey – the Productive Operating Theatre Programme (TPOT).

1.8 JOINT REPLACEMENT EDUCATION

The joint replacement school is an educational concept first employed in the UK almost 10 years ago. Its principal aim is to educate patients before they undergo joint replacement, and it involves a multidisciplinary team delivering information to a patient group in a relaxed environment. There are good examples of joint replacement schools in Ireland which, for example, involve a 30-minute talk from each of the following disciplines: orthopaedic surgery, anaesthesia, nursing, physiotherapy and occupational therapy.

The patient journey is discussed, and patients are encouraged to prepare questions in advance of the school. Each discipline discusses their angle in the team approach to the joint replacement care pathway. The discussion aims to empower patients, as well as prepare them for their surgery and post-operative rehabilitation. The encounter also allows staff to discuss the complications that can occur, and educate the patient in managing these complications, should they develop. The curriculum discussed during the event is documented in a booklet, which is given to each patient on completion of the session. It is hoped that this education process will augment current consent protocols, and will better inform and empower patients, allowing them to be part of their own healing process. In addition to familiarising patients with the hospital environment and staff, the process helps to allay patient stress and fear of surgery. Overall, it is a positive reciprocal communication experience for both staff and patients, allowing a true patient-centred approach to joint replacement surgery.

We recommend this excellent model as a means of educating patients, allaying their fears and empowering them to take an active part in their recovery.

1.9 ENHANCED/RAPID RECOVERY PROTOCOLS

Enhanced recovery, also called rapid or accelerated recovery, is an evidenced-based programme of care, which was initiated in Copenhagen in 1997 by Professor Henrik Kehlet, and was adopted by hospitals across the UK from 2002 onwards. The patient should be introduced to the enhanced recovery concept at the pre-assessment clinic or joint replacement school.

Enhanced recovery programmes have been adopted as a means to achieve productivity gains and cost savings. The evidence base to support widespread implementation is limited, but does suggest possible benefits in terms of improved patient well-being, reduced length of hospital stay, fewer post-operative complications, reduced re-admissions and improved patient outcomes (Paton et al., 2014).

Enhanced recovery is founded on four working principles:

1. All patients should be on a pathway to enhance their recovery. This enables patients to recover from surgery, treatment and illness, and leave hospital sooner, as a result of minimising physical and psychological stress responses.
2. Patient preparation ensures that the patient is in the best possible condition for surgery. Moreover, such preparation identifies risks and also ensures that the patient commences rehabilitation prior to admission, or as soon as possible after that.
3. Proactive patient management components of enhanced recovery are embedded across the entire pathway before during and after operation/treatment.
4. Patients play an active role, and take responsibility for enhancing their recovery.

During the pilot for prospective funding in 2011-2013, many hospitals commenced enhanced recovery programmes for patients undergoing total hip and knee replacements. We recommend extending enhanced recovery programmes to all suitable patients.

1.10 PRINCIPLES OF DAY OF SURGERY ADMISSION (DOSA)

The traditional culture of admitting patients a day or more before their intended surgical procedure was originally instigated in order to carry out pre-operative assessment. However, due to increasing pressure on capacity and costs, more efficient resource optimisation is necessary. Most planned surgical inpatient admissions will go through a DOSA unit pre-operatively. However, certain groups of patients will be unsuitable for DOSA, and these patients will need to be admitted to hospital the day before surgery. It is essential that beds are protected for these patients. It is unacceptable to bring a patient into hospital on the day of their surgery and not have systems in place to ensure that there will be a bed available for them.

During the prospective funding pilot in 2011–2013, DOSA rates increased from practically zero to over 70% in the 12 orthopaedic hospitals participating in the pilot.

1.10.1 Pre-operative site marking

The patient's identity, planned procedure, side/site/level/digit should be verified with the patient/parent/guardian prior to site marking. Site marking must be performed by the consultant surgeon in charge of the patient's care, or by a nominated competent deputy who will be performing / assisting in the operation and will be present for the "time-out"

process. Relevant x-ray films, diagnostics and original reports must be available and reviewed by the consultant, or by a nominated competent deputy, prior to site marking. The site must be marked with indelible ink in the presence of a parent or guardian, if applicable, prior to the patient being transferred to the operating theatre environment (HSE, 2013).

Following completion of the pre-operative site marking procedure, an anaesthetic assessment takes place. When the theatre team indicate their readiness, the selected patient is accompanied to the holding bay in the theatre suite where the receiving nurse cross-checks their personal details and other information. The patient is then placed on the operating table top, or on a trolley, for transfer to the anaesthetic room.

1.11 FACILITIES FOR PLANNED ORTHOPAEDIC PROCEDURES

1.11.1 Day units

In the draft document, Guidance on the Appropriate Delivery Location for Different Types of Elective Ambulatory Surgery, the National Clinical Programme in Surgery analysed elective day cases from the 2012 HIPE database. When assessed at an individual hospital level, the percentage of surgical patient discharges that could have been performed in a lower cost facility ranged from between 8.7% and 43.4% in larger Model 4 hospitals to between 6.7% and 37.4% in Model 3 hospitals, and between 19.7% and 66.8% in Model 2/2S hospitals.

Currently, a large volume of planned orthopaedic surgery patients are admitted as day cases. Many more could be admitted as day cases if designated beds were available and it is clinically appropriate to do so.

In a properly resourced and efficient day unit there should be:

- a clear integrated care pathway (ICP) for patients undergoing day surgery from the outpatient clinic to discharge
- appropriate staffing levels by dedicated staff, as set out in the Model of Care for Elective Surgery
- agreed protocols and referral pathways to health and social care professionals (HSCPs)
- full compliance with the WHO Surgical Safety Checklist. (WHO, 2009)
- an appropriate discharge protocol with follow-up, outreach and re-admission where necessary
- liaison with the primary and community care team at the point of discharge.

Patients should have access to a hospital point of communication after discharge, in case of an emergency, and there should be a clear pathway for re-admission, if necessary.

1.11.2 Necessary support structures

- access to diagnostic services in an outpatient setting, this includes consultant radiologists with a special interest in MRI or musculoskeletal imaging, and to the appropriate equipment (especially MRI)
- post-operative discharge planning completed prior to attendance; patients with social issues may not be suitable candidates
- skilled orthopaedic nursing staff
- skilled health and social care staff
- extended working day if the opportunity to facilitate two admissions per bed day arises. The second patient of the day may not be fit for discharge until later in the evening (NCPS, 2011:44-56).

1.12 INPATIENT WARD

The importance of the theatre environment for planned orthopaedic surgery has been understood for many years. Moreover, studies have shown that the ward environment is also important in the prevention and control of infection (HIQA, 2012).

The National Clinical Guideline No. 2 states: "Risk stratification should be performed locally to identify areas where MRSA infection results in high morbidity and mortality and where patient isolation or cohorting is essential. Isolation or cohorting is essential in high-risk areas, i.e., intensive care units (ICUs), orthopaedic units, and other specialised clinical areas with vulnerable patients." (Department of Health (2013).

Furthermore, HIQA states that healthcare is provided in a physical environment which supports the delivery of high-quality, safe, reliable care, and protects the health and welfare of service users. The physical environment that is developed and managed must minimise the risk of service users and members of the workforce acquiring a healthcare-associated infection. (HIQA, 2012).

Complications following orthopaedic surgery are distressing for the patient and are costly for the health service. In the NHS, infection in patients following total hip and total knee replacements can cost £70,000 (e99,000) per patient to treat. (NHS, 2012).

The importance of infection prevention and control in orthopaedic patients cannot be overemphasised. Therefore, this Model of Care recommends that orthopaedic patients should be cared for in designated wards.

1.12.1 Inpatient facilities for planned orthopaedic patients

- Patients should be nursed in dedicated, planned

orthopaedic wards, away from potential sources of cross-contamination from patients with infections. Wards should be staffed by a team experienced in the management of patients with musculoskeletal disease

- Bed spacing should be planned and managed in a way that minimises the risk of spread of infection. Due to the risk of cross-infection, it is not acceptable to mix planned orthopaedic surgery patients in a ward with medical and other surgical patients
- Facilities must be available for isolating patients who are known to be infected
- The correct nursing and health professional staff numbers to meet individual patient needs is essential to ensure safe care
- Continuous professional development (CPD) should be established for all providers of orthopaedic services
- Local nursing management should endeavour to have a constant workforce of experienced nurses and health professional staff, without having to resort to agency nurses/locums. Consistent staffing ensures efficiency and safe practice. Agency staff may not be fully aware of a unit's protocol, or have the necessary experience to nurse patients with complex orthopaedic conditions, and therefore this creates an unnecessary added clinical risk to patients
- The patient's treatment should be in a setting where satisfactory standards of clinical governance are applied
- All patients should receive hospital treatment under the care of a named consultant orthopaedic surgeon who is ultimately responsible for defining the quality of clinical care provided by his/her service. (BOA, 2013/ 2014:9)
- Access to a high dependency unit (HDU) is necessary. Such units should have nursing staff trained in the management of orthopaedic patients. If admitted to these units, orthopaedic patients should be isolated from other patients, in order to avoid cross-infection
- If necessary, the pain management team should be involved during the peri-operative and post-operative period
- Health and social care professions should be staffed to provide a seven day service as required to ensure mobilisation of patients at weekends, maximise functional independence, provide splinting services and discharge planning
- Adequate facilities should be provided to encourage patient mobilisation and rehabilitation thereby reducing length of stay.

1.13 THEATRE FACILITIES

Preventing airborne infections during a surgical procedure is of paramount importance for effective and economical delivery of quality care, and for the health and well-being of patients. Surgical site infections can cause complications in the post-operative management of the patient, and are a significant contributory factor in morbidity, mortality, and healthcare costs. Certain types of surgery amplify the risk, due to the deep wound and the insertion of the prosthetic device. Laminar air flow systems with high-efficiency particulate air (HEPA) filtration, remove airborne particles of 0.3 mm and above with 99.97% efficiency; such systems are generally used for orthopaedic implant surgery. Laminar air flow theatres and other strategies that may reduce particulates would be expected to reduce particulate load. The most cited studies supporting the use of laminar air flow theatres were conducted in the 1970s and 1980s by Charnley and Lidwell et al. More recent studies have shown no clear evidence of laminar air flow reducing the incidence of deep surgical site infection. (International Consensus Group, 2013: 85)

- The report recommends further investigation in this field, and until this investigation is complete and results have been verified, we recommend the use of laminar air flow theatres for arthroplasty surgery. The absence of a high level of evidence from randomised trials is not proof of ineffectiveness. The British Orthopaedic Association also recommends laminar air flow operating theatres for arthroplasty surgery. (BOA, 2013/ 2014:32).

Most modern operating theatres have conventional plenum ventilation with filtered air, using filters with an efficiency of 80-95% to remove airborne particles <5 mm [DOP test25] surgery (Dharan et al., 2002). Most orthopaedic surgery can be performed in operating theatres with conventional plenum ventilation. All operating theatres must have scheduled maintenance protocols, and strict adherence to these protocols must be observed. Airborne particulate bacteria are a major source of contamination in the operating theatre; they originate from normal skin flora of patients or staff. Bacteria on skin squames, lint and other dusts filtrate into the air in the operating theatre via turbulent air currents, and then deposit on surfaces. Studies have shown that the number of airborne bacteria around the wound is correlated with the incidence of peri-prosthetic infection. (International Consensus Group, 2013:84)

Personnel are the predominant source of particulates. One of the main transport methods for bacteria is via the movement of airborne particles of human skin. Ritter et al. demonstrated that bacterial counts in theatre air increased 34 fold in an operating room with five people present, when compared with the bacterial count in air in an empty room. In ultra-clean air theatres, interposition of theatre personnel between the air

source and the wound can increase rates of infection; for this reason, provision of efficient occlusive clothing is critical.

Studies have shown a positive correlation between traffic flow rates and air bacterial counts in orthopaedic procedures. The number of people in theatres should be kept to a minimum. In a study by Panahi et al., door openings were observed during primary and revision total joint replacement surgery. They identified 0.65 and 0.84 door openings per minute in primary and revision cases, respectively. The main personnel responsible for door opening were nurses and implant technical representatives. Multiple door openings can result in a drop in the pressure gradient, thus requiring more air to be pumped through laminar air flow systems and, consequently, the high-efficiency particulate air filters are consumed more quickly. In theory, talking can accelerate the eventual contamination of masks. Talking, as well as the number of people present in the theatre, should be kept to a minimum during operative procedures. An increase in the amount of talking, and in the number of people present, can increase the number of airborne microorganisms. (International Consensus Group, 2013:86)

In an effort to reduce theatre traffic, implants should be templated in advance, if practicable, and proposed implants should be held in the theatre in advance of the surgical procedure.

1.14 THE THEATRE ENVIRONMENT

A high standard of theatre protocol is essential, in order to maintain the optimum air flow in an ultra-clean air theatre. The quality of air in operating theatres should be checked and validated as part of a monitored schedule, and reports should be readily available. Use of the orthopaedic theatre facilities by other specialties should be confined to clean trauma and other clean surgical specialties. If possible, planned orthopaedic lists should be carried out prior to any other specialty using the theatre on a given day.

There should be a clear and agreed sterile technique protocol in the orthopaedic theatre. Adherence to this protocol should be mandatory. The surgeon is responsible for the audit of infection, and therefore should decide the theatre protocol in conjunction with the clinical nurse manager, the theatre manager and the Infection Prevention and Control Team (BOA, 2006).

1.14.1 Theatre staffing

Theatre managers should ensure that operating theatre personnel, including nursing and ancillary staff, have reached the required competency level to work as part of the theatre team. Orthopaedic surgery is complex, and staff require continuous education in order to enable them to care for the patient in a holistic fashion. Experienced, competent nurses will proactively manage the patient caseload, ensuring that all aspects of quality patient care are met. The time required to train theatre nurses in orthopaedic surgery must be factored in by theatre managers and hospital management when deciding the whole-time equivalent complement of staff for a theatre.

1.14.2 Equipment

Due to the increasing complexity and volume of orthopaedic equipment, it is essential that there is a constant presence of an experienced orthopaedic team who are familiar with the equipment, decontamination standards, and reassembly of instrumentation. The scrub nurse is a vital member of the operative team, and the efficiency, speed and safety of the operation are enhanced by the presence of a knowledgeable scrub individual.

- The use of good quality disposable gowns and drapes, with a proven resistance to strikethrough, is recommended
- Jewellery, nail varnish or false nails should not be worn.
- All hair should be fully covered
- Each member of the multidisciplinary team in an orthopaedic or trauma operating theatre must wear a mask during an operation, or when operative sets are open
- A full range of specialised implants, instruments and supplementary stock must be readily available
- Non-orthopaedic emergencies such as vascular injury may occasionally occur, and the required specialised instrumentation should be available for such emergencies
- Operative sets and instruments should be opened as close as possible to the time of skin incision
- Requirements for bariatric patients should be provided.

1.14.3 Record-keeping and operation notes

Good records are a basic tool of clinical practice and should be legible. The records must include the name, date of birth and address of the patient. The referring GP should be identified and the hospital number should be clear. The hospital and surgeon with responsibility for care should be named (HSE, 2011).

The admission note should record the general medical condition of the patient, as well as their fitness for the proposed operation. The note should contain a clinical history, the full clinical examination findings, as well as information on the patient's pre-existing medical history, and all current disabilities. The purpose of the operation should be stated. Details of the patient's medication regime should be listed.

An explanation of the proposed procedure, as well as the associated risks and benefits, should be recorded in the notes. If appropriate, details of the type of implant to be used should be explained to the patient, together with information on the implant's success and failure rates, if known. Ideally, the operating surgeon should complete the consent form with the patient; if this is carried out in the outpatient department, there should be only a short delay between completion of this procedure and commencement of the operation. In certain circumstances, patients must be made aware of the fact that if peri-operative findings indicate that a certain procedure would be inappropriate, then an alternative procedure may be performed. This should also be recorded in the notes.

It is best practice to make operation-related notes in handwriting, or to dictate such notes for immediate typing and signature by the operating surgeon. If a pre-arranged pro forma is being used, the operating surgeon should personally complete the pro forma.

A record of the operation should be made immediately following surgery, and should include:

- the name of the operating surgeon, his/her assistants and the name of the consultant responsible
- the diagnosis and the procedure performed
- details of side operated on
- details of the incision and any additional procedures needed in order to achieve satisfactory exposure
- description of the findings
- details of all soft tissue release procedures
- details of significant tissue excision, transposition or augmentation;
- details of serial numbers of prostheses and other implanted materials
- details of bone grafting
- tourniquet time
- details of sutures used
- an accurate description of any difficulties or complications encountered, and how these were overcome
- immediate post-operative instructions
- the surgeon's signature and the date of the operation
- data forms for the Irish National Joint Register (INOR) must be checked for completeness and accuracy, and signed by the surgeon before he/she leaves the operating theatre.

The patient's progress after the operation, including any early complications, should be listed. The date of discharge and arrangements for continuity of care should be recorded.

- All notes should be contemporaneous and should not be altered; errors should be identified and dated. Orthopaedic records within general hospital records should be easily identifiable within the case notes
- Follow-up notes should allow another doctor to assume the care of the patient at any time
- All doctors, nurses (or other clinicians) referred to in an entry must be identified by name and designation
- Details of written and verbal information given to GPs, patients, relatives and carers, whether at admission or later, must be recorded
- Details of all investigations considered, and whether the investigation has actually been requested, should be noted
- Ideally, there should be at least one entry each day recording the patient's progress
- An entry should be made whenever the management of the patient is changed, or when an additional procedure is carried out
- An entry should be made whenever a doctor is called to see a patient
- Deletions should be made with a single line, and then signed and dated
- Facilities should be available for the transcription of dictated notes.

1.14.4 Theatre practices

The WHO initiative, Safe Surgery Saves Lives, which Ireland signed up to in 2008, aims to identify a core set of safety standards that can be universally applied across countries and settings. In July 2013, a National Policy for Safe Surgery and Procedure was launched in Ireland (HSE, 2013). Incidences of wrong procedure or wrong site surgery are considered totally preventable. They are largely the result of miscommunication and unavailable or incorrect information. A major contributing factor to these types of errors is the lack of a standardised pre-operative process.

Checklists are advocated to improve inter-professional communication in theatre. There is high-quality evidence to support the beneficial effect of surgical safety checklists and time-out for reduction of errors, surgical site infection and other major post-operative complications, by ensuring timely administration of pre-operative antibiotic prophylaxis.

One study demonstrated that the impact of the implementation of an inter-professional pre-operative checklist in theatre was associated with a decline in communication failures (mean number of communication failures per procedure decreased from 3.9 to 1.31 (International Consensus Group, 2013: 109).

However, checklists must never be viewed as the complete answer to preventing errors. They are only one aspect of ensuring a safety culture in healthcare, and they must never

be substituted for good communication, good documentation and team working.

The WHO surgical safety checklist (time-out) should be used before the commencement of surgery in all cases. Individual hospitals may elect to adapt some details of the time-out process in order to better reflect local circumstances. Any adaptations should be undertaken in accordance with the local organisation's governance scrutiny process.

Site marking must be performed by the consultant surgeon in charge of the patient's care, or by a nominated competent deputy who will be performing / assisting in the operation and will be present for the "time-out" process. Relevant x-ray films, diagnostics and original reports must be available, and reviewed by the consultant or nominated competent deputy, prior to site marking (HSE, 2013).

1.14.5 Maintaining normothermia

Maintaining normothermia in surgical patients has been reported to significantly lower the risk of post-operative surgical wound infections (Melling et al. 2001; Schmied H et al., 1996).

The intra-operative period is important in terms of surgical site infection (SSI) prevention, and leaves room for introducing measures that do not target the transmission of pathogens, and instead actually enhance the patient's immunity. Peri-operative hypothermia is common, and is estimated to occur in about half of all surgical patients. Maintaining normothermia during surgery requires close collaboration with the anaesthetist. The primary beneficial effects of warming are mediated through increased blood flow and oxygen tension at the tissue level, but there are also other mechanisms. Hypothermia has been shown to affect molecular interactions and cellular functions in a number of systems, including the immune system and the endocrine system; the consequences of hypothermia may include coagulation, viscosity and haematocrit. Melling et al.(2001) carried out a randomised study on 421 patients undergoing clean surgery: one group with peri-operative warming, and the other without. The SSI risk was 14% in the non-warmed patient group, whereas it was only 5% in the warmed patients. This difference was highly significant. (International Consensus Group, 2013: 91). No randomised control trial specifically for orthopaedic patients has been identified; nonetheless, the importance of patient normothermia is well recognised.

A forced air warming (FAW) blanket is a popular way to maintain normothermia during surgery. FAW systems (warming units and blankets) are designed to warm patients by gently blowing warm air onto the skin via an air blanket. The other methods used to warm patients during surgery are conductive fabric warmers and water-circulating warmers.

The theoretical risk posed by FAW blankets is well recognised. Some recent studies have evaluated disruption in air flow in laminar air flow theatres when FAW blankets were used. No studies have shown an increase in SSI related to the use of these devices. An experimental study by McGovern et al. found that FAW blankets lead to a disruption in the air flow at the surgical site under laminar air flow conditions when compared to the use of conductive fabric warmers during simulated total hip replacement and spine surgery. Legg et al. found increased air particles above the surgical site when using FAW blankets. Tumia et al. undertook air sampling under laminar flow conditions in orthopaedic procedures and failed to identify any significant rise in air bacterial counts with the use of FAW blankets. Shape et al. performed air sampling in laminar air flow theatres using volunteer psoriasis patients who had increased shedding of skin cells. The air 30cm from a theoretical opening site was sampled and there were no positive cultures. Significantly, in another study, Albrecht et al. found that air intake filters used in air blowers were not optimally efficient and this resulted in colonisation of the internal parts of the device. Ninety two percent of the devices tested demonstrated positive bacterial growth, most notably with staphylococci. Forced air warming units must be maintained, and the microbial filters must be changed as per the manufacturer's instructions, so that the units are operated at maximum efficiency. No change to practice is recommended, but further study is required (International Consensus Group, 2013: 92).

Local policies should be developed by a multidisciplinary group including consultant trauma and orthopaedic surgeons, theatre managers, nurse managers as well as the infection prevention and control team.

Smith et al. (1998) reported an incidence of hyperthermia (core temperature greater than 37°C) requiring cessation of convective warming in 33% of patients receiving convective and fluid warming. If active patient warming is to be used, then continuous core temperature monitoring should be obligatory, in order to avoid accidental hyperthermia.

1.15 AuDIT

1.15.1 National Office of Clinical Audit (NOCA)

Through collaborative agreement between the Quality Improvement Division of the HSE and the Royal College of Surgeons in Ireland (RSCI), the RCSI provides administrative and operational support to the National Office of Clinical Audit (NOCA). NOCA functions through an executive team

who provide managerial and operational support to deliver the objectives of the NOCA governance board. The NOCA governance board is an independent voluntary board which oversees the establishment of sustainable clinical audit programmes in agreed specialties. The central aim of all NOCA audit streams is to improve clinical services for patients in Ireland by turning clinical data into quality information. NOCA is responsible for the establishment of the Irish Audit of Surgical Mortality (IASM), Irish National Orthopaedic Register (INOR), National ICU Audit, and Major Trauma Audit. In addition, NOCA provides administrative support and operational governance to the Irish Hip Fracture Database (IHFD).

1.15.2 Irish National Orthopaedic Register (INOR)

The INOR is an electronic point-of-care system that will record and monitor elective arthroplasty surgery in Ireland. In addition, it will define the epidemiology of joint replacement surgery in Ireland, and will provide timely information on the outcomes of joint replacements while identifying risk factors for a poor outcome. The objective of the INOR is to provide information that will help improve the quality of care and clinical outcomes of joint replacement recipients. The introduction of a national arthroplasty register will enable early detection of failing devices, procedures, institutions or surgeons, in order to limit the impact of such failures for future patients. Implementation of the INOR will increase patient safety, confidence and overall experience while reducing surgical revision and giving orthopaedic surgeons the opportunity to participate in and contribute to measurable clinical audit. The INOR will work with international counterparts to ensure that a consistent approach to data collection and interpretation is achieved, and thus allow sustainable benchmarking with existing registers. For further information on all NOCA audit streams, visit www.noca.ie.

1.15.3 Trauma register

A trauma register is a vital component of a trauma system, as it provides a tool for auditing patient care at the individual hospital level. This includes auditing the effectiveness of the trauma system for improving patient outcomes across the entire continuum of care from pre-hospital to rehabilitation.

Following a recommendation from the RCSI National Trauma Audit Committee (NTAC) in 2010, and a further endorsement by the National Clinical Programme in Emergency Medicine in 2012, a national system of trauma audit employing the internationally recognised Trauma Audit and Research Network (TARN) system was initiated in Ireland in 2013. TARN has been in operation in the UK since the 1990s and has been at the forefront of quality and research initiatives in trauma care, most recently supporting the development of major trauma networks in the UK.

TARN is based on the web-enabled collection of a standardised dataset for patients who are admitted to hospital or who die in the emergency department. This includes injury severity scoring and benchmarking of data, which is undertaken at the TARN base in Manchester. Hospital-level major trauma audit (MTA) co-ordinators and clinicians have direct access to their own hospital's data and can compare their performance against aggregated data for similar hospitals. These data include mechanism of injury; incident and pre-hospital data, including ambulance data; observations, investigations and interventions in the emergency department, theatre, critical care and the ward; times to treatment; length of stay, and patient outcomes. TARN uses a model to calculate the likely rates of survival for particular injuries or combinations of injuries, taking into account age, gender and the patient's physical response to their injuries. The database then compares the number of expected survivors against the number of actual survivors, in order to produce a rate of survival for each hospital, adjusted by the complexity of the major trauma case.

Through the National Emergency Medicine Audit (NEMA) governance committee, NOCA reviews TARN reports, and contextualises them for Ireland. Through the NOCA governance board, it proposes national aggregate reports for publication. For further information, visit www.noca.ie.

1.16 Surgical Site Surveillance

The European Study on the Efficacy of Nosocomial infection Control (SENIC) showed that well-organised surveillance and infection control programmes which included feedback of infection rates to surgeons were associated with significant reductions in surgical site infection. Similar findings by Cruse and Ford (1980) showed that surgical site surveillance is critical to the maintenance of good standards. In April 2004, surgical site surveillance in orthopaedic surgery became mandatory for all NHS trusts (Public Health England, 2014). The British Orthopaedic Association recommends surgical surveillance for arthroplasty surgery.

The National Clinical Programme for Trauma and Orthopaedic Surgery recommends that similar surveillance become mandatory in Ireland. This is supported by the Irish Institute of Trauma and Orthopaedic Surgery.

1.17 Procurement of Implants

Historically, procurement has been carried out locally by hospitals, and this approach has led to:

- duplication of effort
- lack of standardisation of quality and service support for hospitals

- differentials in commercial arrangements between hospitals
- issues regarding compliance with procurement regulations for hospitals (Quinlivian, 2014).

The HSE is currently engaged in a national tender process for orthopaedic primary hip and knee implants. Tender submissions are due for return in July 2015.

The HSE spends approximately €35 million each year on orthopaedic implants across the entire spectrum of orthopaedic procedures. Currently, 12 hospital sites are involved in carrying out elective primary hip and knee procedures, with approximately 3,000 primary hip procedures and approximately 2,000 primary knee procedures carried out annually. Total spend in 2012 on all hip procedure implants was approximately €14.6 million, and spend on all knee procedure implants was approximately €9.1 million. Currently, each hospital individually negotiates with suppliers for the best price/terms available to them. This fragmented approach results in significant price differentials, involves duplication of effort, and does not ensure standardisation of quality and service support for patients and staff. Analysis indicates that significant pricing differentials exist from location to location for each supplier.

National procurement evaluation groups – comprising procurement and finance, and clinical representatives – provide expertise and governance, and also enhance standardisation of product quality and service support by:

- maintaining an appropriate level of clinical choice;
- ensuring sustainability and development of services in the current economic climate
- aligning with activity-based funding
- providing visibility of procedures and implant usage at both hospital level and consultant level
- increasing transparency in relation to cost
- achieving value for money
- promoting a competitive marketplace for trauma and orthopaedics.

The National Clinical Programme for Trauma and Orthopaedic Surgery is working in collaboration with the Irish Institute of Trauma and Orthopaedic Surgery, the Clinical Strategy and Programmes Division, and the Health Business Services Procurement HSE in order to achieve an efficient and effective managed solution for the purchase of orthopaedic primary hip and knee implants for publicly funded hospitals carrying out planned orthopaedic surgery. The solution should deliver value for money and should also comply with all relevant legislation. The national procurement process will optimise opportunities around economies of scale, thus delivering best value for money for the HSE and the public. The process will ensure that current contracts are established in order to meet legislative requirements as well as support the provision of elective orthopaedic primary hip and knee surgery across the HSE.

Exceptions to the use of implants sourced outside the national procurement process should be made on an individual patient basis or as part of a clinical trial, rather than purely on surgeon preference. Prior to being introduced into the Irish public health system, all new technologies for joint replacement surgery should be assessed by an appropriate body, such as the IITOS lower limb arthroplasty committee. This measure is not designed to diminish clinical choice, but rather to improve and ensure quality and safety.

1.18 COMPLExITy CODING

Currently, procedure complexity is both interpreted and captured from clinical records. A study carried out in University Hospital Limerick sought to compare a newer system which uses a prospective data collection form in place of the routine administrative chart abstraction method.

This study demonstrated the improved capturing of adverse events after arthroplasty using a well-designed assessment tool which clearly defined adverse events and provided an easy to use severity grading system. The study showed a tenfold increase in the number of adverse events captured prospectively, compared with the number of events captured using the chart abstraction method. The inter-observer reliability of the form had been proven previously in spine surgery, thus obviating the need for it to be repeated in the context of arthroplasty. The authors concluded: “In addition to the obvious gain in our knowledge of the expected adverse events following arthroplasty, this system – in the context of healthcare economics – can lead to more accurate funding of tertiary centres where these complex surgeries are performed.” Adverse events can increase the cost of surgery and, if not understood, can create a deficit in the hospital’s budget, leading to restriction of services as a result of overspending. The authors contend that this deficit is potentially due to “under resourcing”, and that it is therefore of paramount importance, especially in the current financial climate, to have accurate records of these adverse events in order to aid budgetary planning and allocation of system resources (Lenehan et al., 2011).

The National Clinical Programme for Trauma and Orthopaedic Surgery, in collaboration with the authors of the University Hospital Limerick study, are working towards producing a suite of adverse event point-of-care coding forms.

2. Trauma

2.1 INTRODuCTION

The word trauma means wounding due to physical injury. It is important, however, to understand trauma as a disease entity. Although there are many ways to cause injury (e.g., road traffic incidents, falls, sporting injuries, occupational hazards, knife and gun injuries), they all result in trauma.

Most people understand trauma to involve breaking or fracturing a bone. Fractures occur when the physical force exerted on the bone is stronger than the bone itself. The risk of fracture depends, in part, on age. As people age, bones become more brittle, and falls are more likely to cause fractures. The main types of fractures are displaced, non-displaced, open, and closed. Displaced and non-displaced fractures refer to the way the bone breaks.

In a displaced fracture, the bone snaps into two or more parts and moves, so that the two ends are not lined up straight. If the bone is in many pieces, it is called a comminuted fracture. In a non-displaced fracture, the bone cracks either partly or the entire way through, but nevertheless maintains its proper alignment.

A closed fracture is where the bone breaks, but there is no puncture or open wound in the skin. An open fracture is where the bone breaks through the skin, which could incur the risk of deep bone infection. Stress fractures result from repetitive application of moderate force, as may occur in long-distance runners.

A dislocation is a complete separation of the two bones that form a joint. Subluxation is partial separation. Often, the dislocated joint remains dislocated until it is realigned by a clinician.

Injuries to soft tissue such as muscles, ligaments, tendons, fascia, and bursae are also among the range of injuries treated by consultant trauma and orthopaedic surgeons. Ligaments connect one bone to another. Tears may occur in ligaments (sprains) or in muscles (strains). Tendons connect muscles to bones. Tendon tears can also be either partial or complete.

Pain that is out of proportion to the apparent severity of the injury, or which steadily worsens in the first hours or days immediately after injury, suggests compartment syndrome or ischemia. This is a serious condition, which must be treated immediately in order to preserve the muscle tissue.

Patients with musculoskeletal fractures and injuries account for one-third of the emergency surgical admissions and one-third of the acute surgical procedures in Ireland annually (NCPS, 2013). The details outlined in this section are intended to set standards for the service. Serious complications are unusual, but may threaten life or limb viability or cause permanent limb dysfunction. It is, therefore, important that pathways of care are clearly defined. Patients who sustain mild and moderate musculoskeletal injuries, as well as patients who sustain major traumatic injuries, require different resources.

This section of the Model of Care deals with fractures and musculoskeletal trauma, which constitutes the vast majority of cases treated annually. The resources provided for patients with mild and moderate injuries must reflect best practice guidelines for the management of musculoskeletal injuries. While the majority of patients with musculoskeletal injuries can be treated in existing trauma units, these patients must have access to appropriate facilities. The overall burden of non-major trauma imposes a significant resource requirement on Irish hospitals. Best practice management of these patients requires facilities such as access to diagnostics, hospital beds and theatres, as well as acute and community rehabilitation. There is an imperative for timely access to diagnostic radiology investigations (particularly CT and MRI), and the facilities to support these services. In addition to better outcomes for patients, bed utilisation and patient flow can be improved in acute hospitals by the provision of these resources. Currently, day case trauma rates are reduced by the non-designation of day ward beds for trauma patients. It is more efficient and better value for money to treat patients on a day case basis if their injury/condition allows it.

2.2 TRAuMA WORKLOAD

Seventy three percent of trauma inpatients undergo a surgical primary procedure during their stay in hospital and 52% of this activity involves lower limb surgery. Acute same day patient discharges undergo an operation 62% of the time; of these operations, 73% involve upper limb surgery.

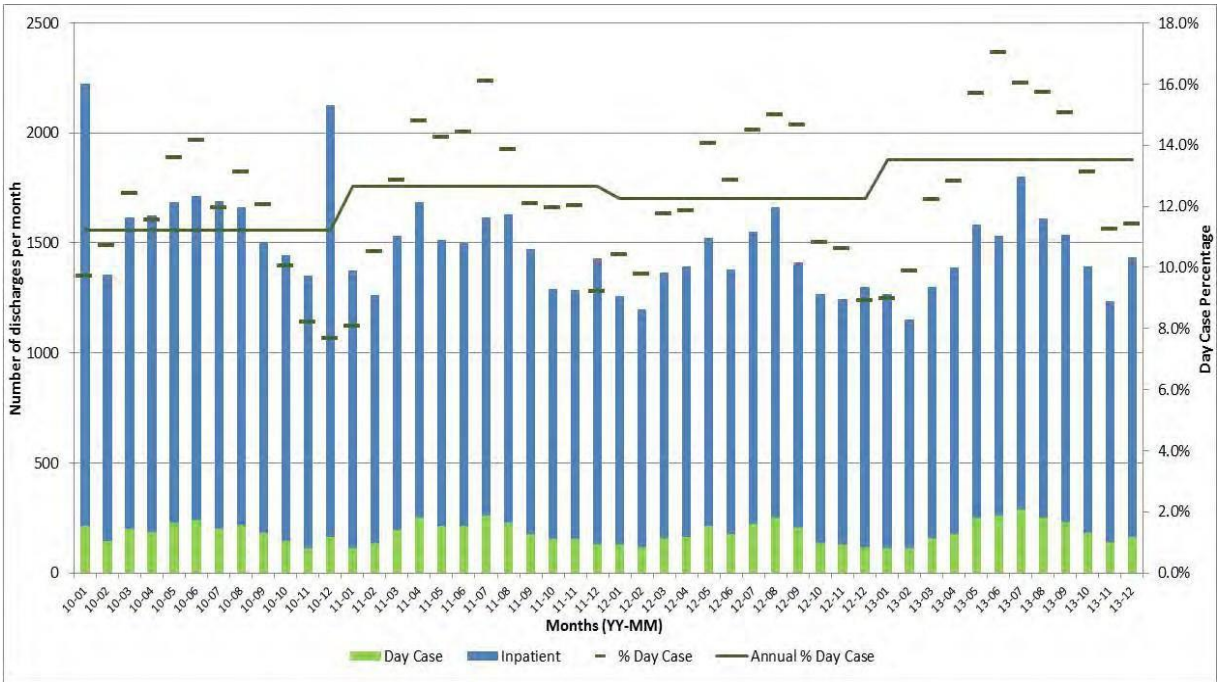
Most acute patients stay in hospital for one or more nights. Acute day cases (admitted and discharged on the same day) accounted for 13.5% of discharges in 2013. The majority of these discharges were patients who had undergone upper limb procedures. Due to seasonal factors, trauma day case workload decreases in October of each year and increases again the following March.

Despite perceptions to the contrary, musculoskeletal trauma activity is largely predictable throughout the year, with peaks

in summer and winter. It is therefore not unreasonable to expect acute hospitals to plan ahead, so that the necessary resources are in place during the peaks and patients can be treated in a timely manner. Currently, many patients could be treated as day case patients, but are unnecessarily admitted as inpatients. Such patients' pre-operative length of stay can also be excessively high. This has a knock-on negative effect on patient flow, and is clearly not an efficient way to deal with bed capacity issues. Proper demand and capacity planning is essential for the delivery of an efficient and safe trauma service.

	Year 2010			Year 2011			Year 2012			Year 2013		
	#DC	**#Inpat**	**%DC**	**#DC**	**#Inpat**	**%DC**	**#DC**	**#Inpat**	**%DC**	**#DC**	**#Inpat**	**%DC**
Lwr Limb Surg	138	9,029	1.5%	121	7,971	1.5%	112	7,559	1.5%	152	7,804	1.9%
Upr Limb Surg	1,674	6,317	20.9%	1,546	5,151	23.1%	1,434	4,897	22.7%	1,635	4,925	24.9%
Spine Surg	53	405	11.6%	50	351	12.5%	62	365	14.5%	69	364	15.9%
Other Surg	245	1,506	14.0%	354	1,378	20.4%	254	1,206	17.4%	284	1,321	17.7%
NonSurg TO procs	131	500	20.8%	156	516	23.2%	168	497	25.3%	195	499	28.1%
Sub---total	2,241	17,757	11.2%	2,227	15,367	12.7%	2,030	14,524	12.3%	2,335	14,913	13.5%

Trauma day case rate table: Annual discharge volumes for patient having a designated trauma procedure.



Trauma day case rate chart: Monthly day case & inpatient discharge volumes for emergency discharges following a trauma procedure.

Trauma activity summary in 2013	Inpatient						DayCase		Total num	Add'l Wrk Load Non
Trauma orthopaedic sub---specialties	Num	BDU	AvLOS	PreBDU	PreAvLOS	DOSA	Num	DC %	Prime Proc	Prime Procs
Lower limb surgery	7,804	102,433	13.13	15,600	2.00	32.4%	152	1.9%	7,956	758
Other trauma orthopaedic surgery	1,321	14,397	10.90	3,426	2.59	32.2%	284	17.7%	1,605	1,905
Spinal surgery	363	5,990	16.50	1,339	3.69	26.7%	69	16.0%	432	165
Upper Limb surgery	4,925	14,312	2.91	4,525	0.92	41.7%	1,635	24.9%	6,560	692
Prorata unmapped proc's (< 20 PerA)	538	4,929	9.16	968	1.80	37.8%	75	14.2%	614	
Sub---total --- have surgery	14,951	142,061	9.50	25,858	1.73	35.5%	2,215	12.9%	17,167	
Trauma Orthopaedic admit --- non surgery primary procedures										
Non---surgical common proc (20 or more PerA	2,979	27,981	9.39	6,209	2.08	35.8%	333	10.1%	3,312	
Non---surgical Trauma Orthopaedic	499	3,172	6.36	859	1.72	33.7%	195	28.1%	694	235
No primary Procedure coded	1,895	5,817	3.07				796	29.6%	2,691	
Prorata unmapped proc's (< 20 PerA)	201	1,837	9.16	361	1.80	37.8%	47	14.2%	247	
Sub---total --- do not have surgery	5,574	38,807	6.96	7,429	1.33	23.5%	1,371	19.7%	6,944	
Grand Total	20,525	180,868	8.81	33,287	1.62	32.2%	3,586	14.9%	24,111	

Table: Post-Trauma discharges in 2013 having a designated orthopaedic surgical primary procedure or being admitted under the care of orthopaedic clinicians for other primary care.

Treatment of hip fracture is the most common trauma condition requiring surgery. Debridement of skin and subcutaneous tissue is more commonly performed as a secondary procedure in association with another higher acuity primary procedure.

2013 Top 20 Surgical procedures report for										Add'l Wrk
Trauma --- most common procedures	Inpatient						DayCase		Total num	Load Non
Procedure	Num	BDU	AvLOS	PreBDU	PreAvLOS	DOSA	Num	DC %	Prime Proc	Prime Procs
Hemiarthroplasty of femur (4752200)	1426	29658	20.80	3362	2.36	26.3%	##	0.1%	1428	24
Open rdctn fx ankle IF diats/fib/malus (4760001)	1365	5232	3.83	1796	1.32	37.2%	29	2.1%	1394	63
IF fracture trochanteric/subcapitl femur (4751900)	1096	22714	20.72	2663	2.43	29.7%	##	0.1%	1097	24
Closed rdctn fracture distal radius IF (4736302)	836	1772	2.12	645	0.77	40.7%	216	20.5%	1052	65
Open rdctn fracture distal radius w IF (4736602)	875	2661	3.04	800	0.91	40.5%	96	9.9%	971	58
Closed reduction fracture distal radius (4736300)	557	1136	2.04	422	0.76	35.7%	369	39.8%	926	82
Exc debridement skin & sbc tissue (9066500)	700	7336	10.48	1738	2.48	36.3%	197	22.0%	897	1410
Open reduction fracture femur with IF (4752801)	869	16315	18.77	1736	2.00	27.4%	##	0.0%	869	36
Open rdctn fracture shaft of tibia w IF (4756601)	322	1986	6.17	414	1.29	39.8%	##	0.3%	323	36
Closed rdctn fx distal humerus w IF (4745601)	249	523	2.10	160	0.64	56.6%	70	21.9%	319	##
Open rdctn fx ank IF 2 diats/fib/malus (4760301)	311	1420	4.57	601	1.93	37.0%	##	0.6%	313	10
Open rdctn fracture distal humerus w IF (4745901)	286	1101	3.85	335	1.17	37.4%	23	7.4%	309	15
Open rdctn fx proximal humerus w IF (4742901)	235	1073	4.57	387	1.65	34.5%	##	0.0%	235	24
Closed rdctn fracture metacarpus w IF (4733601)	110	179	1.63	96	0.87	37.3%	123	52.8%	233	18
Repair of Achilles' tendon (4971801)	203	382	1.88	145	0.71	44.8%	23	10.2%	226	##
Closed rdctn fx proximal phlx hand w IF (4732401)	110	184	1.67	83	0.75	43.6%	104	48.6%	214	##
Open reduction fracture olecranon w IF (4739901)	200	680	3.40	203	1.02	40.5%	10	4.8%	210	19
Closed reduction of dislocation of hip (4704800)	173	1482	8.57	150	0.87	58.4%	10	5.5%	183	33
Closed reduction fracture femur with IF (4753100)	170	2443	14.37	333	1.96	25.9%	##	0.6%	171	11
Open rdctn fx mdl/lat tibial plate w IF (4754901)	169	1217	7.20	316	1.87	32.5%	##	0.0%	169	14

Table: Top 20 most commonly performed trauma procedures discharges in 2013.

Acute inpatient trends

Both trauma inpatient AvLOS and pre-operative AvLOS for patients undergoing a procedure increased between 2010 and 2013.

	Year 2010			Year 2011			Year 2012			Year 2013		
	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS	#Pat	AvLOS	PreOP AvLOS
Lwr Limb Surg	9,029	12.58	2.16	7,971	12.53	1.83	7,559	12.33	1.93	7,804	13.13	2.00
Upr Limb Surg	6,317	2.79	0.82	5,151	2.96	0.98	4,897	2.91	0.97	4,925	2.91	0.92
Spine Surg	405	13.64	3.17	351	16.21	3.70	365	13.99	3.70	364	16.46	3.68
Other Surg	1,506	9.58	2.61	1,378	10.47	2.52	1,206	9.91	2.35	1,321	10.90	2.59
NonSurg TO procs	500	5.69	1.48	516	5.60	1.44	497	5.48	1.69	499	6.36	1.72
Sub--total	17,757	8.67	1.72	15,367	8.99	1.64	14,524	8.76	1.68	14,913	9.41	1.73

Table: Annual discharge volumes for inpatient having a designated trauma procedure.

Volumes were significantly higher in January and December 2010, coinciding with periods of prolonged icy conditions. Upper limb trauma treatment tends to increase in the summer months.

Monthly AvLOS values are widely distributed, but show a slight upward trend. Monthly pre-operative AvLOS has remained static.

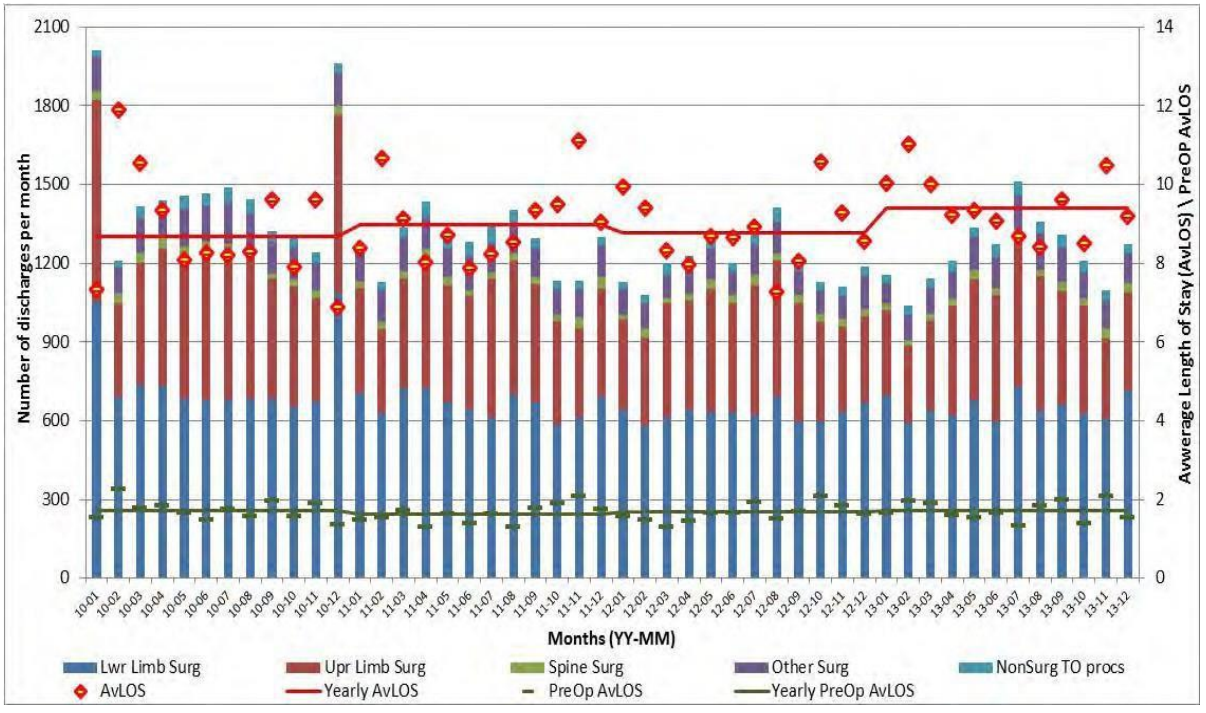


Chart: Monthly discharge volumes, AvLOS and Pre-Op AvLOS for acute discharges following a trauma procedure.

There has been an increase in the national AvLOS, predominantly among patients aged 65 years and over (i.e., both the age ranges 65-84 years, and 85 years and over).

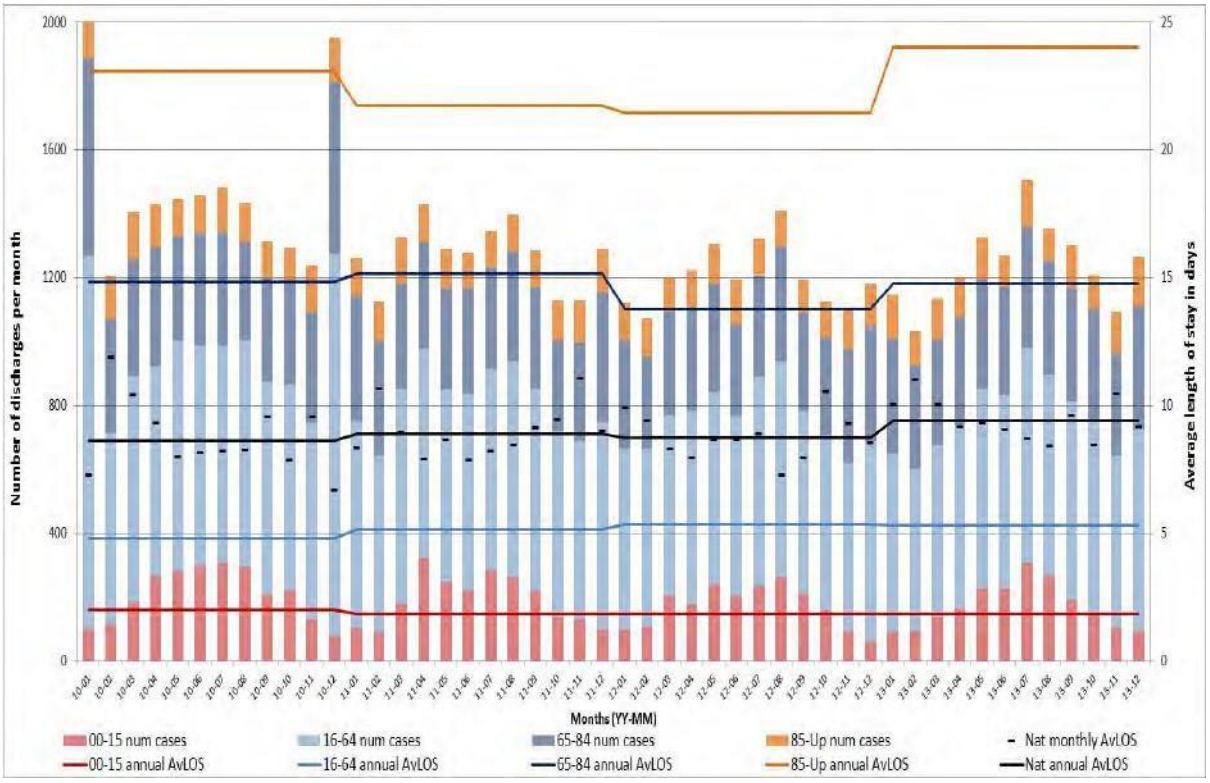


Chart: Planned monthly discharge volumes and annual AvLOS values by age ranges, where age group monthly discharge volumes are shown as a stacked bar and annual AvLOS for each of the ages ranges are shown as similar coloured line. National average monthly AvLOS is shown as black dashes while the annual AvLOS for all age ranges is shown as a black line.

A relatively small number of trauma patients (5.6%) who stay in hospital for more than 30 days account for 41% of trauma bed days. According to 2013 HIPE data, patients aged 75 years and over account for higher proportions of trauma bed utilisation.

Number of longstay trauma patients (> 30 days).

LOS range in Days	Age 05--15	Age 16--64	Age 65--74	Age 75--84	Age 85up	Total
31--60	##	91	87	172	167	520
61--90	##	24	33	44	56	157
90--180	##	15	24	34	43	116
181---365	##	##	##	11	10	30
Ovr365	##	##	##	##	##	6
Tot Long Stay	##	137	148	261	280	829

Bed Days Used by long stay patients

LOS range in Days	Age 05--15	Age 16--64	Age 65--74	Age 75--84	Age 85up	Total
31--60	125	3,766	3,539	7,254	6,991	21,675
61--90	##	1,756	2,384	3,158	4,040	11,338
90--180	##	1,695	3,148	4,251	5,606	14,700
181---365	##	1,274	1,009	2,535	2,128	6,946
Ovr365	##	914	##	##	1,830	2,744
Tot Long Stay	125	9,405	10,080	17,198	20,595	57,403

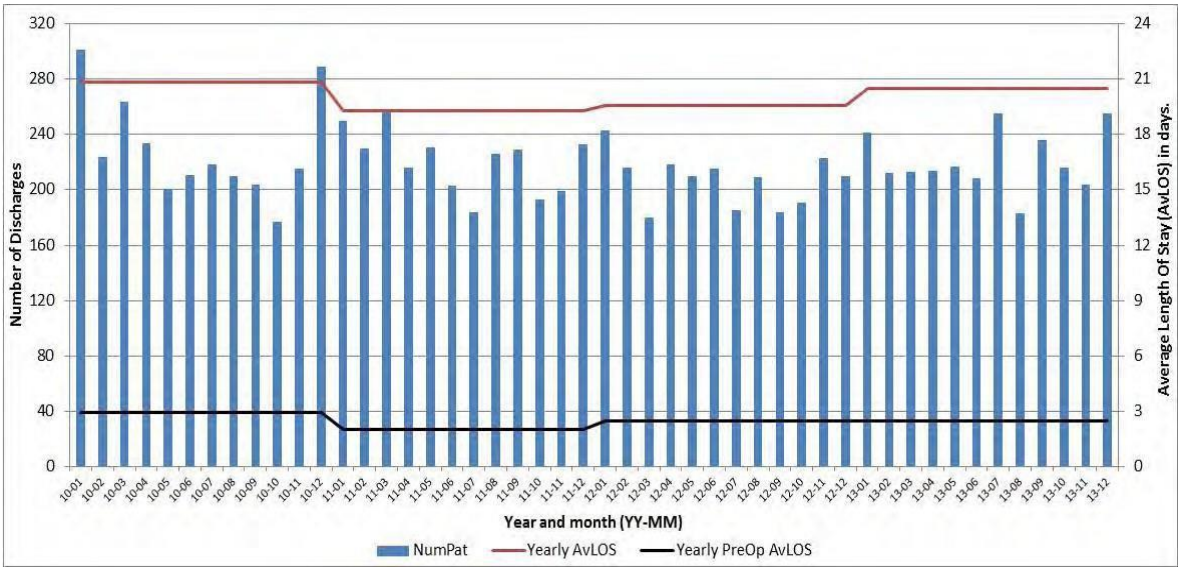
Table: Age range analysis of trauma patients who stay more than 30 days in hospital and the bDu resources used for those discharged in 2013.

Trauma individual procedures – hip fracture treatment

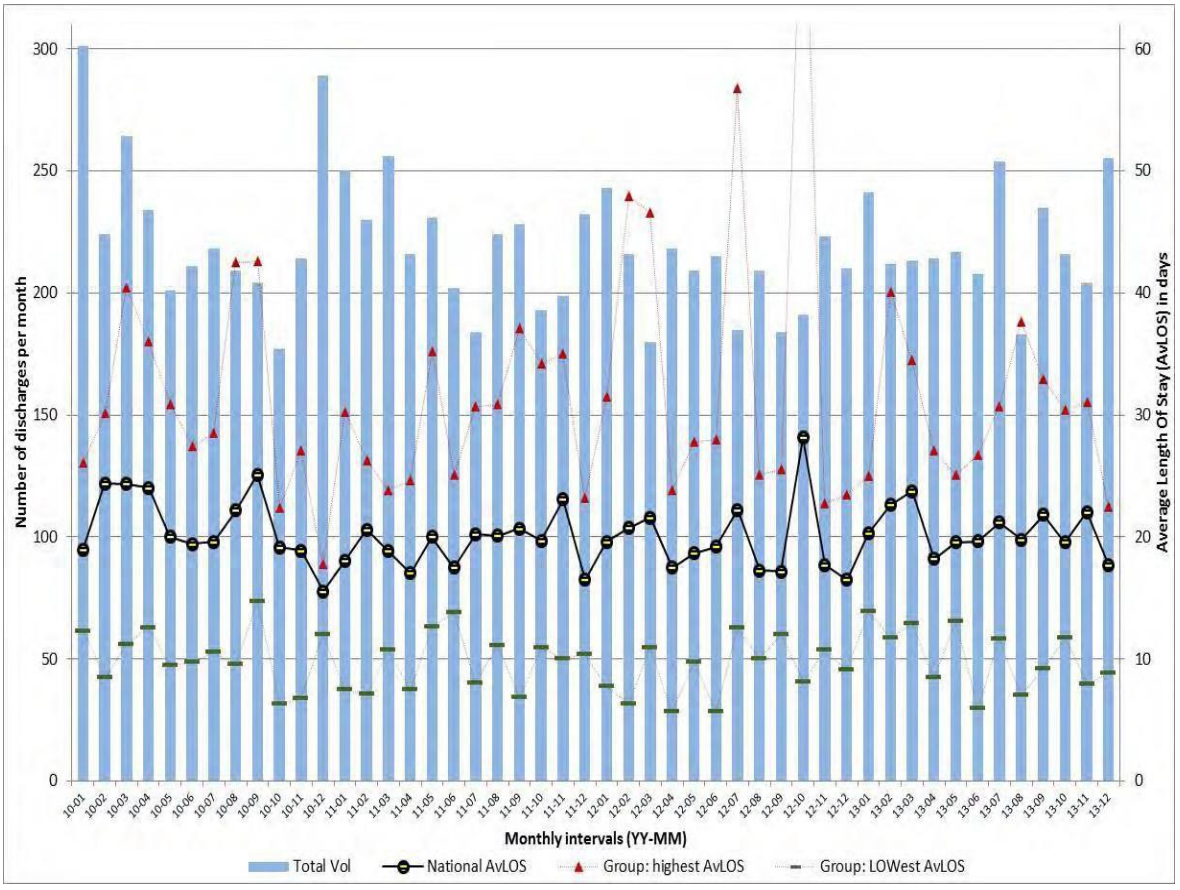
Management of hip fractures in all inpatients with acute episodes of care who have a primary procedure was summarised by hospital group. The table below shows annual volumes for number of patients, bed days used, and AvLOS by hospital group. One hospital group consistently has the shortest AvLOS for hip fracture treatment patients each year, while the longest hospital group AvLOS is over 2.4 times higher.

HIPE Data	Year 2010			Year 2011			Year 2012			Year 2013		
	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS	#Pat	BDU	AvLOS
Hsptl Group 1	190	2,022	10.64	218	2,170	9.95	183	1,667	9.11	198	2,132	10.77
Hsptl Group 2	961	17,350	18.05	922	15,026	16.30	860	12,298	14.30	813	12,938	15.91
Hsptl Group 3	328	4,954	15.10	344	5,749	16.71	354	5,775	16.31	370	6,861	18.54
Hsptl Group 4	433	10,004	23.10	366	9,118	24.91	324	7,854	24.24	343	8,219	23.96
Hsptl Group 5	369	9,750	26.42	357	9,184	25.73	349	10,471	30.00	466	11,797	25.32
Hsptl Group 6	464	13,180	28.41	438	9,817	22.41	413	10,574	25.60	462	12,385	26.81
Total	2,745	57,260	20.86	2,645	51,064	19.31	2,483	48,639	19.59	2,652	54,332	20.49

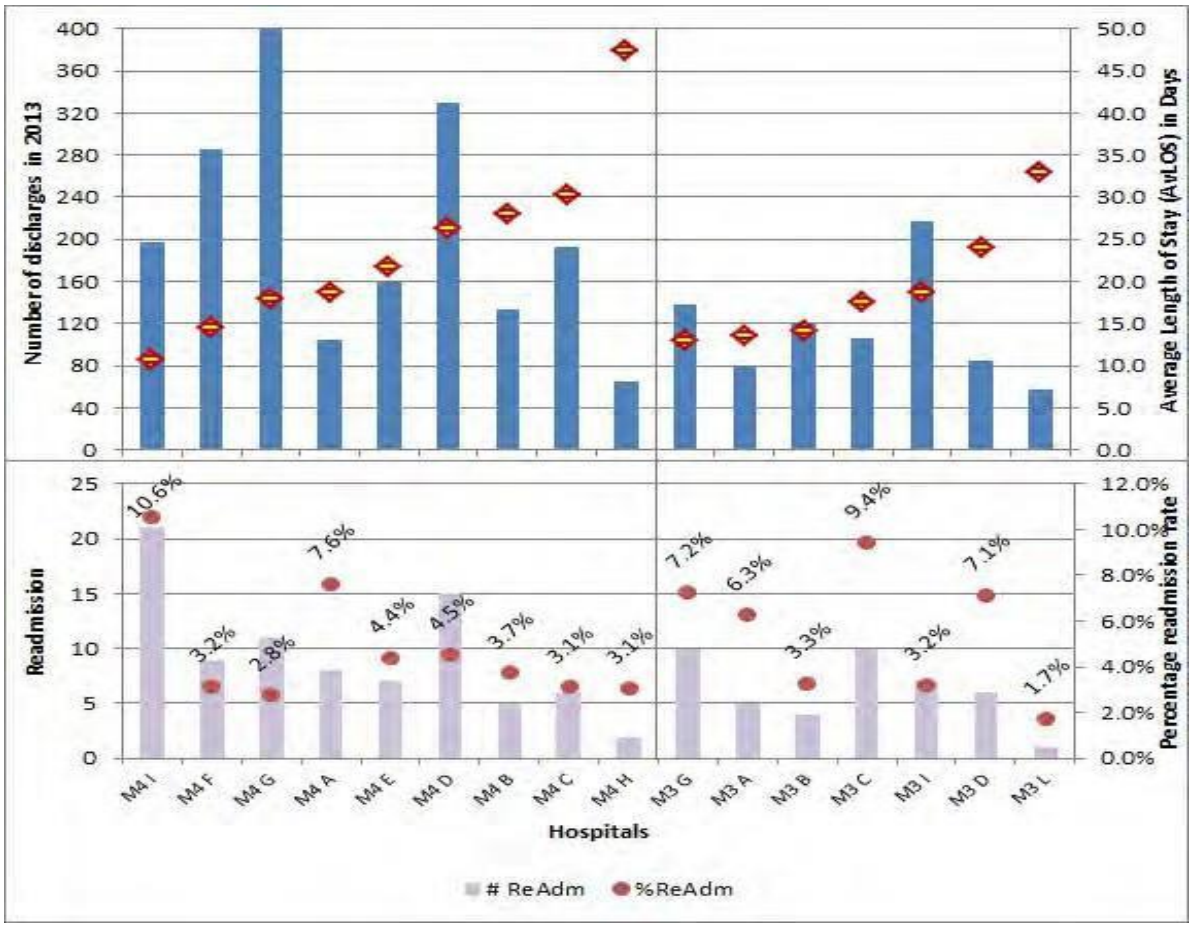
The chart below shows monthly figures for national discharge volumes and annualised national AvLOS and pre-operative AvLOS. Nationally the annual AvLOS values were 20.86, 19.31, 19.59 and 20.49 for the four years from 2010 to 2013. Pre-operative AvLOS is running 2.5 days for 2012 and 2013.



The chart below shows monthly figures for national discharge volumes, national AvLOS, Hospital Group with the lowest AvLOS and Hospital Group with the Highest AvLOS. Nationally monthly AvLOS varies around the 20 days mark for all four years. January and December of 2010 had severe ice conditions resulting in higher patient volumes.



The chart below shows 2013 trauma inpatient volume and AvLOS values for model 4 hospitals on the right and model 3 hospitals on the left. There is a marked variation in activity volumes and AvLOS values by hospital. The model 4 hospital with the shortest AvLOS also has the highest readmission rates whereas the model 4 hospital with the second lowest AvLOS has one of the lowest readmission rates. The two hospitals with the lowest volume of activity, far right of model 4's and model 3s have the longest AvLOS values.



2.3 TRAuMA – ACuTE INPATIENT CARE

The goal in managing fractures is to ensure that the involved limb, when healed, has returned to its optimal possible function. After initial treatment, injuries are reduced, immobilised, and treated symptomatically as indicated. Either non-surgical or surgical means may be used. In open reduction with internal fixation (ORIF), fracture fragments are aligned and are held in place using a combination of wires, screws and plates.

The severity of a fracture depends on its location and the damage done to the bone and tissue in the surrounding area. Immobilisation of the fracture decreases pain and facilitates healing by preventing further injury and keeping the fractured bones aligned. Serious fractures can result in dangerous complications if not treated promptly. Complications can include damage to blood vessels or nerves, and infection of the bone (osteomyelitis) or surrounding tissue. Stiffness and impaired range of motion can occur. Fractures that extend into joints usually disrupt articular (surface of the joint) cartilage; misaligned articular cartilage tends to scar, causing osteoarthritis and impaired joint motion. Surgical intervention needs to occur in a timely manner in order to maximise the patient's potential for recovery.

Adherence to some general principles is necessary in order to provide a safe, accessible and efficient service. As follows:

- Twenty-four hour access to operating theatres must be available
- Theatre access must not be in competition with other surgical disciplines
- Rehabilitation must commence in the acute phase, and must be provided by a multidisciplinary team
- Discharge directly to home, with or without ongoing community supports and follow-up rehabilitation, should

be the goal for all patients
- Individuals not suitable for discharge directly to home from the acute facility should be considered for post-acute inpatient rehabilitation
- Rehabilitation protocols to guide clinical practice in the acute setting need to be developed
- Patients should have access to step-down beds and should not remain on an acute ward once the acute phase of treatment is completed
- Provision of appropriate personnel – Interventional radiologists, physiotherapists, occupational therapists, and medical social workers – to deliver rehabilitation in the acute setting will facilitate improved integration and transfer of care across the continuum.

An individual with musculoskeletal trauma will usually present to one of the following:
- GP
- ED as a walk-in or by ambulance
- outpatients department
- as an inpatient or other specialty referral.

2.3.1 Trauma co-ordinator

The trauma co-ordinator role involves a clinical, educational and administrative workload. Ideally, this person is a full-time registered nurse or healthcare professional with competency in trauma care and service management.

Among the responsibilities of the role are:
- co-ordinating care of the trauma patient throughout hospitalisation
- planning and implementing protocols and guidelines;
- collaborating with and assisting the trauma services director
- managing the day-to-day operations of the trauma programme (as appropriate for the hospital)
- budgeting
- supporting the multidisciplinary team who work together to provide quality trauma care
- performance improvement and patient safety
- research
- audit
- acting as a liaison to other hospitals, administrative departments, and community committees, to educate and gain support for the trauma programme.

The role of trauma co-ordinator is critical in Model 4 hospitals. In Model 3 hospitals it could be combined with another role, for example, Irish Hip Fracture Database data collector. The role should be held by a senior nurse with administration skills and strong decision-making abilities.

2.3.2 Treatment plan

Once the assessment and initial management plan has been developed in the emergency department or outpatients department, the multidisciplinary orthopaedic team will implement the plan, whether it is conservative management or surgical intervention. For patients requiring surgical intervention, this must be done in a timely manner, using the expertise of orthopaedic specialists, anaesthetists and surgical staff employing currently recognised operative techniques. Input from pain medicine specialists is desirable where necessary.

Hospital inpatient care should be provided by a trauma and orthopaedic services team (TOST) comprising medical, nursing, support staff and health and social care professionals. Physiotherapists, occupational therapists, social workers and dieticians are essential members of the team, with input available from other health and social care professionals as required. Rehabilitation must commence in this phase, with a focus on the patient's mobility and function in basic everyday activities, including self-care, toileting and feeding. This will assist in guiding the need for ongoing rehabilitation and will ensure early referral to post-acute rehabilitation services.

2.3.3 Secondary trauma

This refers to a group of patients whose injuries may require further diagnostic tests, but may not require immediate access to theatre and can be scheduled within a limited timeframe. These patients must be treated expeditiously and must not be regarded as equivalent to planned orthopaedic patients who are admitted from a waiting list. Secondary trauma patients require the expertise, equipment and facilities available in the acute hospital sector.

2.3.4 Post-traumatic stress disorder

Post-traumatic stress disorder (PTSD) is an anxiety disorder that may occur in people who have been exposed to a traumatic event. People with PTSD persistently experience a range of symptoms including nightmares or flashbacks. Typically, symptoms begin to develop within three months of the event. PTSD is a potential complication for musculoskeletal trauma patients, and may have considerable negative effects on outcomes.

A serious injury can have a negative impact on quality of life. For example, if a person sustains a fracture in an accident, they will experience pain and may need surgery to repair the injury.

For a while, the patient will probably have to use a walking aid such as crutches. It may be some time before they can resume sports and other activities.

In most cases, these physical effects gradually diminish. However, healthcare professionals need to be aware of other conditions that could affect recovery. Mental health is as important to the final outcome as the patient's physical response.

The disciplines of psychology, psychiatry and occupational therapy are important in the trauma centre's acute care and rehabilitation teams. A plan to evaluate, support, and treat PTSD should be considered in any comprehensive rehabilitation programme for injured patients.

2.4 NURSING TRAUMA PATIENTS

In partnership with other members of the multidisciplinary team on a trauma ward, the nursing team aims to provide high-quality, patient-centred care that is based on best practice and evidenced-based research, and is responsive to the patients encountered. Trauma wards should be staffed in a way that reflects the orthopaedic patients' needs, and they should provide agreed levels of nursing staff and skill mix. This should be determined by an accepted and valid assessment, based on the professional judgement of the senior nurses and consultants, guided by the following principles:

- It is desirable that all registered nurses working in orthopaedics should receive postgraduate orthopaedic training
- The clinical education, skill and knowledge of the experienced nurse working in orthopaedics should always be acknowledged and valued. The benefits of their intellectual capital in caring for patients are immense
- Skill mix is appropriate to the patients' needs and workload
- Each orthopaedic patient will receive competent and individualised nursing care, so that they are enabled to move from dependence to optimum independence.

2.5 DIAGNOSTICS

Timely access to diagnostics is an essential component of the care of trauma patients. The specialty of trauma and orthopaedics is totally dependent on the availability of diagnostic imaging services. Currently, there are difficulties with the availability of diagnostic services.

CT access is required 24/7 at all level 3 and 4 hospitals. MRI access is needed 24/7 in at least one hospital per hospital group. Interventional Radiology – minimum access is 9-5 Monday-Friday at every level 3 and 4 hospital and 24/7 in at least one hospital per hospital group.

The minimum requirements are:

- plain films – 24-hour access
- CT – 24-hour access
- immediate access to MRI, if required, in another centre.

2.5.1 NIMIS (National Integrated Medical Imaging System)

A standardised state-wide system of electronic linkage between the public hospitals has been established to allow review of x-rays at sites remote from the referral site, and also in order to reduce duplication of radiograph images.

It is vital that these services are available at weekends and on bank holidays.

2.6 TRAUMA OPERATING THEATRE FACILITIES

Hospitals must provide facilities and resources to allow orthopaedic surgeons provide safe, high-quality trauma care. Specifically, hospitals should provide adequate facilities, equipment, devices, and well-trained ancillary personnel, as well as guaranteed operating theatre time to manage emergency cases.

A separate, dedicated theatre is necessary for treating musculoskeletal trauma. The theatre should have regular, scheduled operating times available each weekday and, in the case of emergency treatments, on a 24-hour basis. It should also have adequate staffing levels, and it should be staffed from 08.00 to 20.00 routinely. Depending on an individual hospital's volume of trauma admissions, a second trauma theatre may be necessary.

Emergency access to operating facilities should be available 24 hours a day, and access should not be in competition with other emergency disciplines.

This is only possible if there are enough adequately staffed daily trauma lists both during the week and at weekends, and if these trauma lists are supervised by consultant orthopaedic surgeons and consultant anaesthetists. With such a system in place, 80% of all emergencies can be dealt with during the normal working day (08.00-20.00). Operations performed after 22.00 should be confined to emergency cases that cannot wait. Cancelled patients should be highlighted on the operating list the following day to allow for appropriate access to the operating theatre. If patients are cancelled, this should be reflected in the clinical notes along with the reason for cancellation (BOA, 2007:18). This

should also be documented on the hospital's risk register.

Open fractures should be treated quickly. Once a decision has been made to operate on a long bone fracture, the requisite facilities should be available. Immediate access to the operating theatre must also be available for the patient with multiple injuries, dislocated hips, supracondylar elbow fractures, compartment syndrome, cauda equina compression, or any fracture with vascular or skin compromise.

Ultra-clean air vertical laminar flow systems (UCAs) or equivalent are advisable for joint replacements. In addition, the National Clinical Programme for Trauma and Orthopaedic Surgery recommends that in so far as is reasonably practicable, UCAs should be used for major orthopaedic implant surgery. Scheduled preventive maintenance should be standard policy, and validation reports should be readily available for theatres.

2.6.1 Key requirements

- A separate, dedicated theatre should be available each weekday, and it should be staffed from 08.00-20.00
- A second dedicated theatre should be available if the trauma caseload demands it
- Separate, dedicated theatres should be available at weekends
- A theatre should be available on a 24-hour basis to provide emergency treatments
- Appropriate equipment for all patient requirements
- Theatre access should not be in competition with other emergency disciplines
- It is essential that theatre staff are specifically trained in orthopaedic surgery techniques
- Trained orthopaedic theatre staff should be on call out of hours
- Continuous training in orthopaedic techniques should be provided for theatre staff
- Sufficient support staff should be available to assist with positioning the patient
- In order to avoid patients fasting for excessively long periods, protocols should be in place regarding fasting, and also regarding communication with the wards about the order of the theatre list.

A trauma service cannot function effectively without at least one orthopaedic trained member of the theatre staff being available at all times.

The practice of modern orthopaedic surgery and trauma is impossible without access to adequate x-ray imaging in theatre. There must be adequate image intensifiers and radiographers available to ensure that there are no interruptions to the flow of the operating list. The images captured must be directly loaded onto NIMIS.

Any hospital providing trauma services must be equipped with modern and up-to-date equipment and surgical instrumentation in sufficient quantities to ensure that the service can be provided uninterrupted. Such equipment/instrumentation includes arthroscopes, instruments, and camera systems.

2.7 POST DISCHARGE

Patients who have had a fracture or soft tissue injury require support post discharge in order to maximise their recovery and return to active living. The patient's family/carers need to be included in the discharge plan and given information on the facilities available in the community.

The following is required in order to assist patients with their recovery:

- Ongoing rehabilitation in the community (ambulatory or community programmes, single-discipline outpatients), as well as community support services and equipment need to be organised prior to a patient's discharge from inpatient rehabilitation
- Patients who are unable to achieve a level of function that will allow discharge to their previous accommodation will need to consider supported care options such as residential care
- Service level agreements must be in place between hospital groups, in order to repatriate patients to the referring or bypassed hospital/catchment area. This would serve to facilitate efficiency in the management of acute trauma beds in trauma centres
- Ambulatory and community-based rehabilitation programmes that are responsive to individual needs, and focus on maximising independence and community re-integration, should be available to patients who experience general orthopaedic trauma, irrespective of whether or not they have been admitted to hospital
- Each hospital group must have designated rehabilitation units
- Easily accessible ambulatory rehabilitation programmes, including home- based rehabilitation and centre-based day therapy, should be available for all patients experiencing general orthopaedic trauma who require this service for their recovery. The service should be made available on an equitable basis across the country

- GPs are an essential service link across the continuum of care in the ongoing management of the patient's general orthopaedic trauma condition. Therefore, other service providers must ensure that there is open and regular communication with the patient's GP
- Physiotherapy and occupational therapy should be readily available in the primary care setting (Government of South Australia, SA Health, 2011).

2.7.1 Referral pathways

- Referral pathways are essential in order to ensure that individuals with general musculoskeletal trauma can easily access services, sustain gains made in rehabilitation, and ensure positive outcomes in the long term
- The HSE has endorsed the iRefer guidelines for access to Radiology investigations. (NCPR, 2012)
- Referral pathways need to be structured in such a way that all healthcare practitioners managing these patients have the capacity to refer directly to appropriate rehabilitation facilities, services and/or professionals (Government of South Australia, SA Health, 2011:3-4)
- An effective rehabilitation service is essential for maximising functional recovery and restoring patients back to productive roles in society (RCSENG, 2000).

2.8 DAy CASE TRAuMA

Many patients presenting with acute conditions, and who require urgent surgery, can be efficiently and effectively treated as day cases. Patients may be referred for day surgery from outpatient clinics, emergency departments or primary care. Recent advances in surgical and anaesthetic techniques, as well as the publication of successful outcomes in patients with multiple co-morbidities, have changed the emphasis in day surgery patient selection. It is now accepted that the majority of patients are appropriate for day surgery unless there is a valid reason why an overnight stay would be to their benefit. If inpatient surgery is being considered, it is important to question whether any strategies could be employed to enable the patient to be treated as a day case (Verma et al., 2011).

A sizeable number of musculoskeletal trauma cases are suitable for care through a day ward system. This maximises efficiency in terms of bed utilisation and facilitates significant cost savings. Current practice in some hospitals is to cycle a number of patients through the same bed, a laudable practice that is not in widespread use. Many trauma patients are already treated as day cases. However, it is recognised that many more trauma patients could be treated as day cases should designated day beds be available. The current situation where consultants are forced to admit patients as inpatients due to lack of designated day ward beds is inefficient. Once patients meet the criteria for day surgery they should be admitted as day patients.

After initial assessment, many patients can be discharged, and return for surgery at an appropriate time, either on a day case list or as a scheduled patient on an emergency list, whereas other patients can be immediately transferred to the day surgery service. This reduces the likelihood of repeated postponement of surgery due to prioritisation of other cases. A robust day surgery process is key to the success of this service.

Essential components of an emergency day surgery pathway are:

- identification of appropriate procedures
- identification of a theatre list that can reliably accommodate the procedure (e.g., a dedicated day surgery list or a flexibly run emergency theatre list)
- identified and agreed pathway for day surgery in place;
- robust pre-assessment process
- the injury must be safe to be left untreated emergently, and should be manageable at home with oral analgesia (standardised analgesic pack for the patient to take home)
- clear, pre-operative information should be provided to the patient, in writing.

A potential caseload for emergency day case surgery can be agreed in each centre, which will require the following:

- access to diagnostic services in the outpatient setting: pre-operative work-up completed through fracture clinic/day ward pre-assessment clinic
- post-operative discharge planning completed prior to attendance – this may not be suitable for all patients
- extended working day if the opportunity to facilitate two admissions per bed per day arises. The second patient of the day may not be fit for discharge until later in the evening.

Staff working in these day ward units should be specifically trained in day surgery care. Many units favour multi-skilled staff who have the knowledge and skills to work in several different areas of the day surgery unit. Efficient use of resources is best achieved by a well-trained, flexible and multi-skilled workforce. For managing orthopaedic trauma, however, skilled orthopaedic nursing staff are essential.

The IITOS and the BOA believe that it is essential to separate beds that are designated for planned orthopaedics from beds

that are designated for trauma, and to protect those beds from random (including non-orthopaedic) emergency admissions. Contemporary standards for quality care require the use of dedicated beds and theatres. The admission of musculoskeletal trauma cases to non-orthopaedic wards constitutes suboptimal management.

Designated trauma beds allow for efficient management of patients with staff who are experienced and familiar with injuries (BOA, 2007). Optimal utilisation of trauma beds cannot be achieved without effective discharge planning and appropriate arrangements for the care of the older patient.

2.9 bONE HEALTH

In view of the global burden of disease imposed by osteoporosis, in particular fragility fractures, and taking into account the projected population demographics for Ireland and the current absence of a national approach to fracture management services, a co-ordinated and integrated model is required in order to deliver safe, high-quality healthcare.

Osteoporosis is a disease characterised by low bone mass and structural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. Osteoporosis leads to nearly nine million fractures annually worldwide, and each year over 300,000 patients present with fragility fractures to hospitals in the UK (NICE, 2012). One in three women and one in five men over the age of 50 in Ireland may have osteoporosis. Many people do not know they have this condition, as it generally does not declare itself until the first fracture occurs. This means that up to 300,000 people aged 50 years and over in Ireland may have osteoporosis. Prevalence of osteoporosis in Ireland is rising in line with ageing of the population.

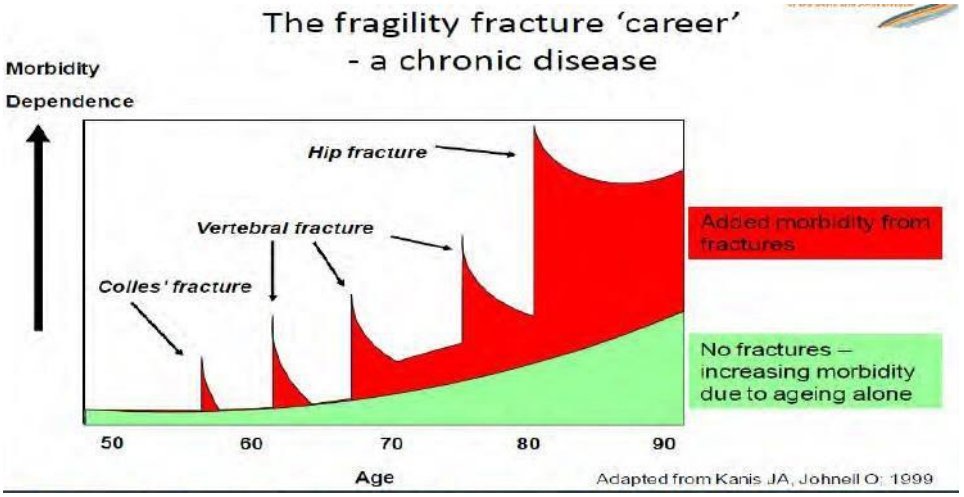
An economic burden of illness (BOI) study of falls and fractures among people aged 65 years and over in Ireland was commissioned from the Irish Centre for Social Gerontology. This report projected costs for the next 20 years in the absence of the implementation of a national falls and fractures prevention strategy. A comprehensive BOI study has not previously been undertaken in Ireland. The results show that in 2010 that fall-related injuries in older people cost the economy between €520 million and €551 million. If these trends continue, it is estimated that costs will escalate dramatically. By 2020, the estimated cost will be between €922 million and €1,077 million, and by 2030 the cost will be between €1,587 million and €2,043 million (DoH, 2008). Between 2000 and 2009, the absolute numbers of all osteoporotic-type fractures increased by 12% in females and 15% in males, while the absolute numbers of hip fractures increased by 7% in women and by 20% in men. The age-specific rates for hip fractures decreased in all age groups with the exception of the 55–59 years age group, where an increase of 4.1% (p00.023) was recorded during the study period.
In addition, associated hospitalisation costs and length of stay increased. Assuming that age-standardised incidence rates remain the same as rates recorded in 2009, the number of all types of osteoporotic-type fractures is projected to increase by 79% over the next 20 years, and the number of hip fractures is expected to increase by 88% by 2025 (McGowan et al., 2013). Early diagnosis, fracture risk assessment and fracture prevention are important aspects of managing impaired bone health and osteoporosis. Access to DEXA scanning at all hospitals, managing patients with musculoskeletal disease is strongly recommended. Secondary fracture prevention is of particular importance, as mortality and morbidity rates increase in the first year after sustaining an initial fracture. It is important that risk assessment measures are focused not only on the right place and the right time but also on the right people, i.e. those at risk of fracture (Department of Health, WA, 2011:21).

Health promotion efforts to promote bone health, prevent and manage bone loss, as well as prevent falls and minimise trauma fractures, should occur across the age spectrum. In particular, awareness-raising messages should be aimed at changing the perception that osteoporosis is a condition of the 'older person' and that falls are 'an inevitable part of ageing', so that prevention strategies are adopted earlier in life. One of the most important ways to minimise the burden of osteoporosis-related fractures is to identify at an early stage people who have sustained a minimal trauma fracture, and then initiate appropriate treatments (Department of Health, WA, 2011:16).

In order to determine how best to devise and implement such a strategy, firstly we need to consider what happens in the years before people present to hospital with a hip fracture. The various patient experiences are illustrated in the 'fragility fracture cycle' in Figure 1. A study based on records from the UK General Practice Research Database (GPRD) reported the lifetime risk of any fracture at age 50 is 53% for women and 21% for men. Thus, fewer than 50% of women will be fracture free for life.

The same study estimated lifetime risks of fracture by gender at age 50 as:

	Hip	Wrist	Vertebra
Women	11.4%	16.6%	3.1%
Men	3.1%	2.9%	1.2%



A crucial observation is that fracture begets fracture. Several studies have evaluated future fracture risk associated with fractures at various skeletal sites. Two major research studies found that a prior fracture at any site is associated with a doubling of future fracture risk. From another perspective, it is known since the 1980s that 50% of patients presenting with hip fractures today have experienced prior fragility fractures in the past (Osteoporosis New Zealand, 2012).

There are five focus areas necessary to reduce fractures:

- Health promotion
- lifetime fracture risk assessment
- treatment
- workforce development
- research and evaluation (Department of Health, WA, 2011:21).

The development of a nationwide fracture liaison service is a key recommendation of this Model of Care. Prescribed exercise classes are a key component of bone health services. (ISCP, 2014)

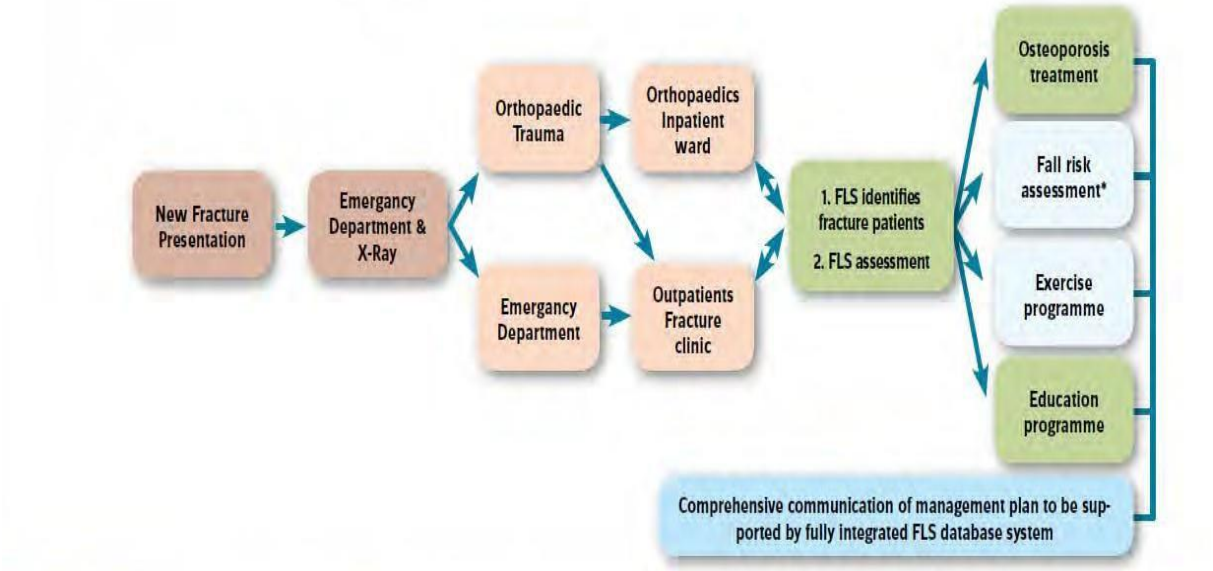
2.10 FRACTURE LIAISON SERVICES (FLS)

Fracture liaison services, commonly known as FLS, are co-ordinator-based, secondary fracture prevention services implemented by healthcare systems for the treatment of osteoporotic patients.

The FLS are designed to:

- close the care gap for patients who have sustained a fracture, and who are currently not offered screening and/or treatment for osteoporosis
- enhance communication between healthcare providers by providing a care pathway for the treatment of fragility fracture patients.

A fracture liaison service comprises a committed team of care providers, and employs a dedicated co-ordinator to act as the link between the patient and the orthopaedic team, the osteoporosis and fall prevention services, and the primary care physician. The FLS would ensure that all patients presenting with fragility fractures to a particular hospital receive fracture risk assessment and treatment where appropriate. The service would be provided by a clinical nurse specialist, who would work to pre-defined protocols in order to identify and assess fracture patients. The FLS can be based in a secondary or primary care healthcare setting, and requires the support of a medically qualified practitioner, be they a hospital doctor with expertise in fragility fracture prevention or a primary care physician with a specialist interest. Services such as prophylactic dexa scanning should be available.



The service structure for a uK hospital-based fracture liaison service (Osteoporosis New Zealand, 2012:10)

The International Osteoporosis Foundation (IOF) recommends a best practice framework (BPF) comprising 13 globally endorsed BPF standards (IOF, 2013). Details as follows:

- patient identification
- patient evaluation
- post-fracture assessment timing
- vertebral fracture
- assessment guidelines
- secondary causes of osteoporosis
- falls prevention services
- multifaceted health and lifestyle risk factor assessment
- medication initiation
- medication review
- communication strategy
- long-term management
- database.

This Model of Care recommends implementation of a fracture liaison service, delivered by a nurse specialist, physiotherapist or occupational therapist with the required competency in bone health and fracture management. This model is a proven approach to the identification, assessment and treatment of fracture risk.

2.11 FRACTuRED NECK OF FEMuR

Hip fracture risk is multifactorial, and reflects general frailty and falls risk as much as it reflects bone fragility. People living in residential care and nursing homes are three times more at risk of hip fracture compared with members of the general population, and around a quarter of patients with hip fracture are admitted to hospital from institutional care. Patient frailty is reflected in the outcome of hip fracture – 10% of patients die in hospital within a month, and within one year, around one-third of these patients have died. The fracture is responsible for less than half of deaths, but the patients and families will often identify the hip fracture as playing the central role in a final illness.

Approximately 3,200 hip fractures are recorded every year in Ireland. The gender ratio is 70% female to 30% male. Fifty eight percent of all hip fracture patients are over the age of 80. Seventy one percent live at home prior to fracture; these patients' pre-fracture mobility is good, with 78% mobilising unaided or with one stick (IHFD, 2013).

Hip fracture is a common, serious and costly injury. Fracture services often fail to respond to the true complexity of their older patients' needs for comprehensive medical and rehabilitation care as well as surgery. Delivering better care at lower cost is challenging, but it is an achievable goal where care standards are derived from evidence-based clinical practice and audit (IHFD). The impact on hip fracture care and patient outcomes will become evident following the monitoring of the implementation of these standards of care.

In 2008, a strategy to prevent falls and fractures in Ireland's ageing population was launched by the HSE, the Department of Health, and the National Council on Ageing and Older People (NCAOP). (HSE, 2008)

Among the findings were the following:

- Every year 10% of all older people need treatment

following an injury. Falls cause 75% of these injuries
- Between 2% and 3% of all injured older people require hospital admission (i.e., more than 7,000 people each year)
- The average length of hospital stay for these patients is 12.7 days.

Currently, hip fracture patients have an AvLOS of 18 days and require considerable support after discharge from hospital (IHFD Preliminary Report, 2013).

The Irish Gerontological Society and the Irish Institute of Trauma and Orthopaedic Surgery collaborated in the development of the IHFD, with the aim of improving hip and fragility fracture care. The strategy looked at hip fracture care under the following headings:

2.11.1 Why focus on hip fractures?

Hip fracture is the most common and the most serious consequence of falls among older people, who have a mortality rate of 20% one year after suffering this type of fracture. Of those who recover, fewer than 50% regain their pre-fracture level of function, fewer than 30% go straight home after hospital treatment, and more than 20% are transferred to nursing home care. Hip fractures account for 79% of the cost of all fragility fractures and, as such, are the most expensive to treat. Hip fracture patients are usually elderly, frail and vulnerable; they require thorough multidisciplinary input during both the acute and rehabilitative phases of their care. Objective monitoring of their care is made easier by the provision of international guidelines and standards against which to measure their care. By focusing on high-quality delivery of care, significant savings will be achieved through reduced lengths of hospital stay, reduced morbidity and mortality rates, and improved functional outcomes with reduced long-stay care needs.

2.11.2 Role of the geriatrician

Older patients with fragility fractures have complex medical needs, and their optimal care is a huge challenge to our trauma and orthopaedic services. These patients' needs for specialist medical care, early rehabilitation and discharge planning are best addressed when a geriatrician with an interest in fracture care is fully integrated into the work of a trauma and orthopaedic service. Collaboration between geriatricians and orthopaedic specialists in the care of older people following fractures was first developed in the 1960s in the UK. Fifty years on, almost all NHS trusts in the UK have routine geriatrician input into the care of older people with fragility fractures.

2.11.3 Irish Hip Fracture Database (IHFD)

Audits will be an integral part of driving clinical and organisational improvements in quality and effectiveness of care after a hip fracture.

The IHFD will:
- collect data on patient casemix, outcomes and secondary prevention
- allow casemix-adjusted outcomes assessments to promote transparency of inter-hospital comparisons
- enable hospitals to compare care and outcomes against international benchmarks and quality standards
- monitor performance over time
- measure the impact of changes in clinical care and service organisation
- support large-scale research on aspects of hip fracture care through the use of time-limited audits and casemix-adjusted outcomes.

Outcomes measurement is essential, and should be recorded by all hospitals as part of a national hip fracture database.

Key elements of good care include:
- where a hip fracture is suspected by ambulance/paramedic, the patient should be transferred directly to the nearest trauma hospital that definitively treats hip fracture patients
- prompt admission to orthopaedic care
- many emergency departments have fast-tracking policies for hip fracture, in order to speed the patient's progress through the department. Admission is inevitable, and unnecessary delay will simply increase the risk of pressure ulcers, confusion and pain
- rapid, comprehensive assessment – medical, surgical and anaesthetic. Experienced anaesthetists and orthogeriatric physicians should work together to ensure that treatment delays do not occur. Pre-operative assessment and optimisation of the patient must be a clinical priority, but should not delay surgery
- in order to prevent pressure ulcers, all patients should be rested on pressure-reducing surfaces from the point of admission to hospital; in transit; in theatre; and in the ward, where high-specification, pressure-relieving mattresses should be readily available. Additional pressure-relieving heel protection may also be needed
- minimal delay to surgery
- accurate and well-performed surgery
- prompt mobilisation
- early multidisciplinary rehabilitation

- early supported discharge and ongoing community rehabilitation
- secondary prevention, combining bone protection and falls assessment
- locally developed and owned pre-operative policies, supported by senior surgeons, anaesthetists and orthogeriatricians working together in the trauma unit will ensure prompt surgery, patient safety and efficiency, with benefits both to patient care and the smooth working of the unit(BOA, 2007:4-5)
- the use of a multidisciplinary integrated care pathway (ICP) and guidelines document which acts as the patient's medical record, and also aims to ensure that the patient receives the recommended standards of care at the appropriate time. Some hospitals have found ICPs helpful in improving key areas in the management of hip fractures, such as optimisation for surgery, early mobilisation, communication with the patient, and discharge planning. If such documents are to be successful in catalysing change, it is essential that all members of the multidisciplinary team are involved in their development and implementation
- a key standard is that hospitals should input data into the IHFD. The IHFD provides training workshops for data collectors, and engages with the local clinical leads and data collectors to implement validation of local data collection. A trained data collector requires approximately four hours protected time per week to collect and enter the data; the data collector will also need access to a computer or laptop in a quiet non-clinical area.

In 2012, the IHFD received national HSE support through the Quality Improvement Division, and IHFD data are now collected on a web-based capture system overseen by the ESRI/HIPE. Currently, 16 acute hospitals are submitting data. The National Clinical Programme for Trauma and Orthopaedic Surgery and the Irish Hip Fracture Database leads have been instrumental in forming a cross-programme group to develop an integrated care pathway for this vulnerable group of patients.

2.11.4 best practice tariff (bPT) for hip fractures

In the UK, the fragility hip fracture best practice tariff (BPT) was introduced alongside a national clinical audit. Together, they aim to improve the level of compliance with defined elements of evidence-based best practice care. The UK Audit Commission found the following:

"There is a clear and steady increase in care meeting the fragility hip fracture BPT criteria. The steady rate of increase was maintained following a significant increase in the BPT element of the tariff in 2011/12. However, in 2011/12, trusts delivered the complete package of best practice care required by the BPT to 49 per cent of patients eligible for it."

2.12 MAJOR TRAuMA

Major trauma describes serious and often multiple injuries where there is a strong possibility of death or disability. These might include serious head, chest, abdominal and skeletal injuries sustained as a result of accidents, sport or violence. Injuries are the leading cause of death among people aged 5–44 years old and are responsible for 14% of all the disability adjusted life-years (DALYs or years lost due to death or lived with disability) lost in the WHO European region. The global burden of disease due to trauma is expected to increase dramatically in coming years, becoming the third leading cause of death by 2020. (IAEM, 2014)

2.13 TRAuMA NETWORK (TN)

A well-developed trauma network encompasses the continuum from prevention, injury detection and control through pre-hospital, definitive care and rehabilitation. A significant goal of a trauma network includes delivering patients to the care facility that has the right resources to match his/her needs in the shortest time possible.

The trauma network embraces the entire spectrum of injury, from mild to major. It functions from the moment of injury until full rehabilitation has been achieved. The trauma network will be the framework in which hospital groups and individual hospitals provide care within a broad geographic area. As patients are optimally treated in the closest appropriate hospital, it may be necessary to cross hospital group boundaries, so as to ensure that patients with major trauma injuries are treated in the closest appropriate facility. The development of referral guidelines is an important component of a trauma network. It is important to bear in mind that the major trauma centres do not constitute the trauma network. "An Integrated Trauma System for Ireland", the IAEM position paper on trauma states "Few individual facilities can provide all care to all patients in all situations – over-reliance on a small number of MTCs might result in these centres being overburdened with large numbers of patients who do not need high complexity care and lead to unnecessarily prolonged travel times for patients. This reality mandates the development of a trauma system of care as well as developing trauma centres" (IAEM, 2014).

The components of a trauma network must include the following:

- surveillance
- injury prevention strategies
- public education and information strategies
- active research
- audit
- clinical training
- pre-hospital care
- appropriate levels of hospital care
- rehabilitation.

Effective collaboration between acute care, primary care and ongoing rehabilitation facilities will enable the patient to return to community life and feel supported.

Shortcomings of the current trauma services include the following:

- Patients with traumatic injuries are taken to hospitals which do not have orthopaedic surgery facilities on site.
- difficulty with access to other surgical specialties
- Lack of interventional radiology facilities
- transport and transfer infrastructure challenges
- insufficient ambulance trauma bypass protocols nationally
- no national co-ordinated policy for trauma care
- no comprehensive audit
- shortage of consultant trauma and orthopaedic surgeons
- difficulty with access to theatre, day and inpatient wards, and outpatient facilities
- overcrowded fracture clinics
- limited access to rehabilitation/step-down beds
- limited access to community rehabilitation services
- difficulties with repatriation of patients from trauma centres.

As the life expectancy of the population increases, there is a concomitant increase in the number of patients requiring treatment for fractures and orthopaedic surgery.

Trauma networks (TNs) are organised groups of services and personnel who serve a defined population and aim to reduce death and disability following injury. They include pre-hospital, in-hospital and rehabilitation services/personnel. TNs ensure that patients are treated by the appropriate clinical staff at the time and place that most benefits them. A central ethos of a TN is to advise and support patients, their families and carers.

This section of the document should be read in conjunction with the Irish Association for Emergency Medicine's paper (IAEM 2014), and the National Emergency Medicine Programme Report (EMP, 2012).

2.13.1 Major trauma centre (MTC)

A major trauma centre (MTC) is part of a trauma network. It is a specialist hospital responsible for the care of a critical mass of the most severely injured patients involved in major trauma. It is the focus of the trauma network; it manages all types of injuries, and provides consultant-level care.

2.13.2 Trauma unit (Tu)

A trauma unit (TU) is a hospital that is part of a TN, and provides care for all except the most severely injured patients. When it is not possible to get to the MTC within 45 minutes, or to get to where the patient needs to be stabilised quickly, the patient is taken to the nearest TU for immediate treatment and stabilisation before being transferred to the MTC. A TU is responsible for the management of trauma patients who are not classified as having major trauma. Patients with less severe injuries (ISS≤15) do no better and may do worse if managed in an MTC. This is in part because they may be de-prioritised compared to the major trauma patients for operations, rehabilitation resources, etc (RCSENG, 2009).

2.13.3 Rationale for changing the way major trauma services are provided

Major trauma patients have complex injuries and need 24/7 emergency access to consultant-delivered care. They need a wide range of specialist clinical services and expertise in order to have the best chance of surviving and recovering. In other healthcare systems in equivalent western economies where TNs are already fully operational, improved patient outcomes have been demonstrated (Oxford University Hospitals NHS Trust, 2015). Where a TN is in place patients have a much better chance of surviving and recovering from a major trauma injury. They have direct access to specialist teams and state-of-the-art equipment, so as to ensure that they receive immediate treatment, 24 hours a day, seven days a week.

Patients with a severe injury are assessed by ambulance staff at the scene of the incident. They are then taken by ambulance directly to the nearest major trauma centre, if it is safe to do so, and if the patient does not need to be stabilised. At the MTC, patients are cared for by an on-site team, including experts in diagnostic testing, trauma injuries and brain surgery. If a patient needs to be stabilised first, he or she is taken to the nearest TU.

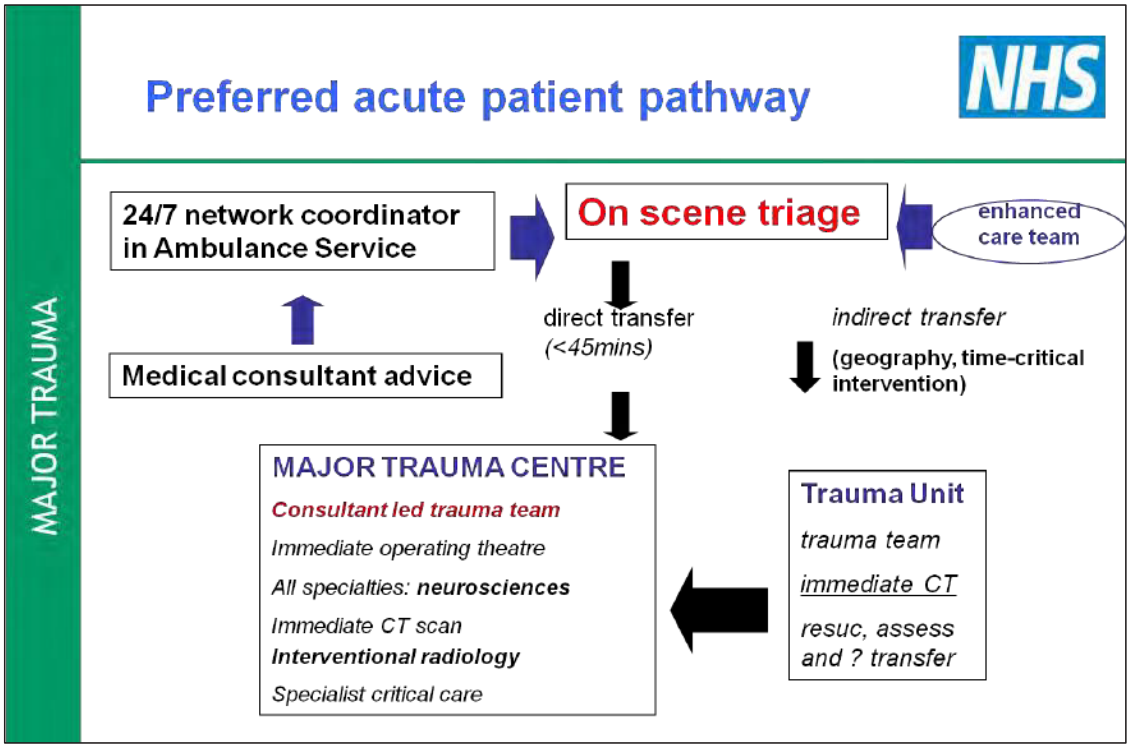
2.13.4 benefits of a major trauma centre

- Major trauma patients will receive world-class care from specialist teams providing 24/7 emergency access to consultant-delivered care
- Long-term disability will be reduced by improving outcomes for adults and children involved in major trauma
- Major trauma patients will require less long-term care
- As a result of receiving specialist care and rehabilitation, patients will have an improved ability to return to work and undertake recreational activities.

In order to ensure best outcomes for major trauma patients, an MTC specialising in major trauma need to have specialist doctors and clinical support staff available at all times. The TN will facilitate delivery of this service. A hospital receiving a critical mass of major trauma patients will lead to the development of clinical teams with expertise and knowledge of treating complex injuries. An MTC requires a team of twelve consultant trauma and orthopaedic surgeons (IITOS/ BOA 2014). MTCs need at least three consultant radiologists with special interest in either emergency radiology or musculoskeletal imaging, plus 24/7 interventional radiology access. The development of a TN will ensure the best use of resources, making the MTCs and TUs more sustainable.

As Professor Keith Willett, National Clinical Director for Trauma Care in the UK has stated: "Thanks to the advances in medicine and technology, patients are now able to survive horrific injuries that previously would have killed them. This is down to the very advanced medical skills that are available in a range of specialties in certain major centres in the NHS. This expertise must be available for all patients, regardless of where they have been injured. At the accident scene the exact injuries are rarely known" (Willett, 2012:12).

We believe that the benefits of specialist, regionalised trauma care – including reduced mortality and improved functional outcomes, which have been realised elsewhere – could also be attained in Ireland. The National Clinical Programme for Trauma and Orthopaedic Surgery strongly recommends the development of a national quality framework to deliver major trauma care across Ireland to an international standard. The development of such a system will support appropriate evidence-based pathways to improve patient outcomes. Patients deserve nothing less.



NHS example of a major Trauma Pathway

3. Workforce planning

3.1 INTRODUCTION

Patients, the public, service providers and clinicians expect services to deliver safe, high-quality care that is evidence based. Effective service delivery requires sufficient numbers of staff to be available at the right time, with the right skills, diversity and flexibility to deliver high-quality care (DoHC, 2011).

Clinical leadership and clinical governance will be further developed to support care delivery through care programmes that are in line with national standards. The involvement of clinicians in management is generally seen as essential, in order to optimise the use of resources and ensure the greatest level of safety in patient care. The formation of the National Clinical Programme for Trauma and Orthopaedic Surgery has enabled the consultant workforce to develop a national leadership strand to their activities. Each of the hospital groups has clinical leads as well as joint national clinical leads.

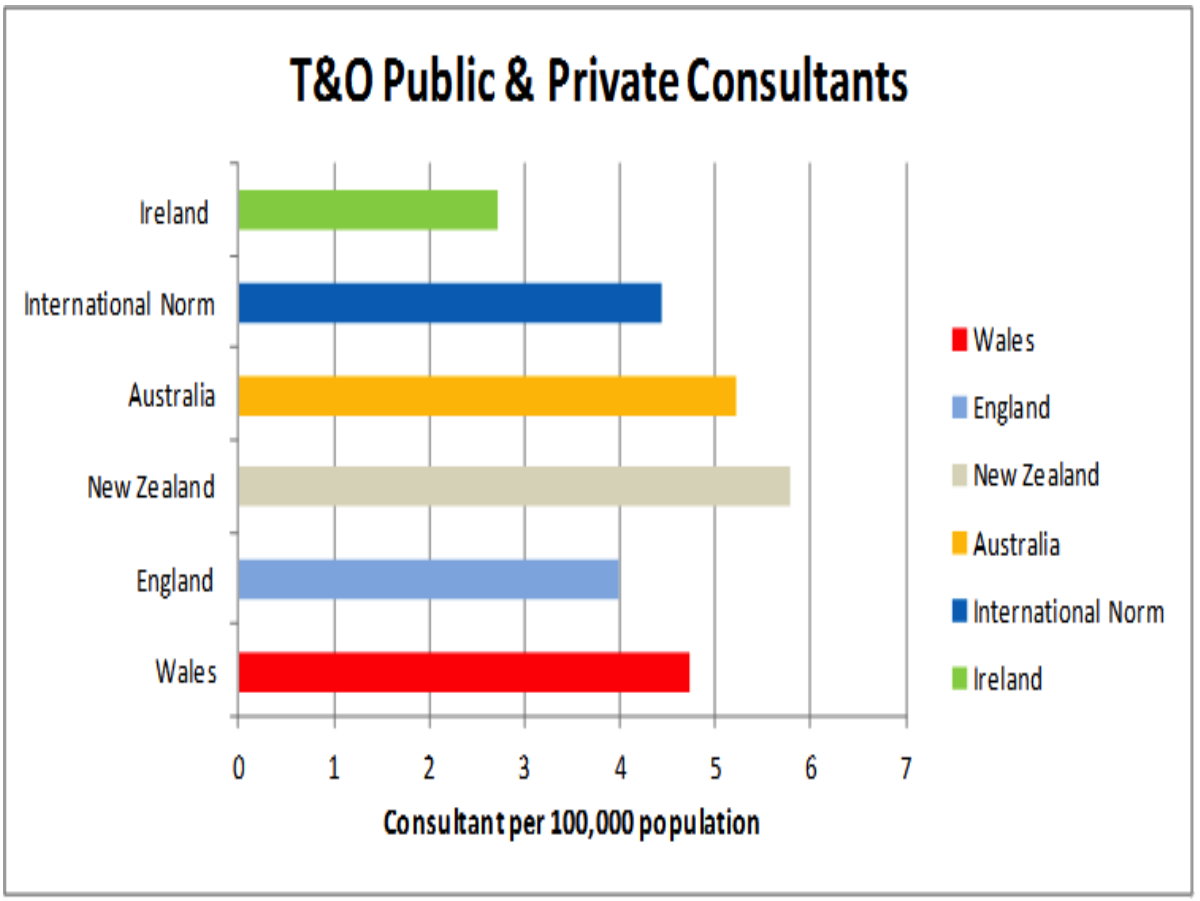
Patient safety and quality of care are at the core of what we all want to achieve. They are powerful drivers of reform and improvement in services. The health system is striving to provide patients with fully integrated healthcare that is easy to access and externally benchmarked (DoHC, 2011:4).

3.2 CONSULTANT WORKFORCE

There is convincing evidence that the best results in treatment are achieved when patients are treated by staff working as part of a multidisciplinary specialist team, and that better clinical outcomes are achieved in hospitals which have the required numbers of specialist staff, high volumes of activity and access to appropriate diagnostic and treatment facilities (DoH, 2003).

Although expansion of consultant numbers is urgently needed, this alone is not the solution. In Ireland, for a population of 4,588,252 (Census 2011) the National Clinical Programme for Trauma and Orthopaedic Surgery and the Irish Institute of Trauma and Orthopaedic Surgery recommends that there should be seven major orthopaedic groups throughout the country, with 27 surgeons in each group. This would give a ratio of approximately one surgeon per 24,000 of the population.

Established areas of subspecialty interest include upper limb, lower limb, malunion, non-union, post-traumatic deformity, pelvic and acetabular injuries, spine, tumour, paediatrics, and orthopaedic traumatology. Fellowship training in subspecialty areas is the key to providing a world-class service to our patients.



The National Clinical Programme for Radiology recommends that:

- Level 3 hospitals with three or more consultant trauma and orthopaedic surgeons require a dedicated consultant radiologist with special interest in MRI and/or musculoskeletal imaging at a manpower ratio of one to every three consultant trauma and orthopaedic surgeons, and 0.5 WTE interventional radiologists per three consultant trauma and orthopaedic surgeons
- Level 4 hospitals require dedicated musculoskeletal radiologists, one per four consultant trauma and orthopaedic surgeons; and one WTE interventional radiologist per four consultant trauma and orthopaedic surgeons
- Major Trauma Centre's - at least three consultant radiologists with special interest in either emergency radiology or musculoskeletal imaging, plus 24/7 interventional radiology access with at least four dedicated interventional radiologists as part of the multidisciplinary trauma team
- Trauma Units - at least 1.5 WTE consultant radiologists with special interest in emergency radiology or musculoskeletal imaging, and 9-5 Monday-Friday interventional radiology access with at least one WTE dedicated interventional Radiologists.

3.3 EDUCATION AND TRAINING

Fundamental to the success of a highly educated orthopaedic service and trauma system is the availability of a highly trained workforce, with the skills and knowledge required to provide the level of care appropriate to their role within that system. To have such skilled and motivated personnel requires that the continuum of education and training needs – from undergraduate education, postgraduate/specialist training to continuing education – must be addressed, and must encompass medical, nursing, health and social care professionals, as well as pharmacy, diagnostic and support staff (Government of South Australia, SA Health, 2011).

"Trauma and orthopaedic surgical practice continues to evolve. As surgical manpower and specifically trauma and orthopaedic manpower issues in Ireland are addressed, and as we move inexorably from a consultant-led to a consultant-delivered service, our trainees, certainly in their early years of training, cannot be considered independent practitioners. Neither should they be considered as wholly service providers" (IITOS, 2009).

This is especially pertinent in the first six years of training (ST 1-6), but it is also important to acknowledge in their final years of training (ST 7 and ST 8). Trainees require direct and indirect supervision, teaching, monitoring and continuous assessment. Time must be built into consultants' and trainees' busy service commitments to allow for their trainees' clinical and operative education, their didactic and clinical teaching, their continuous assessments, and audit and research collaboration. To create such a culture, it is imperative that sessional time is included in future consultant contracts, in order to reflect this training commitment for those who choose to be part of an educational postgraduate programme.

3.4 NURSING

Nurses are the first point of contact for many patients in the health system. Nurses provide care to patients 24 hours a day, seven days a week. They are in a position to positively influence patient care and experience. They act as patient advocates on a continuous basis and patients often feel more at the ease expressing their concerns and fears to the nurse at their bedside. Nurses are responsible for co-ordinating patient care and they work very closely with the multidisciplinary team to ensure that the patient treatment plan is implemented in a timely manner.

Nurses provide a significant volume of the care delivered within the health system, and they comprise almost 40% of the healthcare workforce in Ireland. Appropriate utilisation of their skills and competencies, as well as building on their undergraduate degree programme and the implementation of their clinical career pathway, are of significant importance. Enhanced care provision has included comprehensive physical and psychosocial assessments, prescribing of medications and ionising radiation, caseload management, delivery of nurse-led clinics, as well as nurse-led admission and discharge (DoHC, 2011:7).

In Ireland, as in other countries, there are many imperatives for change, such as changing demographics, expectations of the public and service users, advances in care and treatment options, changing patterns of health and disease profiles, financial constraints, new models of care from the clinical programmes, and emerging health needs. The contribution of nurses, through expansion of their roles, in facilitating the implementation of the European Working Time Directive (EWTD) has been significant.

The reduction in the duplication of resources and the maximisation of the capacity and utilisation of skills and competencies of nurses will benefit patients and nurses. Educational changes enable nurses at all levels to assume

greater leadership roles in healthcare. Leadership at ward level is vital, and it is the Clinical Nurse Manager (CNM) II who leads and directs the nursing and support services workforce.

Over the past two decades, nurses' roles and scope of practice have evolved, and the nursing profession has undergone significant developments which have signalled important milestones and have impacted on the configuration of the nursing workforce. In 1998, the Commission on Nursing (Government of Ireland, 1998) set out a framework for the expansion of nursing and midwifery roles in Ireland through the development of a clinical career pathway. This pathway enabled nurses to advance their education and practice by defining the roles of Clinical Nurse Specialist (CNS) and Advanced Nurse Practitioner (ANP).

In 2009, the Offices of the Nursing Services Director of the HSE published The Guideline for Nurse/Midwife Facilitated Discharge Planning (HSE, 2009). Initiatives such as these have empowered nurses to have greater autonomy in all stages of the patient pathway. The clinical skill and knowledge of the experienced nurse must be valued. The benefits for new graduates of working alongside their experienced colleagues at ward and department level cannot be overestimated.

Ensuring that staffing levels are sufficient to maximise patient safety and quality of care, while optimising the allocation of financial resources, represents an important challenge for the HSE.

While stating that "there is no single nursing staff-to-patient ratio that can be applied across the whole range of wards to safely meet patients' nursing needs", the NICE guideline (NICE, 2014) makes recommendations on factors that ensure patients receive the nursing care they need, including specialist nursing, regardless of the ward to which patients are allocated, or the time of day or day of the week. This includes planning to locate patients where their clinical needs can best be met.

As with all organisations, the healthcare sector should know its internal staff demographics. Data such as the ages of the nursing workforce, intention to retire and the types of positions that will be vacated, should be analysed locally. Succession planning is an integral part of workforce planning, and is essential in order to ensure that vacancies are filled promptly.

Hospital managers should ensure that staffing levels are appropriate to the needs and complexity of care for each individual patient. Safety and risk management is everybody's responsibility and in a situation where there is an unplanned staff shortfall, then prioritisation, risk management and local line management communication protocols should be followed.

The National Clinical Programme for Trauma and Orthopaedic Surgery recommends that the location of orthopaedic patients on specialist wards is a desirable and important element of maintaining patient safety.

In 2014, a Ministerial Taskforce on Staffing and Skill Mix for Nursing was established (DoH, 2014). The taskforce is chaired by the Chief Nursing Officer, Department of Health, and members comprise a group of experts who will develop a framework to determine the staffing and skill mix requirements for the nursing workforce in Ireland.

The aims of the taskforce are:

- stabilisation of the nursing workforce
- staffing and skill mix ranges
- Phase One: general and specialist adult hospital medical and surgical care settings
- further phases.

The recommendations in the taskforce's report will be in the context of emerging models of care and the strategic review of medical training and career structure (DoH, MacCraith Report, 2014).

The Programme for Government 2011 and policy initiatives such as legislative changes for the introduction of nurse medication and ionising medication prescribing create significant opportunities to expand the role of nurses in a proactive manner. Nurses have adapted to additional roles within the orthopaedic service. Further development and expansion of these roles is necessary in order to meet patient and service needs.

Outlined below are descriptions of some of the roles already in place, and the potential within these roles for expansion and further autonomy as practitioners is evident.

3.4.1 Advanced Nurse Practitioner (ANP)

Advanced practice in nursing has developed internationally and nationally. The Commission on Nursing recognised that promotional opportunities should be open to nurses and midwives wishing to remain in clinical practice and accordingly recommended a clinical career pathway leading from registration to clinical specialisation and to advanced practice. Orthopaedic nurses have adapted to many additional roles

within the orthopaedic service. These roles need to be defined and quantified in order to gain recognition for the roles of specialist orthopaedic nurses. The development of the ANP career pathway serves to develop clinical nursing expertise in the interests of excellence in patient care.

ANPs promote wellness, offer healthcare interventions and advocate healthy lifestyle choices for patients, their families and carers in a wide variety of settings in collaboration with other healthcare professionals, according to agreed scope of practice guidelines. They utilise advanced clinical nursing knowledge and critical thinking skills to independently provide optimum patient care through caseload management of acute and/or chronic illness. Advanced nursing practice is grounded in the theory and practice of nursing and incorporates nursing and other related research, management and leadership theories and skills in order to encourage a collegiate, multidisciplinary approach to quality patient care.

Advanced nursing practice is carried out by autonomous, experienced practitioners who are competent, accountable and responsible for their own practice. They are highly experienced in clinical practice and are educated to Master's degree level (or higher). (Nursing Midwifery Board of Ireland, 2010 (Bord Altranais agus Cnáimhseachais na hÉireann).The postgraduate training programme undertaken must be in nursing, or an area which is highly relevant to the specialist field of practice (educational preparation must include substantial clinical modular component(s) pertaining to the relevant area of specialist practice). An autonomous ANP is accountable and responsible for advanced levels of decision making which occur through the management of specific patient caseload. ANPs may conduct comprehensive health assessments and demonstrate expert skill in the clinical diagnosis and treatment of acute and/or chronic illness from within a collaboratively agreed scope of practice framework alongside other healthcare professionals (NCNM, 2010).

The NMBI is responsible for the regulation of advanced practice posts and for the persons who hold these posts (NMBI, 2010).

ANPs in trauma and orthopaedic care should be developed around a model that is focused on service need, and is based on the guidance provided by the NMBI. The core concepts of the ANP role include:

- autonomy in clinical practice
- expert practice
- professional and clinical leadership
- research.

The role of the ANP is based on a vision whereby nursing practice can be developed beyond the current scope of practice, and is supported by clinicians, nurses and other members of the multidisciplinary team.

With the appropriate agreed guidelines, protocols and policies, potential ANPs' scope of practice (trauma and orthopaedics) could encompass the following (examples of) responsibilities:

- see new/review patients with fractures/planned surgery – manage a caseload with agreed referral pathways
- list patients for theatre – prepare theatre lists in collaboration with the team, for example within the ANP role – ANPs' caseload/after pre-operation assessment
- admit/discharge patients – for planned and trauma surgery
- provide education to patients and staff both at local and community level
- audit and research/clinical outcomes – participate, contribute and initiate both at local level and national level/international level
- perform low impact procedures: joint injections, femoral nerve blocks
- manage satellite clinics in primary care and secondary care for planned and trauma review.

The National Clinical Programme in Trauma and Orthopaedics recommends the development of an ANP role in trauma and orthopaedics. The ANP would greatly assist in the management of patients in the appropriate place, and thus would play an invaluable role in reducing waiting lists.

3.4.2 Clinical Nurse Specialist (CNS)

Clinical Nurse Specialists (CNSs) practise in a defined area of nursing which requires the application of knowledge, experience and clinical expertise. The overall purpose of the role is to improve the quality of patient care. CNS responsibilities include a major clinical focus, which comprises assessment, planning, delivery and evaluation of care given to patients and their families in hospital, community and outpatient settings. Nurse-led services are key to the role and have been shown to impact positively on the care provided to patients in addition to meeting the needs of the service (SCAPE, 2010).

The CNS role is identified around a specific health service need, and the role responsibilities are developed around five core concepts which include:

- clinical focus
- patient advocate
- education and training
- audit and research
- consultation.

CNSs provide a pivotal link between patients and their families through a dedicated and consistent approach to their care. CNSs practise as part of a multidisciplinary team and, through an agreed referral pathway, can liaise and refer patients to appropriate members of the team, both in the inpatient and outpatient setting. The CNS may make alterations to prescribed clinical options in line with agreed guidelines, policies and procedures/protocols. Formal, recognised post-registration education that is relevant to the area of specialist practice is required at Level 8 or above on the National Qualifications Authority of Ireland (NQAI) framework. Such formal education is underpinned by extensive experience and clinical expertise in the relevant specialist area. The level of practice of a CNS is higher than that expected of a staff nurse or midwife.

Within the orthopaedic area the potential for CNSs to practise is wide and varied, and encompasses both trauma and elective orthopaedic conditions.
The following are examples of areas of practice where a CNS could be established across the lifespan:

- paediatric – pelvic and limb reconstruction
- pre-operative assessment
- discharge roles and follow-up of patients to the community and outpatient setting
- arthroplasty, Ilizarov/limb lengthening
- nurse-led hip fracture and spinal review clinics
- planned and trauma review
- hip and knee replacement outcomes management – which includes short-term and long-term review for patients
- collaborative working in relation to data collection for the Irish National Orthopaedic Register, Trauma Audit and Research Network and the Irish Hip Fracture Database;
- post-discharge support through nurse-led review in person and by telephone.

3.4.3 Fracture Liaison Nurse (FLN) (CNS/CNM2)

The size of the service can be estimated according to the number of hip fractures in that hospital: the number of overall fragility fractures is thought to be five times the number of hip fractures i.e., 400 hip fractures = 2,000 fragility fractures. The role of the fracture nurse includes the following:

- a comprehensive bone health assessment, including bloods, risk assessment +/- DEXA
- falls assessment
- previous fracture history
- educate patients about bone health, falls and medication compliance
- initiate medication prescription
- if the nurse is a prescriber of ionising radiation, he/she can prescribe DEXA (if the local implementation committee and radiation safety committee in that hospital agree)
- refer follow-on care to primary care
- liaise with local clinical leads regarding treatment for patients/complex patients.

3.4.4 Physician Assistant (PA)

The role of the Physician Assistant is well established in the United States, Canada, Australia and some European countries. Physician assistants work as members of a surgical team and provide pre- and post-operative care. They are medically and surgically trained health professionals who provide a wide range of services under a surgeon's direction (NCPS, 2013).

Due to increased challenges in managing non-consultant hospital doctor (NCHD) staffing levels, there is a need to educate and train physician assistants that the HSE can recruit as part of its workforce. Currently, no Irish third-level institution offers a postgraduate diploma in physician assistant studies, and there is no regulatory body, as this is a new healthcare profession in Ireland. A business case for establishing a Postgraduate Diploma in Physician Assistant Studies has recently been submitted to the RCSI Awards and Qualifications Committee.

3.4.5 Health Care Assistant (HCA)

The Health Care Assistant (HCA) role is well established and such professionals are an integral part of the healthcare team. In the peri-operative setting there is wide disparity nationwide in the duties carried out by HCAs, and we believe there is scope to develop and advance this role. We recommend a review of the HCA role within the peri-operative setting. We consider the review as an opportunity to contribute to the versatility of the peri-operative team, enhance the role of the support worker, and contribute to both patient and service needs within a clinical governance framework. The provision of education and ongoing professional development courses for all staff involved in the care of patients is essential, in order to ensure that best practice principles are applied and that staff feel valued.

3.4.6 Operating Department Assistant (ODA)

Traditionally, surgeons have been assisted primarily by nurses. In the UK NHS (and elsewhere), the role of operating department practitioners (ODP) is well developed. There ODPs have an important role in the three interconnected phases of peri-operative care:

- Anaesthetic phase
- Surgical phase
- Recovery phase

Training varies between higher education institutions, combining plenty of practical involvement in an operating department, with learning the background and theory. In the UK, it is generally a two year programme, leading to a diploma in Higher Education in Operating Department Practice, although training courses can range from two years (full-time) to seven years (part-time). Some universities also run degree programmes in Operating Department Practice (NHS Careers, 2013).

The UK Health and Care Professions Council is the regulatory body for several careers groups, including operating department practitioners.

4. Outpatients department (OPD)

The main functions of an OPD are:

- specialist consultation and examination
- treatment of patients who do not require the facilities of either a day patient or inpatient ward
- screening for the selection of patients for day case treatment, day surgery or inpatient procedures;
- reviewing patients post-surgery
- discharging patients from the care of the hospital, with referral if necessary to other health service providers.

The OPD service is delivered by orthopaedic surgeons and teams as part of a multidisciplinary service located either in or near the outpatient facility, and it includes the following services:

- radiology/diagnostics
- nursing
- casting services
- health and social care services
- orthotics
- physiotherapy
- occupational therapy
- podiatry
- social work
- medical records, clinic administration and clerical services.

The interventions taking place at an orthopaedic clinic can vary in length from a relatively short time requirement for fracture diagnosis and treatment to a considerable time requirement for complex cases, or for explanation of diagnosis and treatment options to patients and agreement on the treatment plan. In some services, there are designated clinics for these requirements.

Orthopaedic clinics in many hospitals have large attendance figures, and frequently exceed the expected treatment timeframe, thus resulting in lengthy delays for patients and inefficient service delivery. Overcrowding at trauma and orthopaedic clinics is endemic nationally, and it is not unusual to have 80-100 patients booked into a four-hour OPD session.

4.1 Current Supply and Demand Issues for Orthopaedic Outpatients

Although there have been improvements in waiting times for orthopaedic services, it will be a challenge to continue to meet the targets, as target times continue to shorten, the population increases, and the number of older people also increases. Current waiting lists for an orthopaedic first outpatient consultation in Ireland are too long. This demonstrates a mismatch between supply and demand.

We must find more efficient and innovative methods of providing orthopaedic services to help reduce waiting times, including reducing did not attend (DNA) rates and the rate of return appointments to outpatient clinics.

The development of agreed pathways of care will provide a process to operationalise clinical models of care and best practice guidelines. Collaboration with the OPD Services Improvement Group will clearly identify the mismatch between capacity and resources. Agreeing the elements of the pathway will remove unnecessary duplication of referrals, improve the options for patients, and ensure that management of patients in primary care is fully optimised prior to their referral to secondary care. Agreement about the number of patients who can safely be seen at a clinic, as well as revised new to review ratios will improve patient experience and improve the flow at OPD clinics. This work is ongoing. The expansion of nurse- led clinics and musculoskeletal physiotherapy triage clinics is a proven means of ensuring that the patient sees the right person at the right time.

Maximum waiting time target for a first outpatient appointment (SDU Technical Guidance, Scheduled Care 2013, Outpatient Waiting Times)	26 weeks for a first time outpatient appointment by 30 November 2014
Current Orthopaedic waiting list June 2015	54,181

Levels of activity and demand must be balanced if sustainable solutions are to be achieved.

Additional considerations are:

- Guideline-controlled direct access to MRI for GPs would help drive efficiency in orthopaedic outpatient service delivery, however this requires adequate resourcing
- the frequent discrepancy between the number of cases that must be seen in order to achieve target waiting times, and the level of activity possible with the current workforce and current hospital facilities that are available to trauma and orthopaedics
- the impact of lack of capacity for inpatient/day case treatment has created a problem, as additional patients

are seen at the OPD
- current application rate to surgery for trauma and orthopaedics, which is now in the region of 24%
- improvements in one part of the pathway can result in adverse impacts in other areas e.g., improving OPD waiting times leads to increased demand for inpatient care, resulting in more challenges to inpatient targets;

4.2 ADDRESSING THE CHALLENGE

While the primary focus to date has been on the inpatient/day case list, in 2013 the focus shifted to the outpatient profile. Orthopaedic services have changed in order to ensure the achievement of waiting list targets.

In addressing the ongoing challenge, key standards must apply. These include the following:
- Equity must apply to all patients regardless of targets or quotas
- 'Non-emergency patients waiting for OPD inpatient/day case treatment must be prioritised according to the severity of their condition in a consistent and transparent way' (NHS Wales, 2004)
- Consideration could be given to the introduction of common waiting lists for routine procedures.

The National Clinical Programme for Trauma and Orthopaedic Surgery recommends that the following be taken into account when OPD services are being organised:
- safe care
- service demands
- waiting lists
- patient expectations
- HIQA standards
- teaching.

The organisation of large numbers of people attending an OPD in an acute hospital is a complex operational and logistical challenge. A priority in this guidance is how best to address this while ensuring an accessible, high-quality, patient-centred environment.

The National Clinical Programme for Trauma and Orthopaedic Surgery is working in collaboration with the Outpatient Services Performance Improvement Programme (OSPIP) in order to develop standardised referral guidelines for the specialty. The OSPIP is working to put in place a standardised set of processes that will enable service providers to transition to an ICT-enabled, clinically driven, performance managed system of care that will ensure patients receive appropriate care in a timely manner using available resources (Outpatient Pathway of Care Development Project Working Group, 2014).

Consultation to date indicates that the following requirements are crucial to achieving improved patient flow, better access and delivery of safe care, resulting in effective and efficient orthopaedic services:
- clearly defined referral guidelines
- improved consultant-to-patient ratio
- review of health and social care services to determine requirements for optimum delivery of care
- further development of the orthopaedic musculoskeletal physiotherapy clinics process
- development of Advanced Nurse Practitioner, Advanced Health Care Professional and Physician Assistant roles as required by service needs
- development of nurse prescribers of ionising radiation in the outpatients department
- service reconfiguration
- continued development of a culture of performance-based management and incorporation of new management systems into service delivery
- further introduction of new ways of working, treatment processes and patient flows
- ways of optimising surgeons' time by tailoring OPD capacity and application rates to actual inpatient capacities and planning
- rheumatology-led triage clinics for arthritic hip/knee injections.

Hospital groups should consider establishing dedicated upper and lower limb interface pathway teams. In the UK, these teams comprise the following healthcare professionals:
- one consultant orthopaedic surgeon
- one staff grade doctor/surgeon
- two upper/lower limb specialist nurses
- enhanced scope practitioners in physiotherapy.

All upper/lower limb work should be directed through this specialist team.

In 2007-08, in NHS Fife, the upper limb team dealt with approximately 5,700 outpatient appointments, 880 day cases and 200 inpatients. Waiting times for access to the dedicated upper limb team is currently 12 weeks, and this is expected to be reduced. The cost of providing this service is approximately £400,000 a year.

4.3 PHySIOTHERAPy ORTHOPAEDIC AND RHEuMATOLOGy MuSCuLOSKELETAL CLINIC

The physiotherapy musculoskeletal project was established in 2011 as a joint initiative between the National Clinical Programme for Trauma and Orthopaedic Surgery and the National Clinical Programme for Rheumatology. The project is an innovative initiative whereby patients normally seen by a consultant are seen and assessed by physiotherapists, who assist in the triage of referrals from waiting lists and recommend patients who are suitable for musculoskeletal triage clinics. The aim of the initiative is to expand the service and enable it to see more patients, and appropriately route more patients who are already on orthopaedic and rheumatology waiting lists. The project has been a resounding success, with over 50,000 patients removed from the waiting list to date.

This indicates that the demand for outpatient services is greater than the need for orthopaedic surgical intervention. Moreover, it highlights both the importance of expanding the orthopaedic musculoskeletal physiotherapy service, and the importance of developing protocols for determining the level at which this service can be delivered by enhanced scope practitioners in physiotherapy.

It is nevertheless recognised that physical capacity for treating trauma and orthopaedic patients is limited, and the geographical location of services does not always match the distribution of patients presenting. Therefore, plans to add more capacity should be developed, and these should include consideration of new ways of working to ensure that all processes and patient flows are optimised.

With regard to outpatient activity generally, there are significant variations in activity profiles between the different subspecialties and different hospital groups. The reasons behind some relatively low levels of activity may be open to different interpretation, and this poses a challenge in identifying the true extent of the activity/capacity gap. Influencing factors perhaps include the extent to which trauma displaces planned activity, the varying levels of management efficiency, and the prioritisation of the trauma and planned service within hospitals. Workforce limitations or the actual shortage of capacity in different organisations, which caps throughput, should be dealt with under the reconfiguration of trauma and orthopaedic services nationally.

4.4 PATIENT SAFETy IN ORTHOPAEDIC SuRGERy

There is a growing worldwide movement towards ensuring greater patient safety in healthcare. The World Health Organization (WHO) has its own Patient Safety Programme, which is part of the World Alliance for Patient Safety.

Much emphasis is quite rightly placed on the WHO Safe Site Surgery initiative. The WHO regards patient identification as a key component of patient safety. “The widespread and continuing failures to correctly identify patients often leads to medication, transfusion and testing errors; and wrong person procedures” (Farley, 2011).

Errors which ultimately culminate in wrong site/wrong procedure cases often originate in the outpatients department. Wachter et al. found that the causes of outpatients’ mishaps were:

- a failure to undertake a proper history or physical examination
- a failure to order an appropriate test 55%
- incorrect interpretation of test results 37%
- \the risk of misplaced results, as 40% of hospitalised patients have pending tests at the time of discharge
- failure in judgement 79%, insufficient knowledge 48% (Murphy, 2011).

4.4.1 Medical records, clinic administration and clerical services

Effective standard operating procedures (SOPs) are essential for the administration of orthopaedic clinics, due to high referral volumes, demand-led trauma services and the range of disciplines involved in service provision for orthopaedic outpatients.

An effective appointments system is essential for the operation of an efficient OPD. A well-managed system will facilitate the functioning of the department and will be an important factor in determining the number of patients for whom waiting space should be provided.

It is essential that patients’ medical notes, diagnostic x-rays and scans are available when required. The absence of this information may adversely affect safe patient care. Managers must ensure that medical record departments are adequately staffed to deliver this service (Campling et al., 1995).

The National Clinical Programme for Trauma and Orthopaedic Surgery fully endorses the British Orthopaedic Association’s recommendation that:

- All notes and letters should be typed and dispatched within three working days; for medico-legal purposes, they should be dated and signed, to indicate that the

notes are contemporary (BOA, 2013/2014: 39)

The General Medical Council (GMC) guidance, Good Medical Practice, requires doctors to ensure that everything they sign is factual and verifiable, and this would apply to letters in the doctor's name, or signed by another party on the doctor's behalf. The key principle is that the reader of the letter must not be misled into thinking that the doctor has seen and signed the correspondence. It is accepted that working practices among surgeons will vary (BOA, 2013/2014:39).

It is the responsibility of surgeons to ensure that they have adequate time to both talk to and examine the patient, and are therefore certain they can satisfy the doctrine of 'informed consent' with regard to any treatment that may be offered to the patient; surgeons must also ensure that they have adequate time to dictate notes as well as letters to the referring doctor, in addition to teaching junior staff and medical students, where appropriate (BOA, 2013/2014:70).

Healthcare staff must ensure that clinic templates are designed in such a way that they provide sufficient capacity for patients to attend appointments within specified clinical timeframes, with maximum waiting times guaranteed. The templates must encompass new patients, review patients, fracture clinics, planned clinics, combined clinics and special interest clinics. The use of voice recognition software can save administration time and can expedite the issuing of reports and letters following OPD and theatre sessions.

4.5 THE OUTPATIENT CONSULTATION

Usually, the patient will have attended their GP, who will seek the opinion of a consultant orthopaedic surgeon. Waiting time for an outpatient consultation varies throughout Ireland and is a reflection of many factors, including the number of orthopaedic surgeons serving the local population.

The consultation with the orthopaedic surgeon should include:

- history taking
- physical examination
- provision of good-quality x-rays films or images. A routine anterior-posterior view may also require a lateral view
- The BOA regards 20-30 minutes as the minimum time allowable for a first consultation. The patient must feel that adequate time has been allowed for this consultation (BOA, 2013/2014:70).

A suitable environment for discussion with the patient and relatives should be provided, and all relevant notes and investigations, including imaging, should be available.

Patients should have the risks and benefits of the operation explained in understandable language. An individual patient may have added risk factors present (such as cardiovascular disease, obesity, predisposition to venous thromboembolism, neurological disease or diabetes) and that patient should be made aware of the added risks.

Patients should be aware that they make the decision about whether or not to undergo surgery. Failure of the hip joint as a result of arthritis is not a life-threatening or limb-threatening disease, but patients should understand that the operation carries a 30-day mortality rate of about 0.5%.

The patient should be made aware of the option not to have an operation, and some other procedures may be possible in appropriate cases.

4.5.1 Patients leaving the surgical outpatient clinic

For each planned surgery patient, a surgical care plan and its components are documented and set in motion in accordance with the procedures outlined in the Model of Care for Elective Surgery (NCPS, 2011: 35).

- Patients receive verbal and, in most cases, written documentation about their procedure and its potential complications and side effects
- Patients are given an estimated length of stay
- There should be documentary evidence of patients' consent if they are satisfied to proceed with the surgery
- An appointment is made for attendance at a multidisiplinary pre-admission assessment clinic
- Details of planned surgery are conveyed to both the primary care team and the community care team
- Patients receive education on post-operative needs e.g., dietary, mobility aims
- There is a dedicated waiting list/admission co-ordinator/ bed manager for planned surgery patients.

4.5.2 Planned orthopaedic surgery clinics

Outpatient planned orthopaedic clinics are established for:

- specialist consultation and examination
- treatment of patients who do not require the facilities of either an acute day patient or inpatient ward
- screening for the selection of patients for day case treatment, day surgery or inpatient procedures
- reviewing patients post-surgery
- discharging patients from the care of the hospital, with referral if necessary to other health service providers.

Planned clinics comprise a range of orthopaedic specialty clinics. As follows:

- joint arthroplasty
- spine
- upper limb
- hand
- lower limb
- foot and ankle
- nurse or physiotherapy led arthroplasty clinics
- physiotherapy musculoskeletal physiotherapy triage clinics
- physiotherapy back pain screening clinics.

The following lengths of time to be devoted to the subspecialty of spine and extended scope practitioner clinics are considered appropriate:

Patients	Consultant Orthopaedic Spine Clinics	Musculoskeletal Physiotherapy Clinics	Back Pain Screening Physiotherapy Clinics
New	30 minutes	30 minutes	30 minutes
Review	20 minutes	20 minutes	20 minutes

There are examples of nurse/physiotherapy led arthroplasty clinics where these health professionals run a clinic according to an agreed protocol. Physiotherapy musculoskeletal triage of outpatient waiting lists exists for patients who have already been referred to the orthopaedic outpatients' service. Diversion of selected cases from consultant lists to therapy-led clinics and nurse-led clinics will reduce waiting times in addition to providing more appropriate and timelier packages of care. This can be achieved through protocol-driven triage of waiting lists and subsequent transfer of patients to non-medical clinics. Clinic staff will then directly manage patients, or refer them on to mainstream therapy services, or for medical intervention. The establishment of generic referrals to a multidisciplinary orthopaedic team would facilitate this approach of offering alternative secondary care management routes. Core skills training should be extended, in order to promote the availability of increased numbers of extended scope practitioners.

Clinical specialists/extended scope practitioners provide protocol-driven diagnostic procedures as well as provide routine follow-up and long-term monitoring of post-operative cases.

Although follow-up physiotherapy and occupational therapy is available in the vast majority of areas through primary care teams, waiting lists remain a major challenge. Both occupational therapists and physiotherapists must continue to provide some services near orthopaedic clinics, in order to be part of the multidisciplinary team and also in order to facilitate both communication and delivery of care in line with agreed protocols.

Review of the literature on Extended Scope Practitioners in the area of hand therapy identifies a series of clinical audits and research that indicate that occupational therapy ESP clinics have the potential to improve the patient pathway by providing earlier access to a specialist opinion for a diagnosis and management of both trauma and planned hand conditions thereby improving service delivery.

4.6 FRACTURE CLINICS

With regard to the workload of fracture clinics, the perception is that it is difficult to regulate the number of new patients due to the nature of the work. Trauma activity is largely predictable, however, with winter and summer peaks. Hospital management should carry out regular activity analysis and ensure that systems are in place to deal with a surge in trauma activity.

Fracture clinics should be staffed and organised, so that:

- all musculoskeletal injuries which require follow-up are seen promptly in the fracture clinic
- Clinics are under the clinical direction of a consultant orthopaedic surgeon. Patients may be seen by extended scope practitioners working to a protocol. They must be deemed by the consultant orthopaedic surgeon to be of the appropriate competence and seniority. The care and responsibility for patients remains with the consultant orthopaedic surgeon
- the number of patients at the clinic must be such that the consultant can devote a reasonable amount of time to each patient
- therapist support is provided to orthopaedic consultants: therapists/extended scope practitioners' input to a fracture clinic has the potential to improve efficiency as

a result of therapists managing follow-up and onward referral of minor injuries. Patient outcomes could also be improved through the provision of early rehabilitation, advice and treatment. Follow-on trauma occupational therapy and physiotherapy is provided in either acute or primary care settings. The combination of both these options is essential in order to ensure competence in physiotherapy trauma management. Close working relationships between both acute and primary care occupational therapy and physiotherapy services is required in order to deliver the required care in line with the timeframes identified in protocols for treatment.

4.7 CLINIC ATTENDANCE RECOMMENDATIONS

The following lengths of time to be devoted to patients in outpatient clinics are considered reasonable where proper clinic and ancillary facilities are available:

Patients	Consultant Orthopaedic Clinics	Consultant FractureClinics
New	20-30 minutes	10-20 minutes
Review	10-15 minutes	10 minutes

The timings set out above apply to general orthopaedic and fracture clinics run by a consultant. These timings encompass the initial consultation and review following x-ray, discussions on informed consent, dictation of notes and necessary telephone calls, etc.

Specialist and teaching clinics may require an increase of up to 50% in the length of time to be allocated per patient.

4.8 FACILITIES

Patients

The following facilities are required for patients:

- a well-designed clinic reception
- clear and simple directions and circulation routes
- a well-organised and efficient appointments system
- privacy and dignity ensured at all times
- uninterrupted consultation with the doctor
- easy access (and wheelchair accessible) to treatment facilities and toilets
- Adjustable height chairs enabling a range of seating heights for patients who present with impaired mobility, pain and post total hip replacements.

Doctors and clinical staff

The following facilities are required for doctors and clinical staff:

- patients ready for consultation, with case notes, x-rays and scans immediately available
- accommodation that will enable consultation and examination to take place in privacy
- sufficient time to carry out the consultation
- Access to Diagnostic Radiology
- sufficient storage for equipment
- access to hand decontamination facilities/equipment and waste disposal.

Other staff

The following facilities are required for other staff:

- good visual contact with waiting patients
- controlled handling of patients' records, so as to maintain confidentiality
- a high-quality, safe and secure working environment.

Consulting room

The following are required:

- individual, adequately equipped office accommodation, including Internet access and IT facilities, in order to enable consultants to access patient information on the hospital's NIMIS and PACS systems
- clinical hand washing facilities
- sufficient space to be able to discuss matters in privacy with patients and staff
- office accommodation must be located close to the orthopaedic secretariat.

The heavy outpatient caseload in orthopaedic and fracture clinics makes it essential to have purpose-designed and built outpatient accommodation conveniently sited in relation to the x-ray department and plaster room. There should be a sufficient number of consulting rooms available to enable department staff to work effectively; the exact number of such rooms would depend on the size of the department. Individual examination rooms should be sufficiently large to enable teaching demonstrations to take place. Solid structures must be used to separate consulting rooms; the use of curtains to separate consulting areas is unacceptable when confidential issues are being discussed with patients.

There should be areas specifically dedicated to dressings, in order to allow satisfactory patient flow and also in order to facilitate patient chaperoning, where necessary. Consideration should also be given to the particular requirements of special clinics, which may necessitate the additional presence of other professions, such as therapists and orthotists.

Orthopaedic clinics need to accommodate patients and their escorts, as many of these patients will be on crutches, or in wheelchairs. Health and safety considerations must be a major focus where there are large numbers of patients with different levels of mobility. Waiting areas should reflect these factors. Easy access to plaster facilities is essential.

4.9 PLASTER ROOM FACILITIES AND STAFFING

The room should contain at least two cubicle areas, each with an examination couch. Sufficient space to walk around the couch is required. Sufficient space is also needed for the patient on crutches or in a wheelchair to manoeuvre to the examination couch. Each cubicle should have IT facilities with Internet access, a wall-mounted x-ray viewer, stands and stools. It should also contain a plaster sink, work surface and storage for plaster saws and tools. A clinical hand wash basin is required. Mechanical ventilation should be provided in order to remove plaster dust.

Separate space is required in order to store supplies of plaster of Paris used for making splints, and also to store bandages, air boots, equipment and instruments. Temperature control may be necessary in one of the stores if heat-sensitive materials are in use. Provision is required for the storage of walking aids such as crutches and splints.

The qualified registered general nurse (RGN)/casting room technician with an orthopaedic casting qualification is a vital member of the orthopaedic healthcare team.

Plaster nurses and technicians work with orthopaedic surgeons to manage patients conservatively, and to treat injuries to bones and joints (e.g., within trauma and orthopaedic clinics, orthopaedic theatres, and diabetes clinics).

The UK specialist advisory committee (SAC) in trauma and orthopaedic surgery requires that, in a centre teaching specialist registrars (SpRs), each plaster room should have at least one member of staff who holds the certificate in casting techniques, and remaining staff should be working towards the qualification. The SAC is an advisory group to the Joint Committee on Surgical Training (JCST) which represents the four surgical Royal Colleges of Great Britain and Ireland. The SAC has liaison members who are responsible for overseeing training in Ireland.

The BOA and the National Clinical Programme for Trauma and Orthopaedic Surgery recommend that all plaster room staff undertaking unsupervised application of casts must have a qualification equivalent to the certificate in casting techniques. Revalidation of this certificate should take place every two years. If unqualified personnel are working in this capacity, orthopaedic surgeons should bring this Model of Care recommendation to the attention of the clinical governance chairman within their hospital. Access to plaster room facilities should be available on a 24-hour basis (BOA, 2013/2014:40).

It is the role of the technician, and one of the roles of the plaster nurse, to apply and remove plaster casts. Plaster nurses/technicians apply splints and braces, working directly with patients to instruct them on the care of their injuries/casts and also to provide verbal/written instructions. In addition, plaster nurses/technicians instruct patients on the use of aids such as crutches. The plaster nurse is also involved in wound care (assessment, management, evaluation) and the removal of k-wires.

Plaster nurses and technicians assess, plan, implement and evaluate care episodes using, wherever possible, evidence-based practice. There is the potential for harm to the patient if the nurse or technician does not exercise good clinical judgement.

Some of the complications that can arise include:

- circulatory impairment, including compartment syndrome
- nerve impairment caused by a poorly applied cast, or as part of the circulatory impairment
- long-term problems for the patient due to either incorrect positioning of the limb, incorrect positioning of the cast, or an incorrect cast being applied
- pressure ulcers due to an incorrect or poor casting technique, or inappropriate patient intervention resulting from a lack of proper instruction to the patient
- stiffness of joints due to incorrect extension of a cast which obstructs movement of the adjacent joint(s), or lack of instruction to the patient regarding specific appropriate exercises. (This does not include a joint held within a cast, as stiffness may occur here as part of the initial treatment and will be managed appropriately at a later time)
- an allergic reaction to cast materials if the plaster nurse/

technician fails to assess the patient appropriately prior to treatment, or fails to recognise the symptoms when an allergic reaction occurs.

In the UK, the BOA casting committee is responsible for overseeing the provision of training and the continued professional development (provision of revalidation courses) of those involved in the application of casts. The British Casting Certificate course and assessments are validated by the BOA and the Association of Orthopaedic Practitioners (AOP) and supported by the Royal College of Nursing (Society of Orthopaedic and Trauma Nursing). This programme is currently accredited by Glasgow Caledonian University, with 60 credits awarded at diploma level.

Short courses in basic casting techniques are available in Ireland. These courses are open to RGNs working in an emergency department, OPD or orthopaedic ward settings; they are also open to NCHDs who are on a training scheme and are working on an emergency medicine or trauma and orthopaedic rotation. The programme is accredited by both the Nursing and Midwifery Board of Ireland and the RCSI Professional Development Scheme. Practical sessions are facilitated by experienced plaster nurses/technicians who hold the BOA, British Casting Certificate. In conjunction with the RCSI Department of Surgical Affairs, a one-day programme is run twice a year for medical staff who are not currently on a training scheme; this programme forms part of their continuous professional development (CPD). Other short casting update sessions aimed at upskilling staff are held in a small number of hospitals throughout the country.

4.10 PRIMARy CARE

The primary care team provides early diagnosis/treatment and determines the initial care pathway for patients. The team is also the main gatekeeper to secondary care services. However, capacity within primary care is limited, and it is essential that a balance be struck between primary and secondary care services, with due consideration given to how these sectors can work together for the benefit of the patient.

Limited capacity within primary care can influence the level of reliance on secondary care services. For example, there is great potential for innovative use of primary care (supported by extended scope practitioners) to develop a musculoskeletal service in the community, thus obviating the need to refer a significant proportion of patients to secondary care. Additionally, evidence suggests that increased numbers of joint injections, as well as increased numbers of minor surgical interventions, could be undertaken in a primary care setting.

4.11 PRIMARy CARE PATHWAyS

Evidence suggests that a high proportion of patients who find themselves on an acute inpatient waiting list could be successfully treated in primary care or through an alternative multidisciplinary team care programme. Approximately one-third of patients who are referred to secondary care services do not need to be seen by a consultant. A significant proportion of referrals to a consultant trauma and orthopaedic surgeon's waiting list do not require surgery, and many of these patients may therefore be better treated through an alternative patient pathway. There is significant potential for exploring the development of care pathways by clinicians in the primary and secondary care sectors.

Development of alternative care pathways and clear referral protocols may assist with demand. Protocol-driven direct access for GPs to diagnostic and therapy services could significantly improve the treatment pathway, reduce patient waiting times, and optimise use of limited resources.

Extended roles for other members of the primary care team should be encouraged wherever workforce considerations allow. Recruitment and retention issues are as problematic in primary care as they are in secondary care. For more specialist primary care services to be sustainable, there needs to be appropriate workforce planning for all members of the primary health care team.

The current service profile for trauma and orthopaedics demonstrates a whole range of good practice, but there is a need to standardise and roll out those practices that have been shown to be effective, in order to achieve maximum benefit. It is apparent that, although changes that would improve overall throughput are possible within the existing service, such improvements are unlikely to be sufficient to meet demand.

Reducing variation in the delivery of trauma and orthopaedic services can be influenced by strong local management processes and the implementation of national standards. Best practice requires that, where possible, hospital groups manage both planned and emergency work throughout the year, predict peaks and troughs as well as detect, analyse and tackle changes in the environment. However, recurrent funding is key to building lasting solutions, and non-recurrent investment cannot support the required volume of work with the present number of clinicians.

Levels of consultant specialisation must be appropriate to demand patterns and must coincide with the casemix presenting on a regional basis. This should be managed at local level.

Planned attempts to reduce follow-up rates, in order to allow additional new outpatients to be seen, will result in an overall reduction in the outpatient waiting list, without having to increase total numbers seen by the consultant in a clinic. Scope for additional nurse-led clinics or GP specialists and HSCP outpatient services could also have a positive effect on the numbers of patients seen. However, the impact of this approach must be recognised, as the concentration of new outpatients is likely to intensify and raise the application rate to the inpatient/day case waiting list.

5. Spine

background

A working group to examine spine services in Ireland and to suggest a model of care for the future delivery of these services. This group comprises representatives of the main hospitals currently providing spine surgical services.

The remit of the group was to:

- evaluate the current level of service provision of spine surgical care
- assess methods to optimise current resource utilisation
- make recommendations on the development of centres of excellence for major spine surgery
- facilitate long-term national strategic planning for the provision of spine surgery.

5.1 INTRODUCTION

The provision of spinal care has becoming increasingly challenging. This national Model of Care for spine surgery proposes a pathway, whereby the delivery of spinal care will be re-organised while simultaneously ensuring quality of care, improving access to care and increasing efficiency. The effective management of complex spinal conditions is facilitated by concentrating the work in a number of highly specialised centres. This promotes the development of specialist expertise, in terms of medical, nursing, and healthcare and social care professionals.

This Model of Care proposes the development of three centres (hubs) of spine surgery based in Dublin (Mater Misericordiae University Hospital), Cork (Cork University Hospital) and Galway (University Hospital Galway).

In Dublin, because of the surgical caseload and current distribution of spine surgery services across the city, a hub-and-spoke model is favoured. More complex operative cases would be undertaken in the Mater Misericordiae University Hospital (MMUH), while less complex cases would be undertaken in other (spoke) units. Surgeons would be appointed with clinical commitments to both the central "hub" units and peripheral "spoke" units, undertaking cases in the most appropriate location. This would ensure continuity of care within each spine surgery network. Outside Dublin, spine surgery should be concentrated in two centres, Cork and Galway, and consultant spine surgeons should be appointed to one of these two centres. This will ensure development of the necessary multidisciplinary skill mix to provide a comprehensive spine surgery service in strategic geographical locations.

In terms of staffing, higher levels of expertise can be gained by exposure to a high-volume and high-complexity caseload. Duplication in terms of staff costs can be diminished by limiting the number of on-call centres. Development of multidisciplinary teams across the specialties of spine surgery, rheumatology, neurology, oncology, and health and social care professionals can be facilitated.

The equipment required to undertake complex spine surgery is highly specialised and costly. It includes spinal cord monitoring systems, intra-operative navigation systems and advanced imaging modalities, such as on table CT scanning. Concentrating complex spine surgery in a number of dedicated units minimises cost by avoiding duplication of such equipment.

5.2 EVOLUTION OF SPINE SURGERY IN IRELAND

In the past in Ireland, many general orthopaedic surgeons and neurosurgeons undertook lower complexity spine surgeries, including lumbar discectomies and spinal decompressions. However, the number of centres performing spine surgery has markedly declined over the past 10-15 years. This is partly due to the continuous complexity of the surgical techniques that require specific expertise, and is also partly due to an increasingly challenging medico-legal environment which classifies spine surgery as "ultra-high risk". Very few general orthopaedic surgeons are willing to perform even routine spinal operations. Consequently, even relatively minor cases are now referred to regional or national centres.

The majority of consultant spine surgeons currently practising are now fellowship trained, with a majority of their practice being devoted to spine surgery. The major spine centres are located in Dublin, Cork and Galway. The volume of cases awaiting outpatient assessment and surgery in the remaining spine centres has far outstripped the capabilities of the individual hospitals, as a result of cases rarely being undertaken outside the regional centres.

There are many issues surrounding the organisation of spine services that need to be addressed in order to ensure that the appropriate range of services is available for patients, that these services are clinically robust, and are readily accessible for both planned and emergency care. In particular, there is a need to address geographic 'black spots' where services are simply unavailable; there is also a need to ensure that the flow of patients from primary care, from emergency departments, and from there to tertiary care, is both appropriate and effective.

Surgical intervention, when required, is best carried out in specialist centres. Pre-operative assessment, post-operative

rehabilitation and care planning can be carried out in a co-ordinated manner and thus optimise the efficacy of the intervention. Furthermore, only experienced consultant spine surgeons should undertake major surgery in a centre that has the necessary multidisciplinary teams available. With this is mind, reorganisation of the service nationally will enhance the service to patients and will ensure that best practice guidelines are adhered to.

5.3 CASELOAD AND CASEMIx IN SPINE SuRGERy

Patients with spinal disorders may present with a number of conditions, which in broad terms can be categorised as:

- trauma, including spinal cord injuries
- tumours, including both spinal metastases and primary tumours
- degenerative spinal conditions, which represent the largest patient group
- spinal deformity – both paediatric and adult.

The provision of adequate care for all of these conditions is driven by different factors. For example, the presentation of both trauma and tumour patients is unpredictable, but volume can be predicted from past data and international population norms. Both groups present with time-dependent conditions which mandate urgent surgical intervention within a matter of hours or days. Given the propensity for rapid and catastrophic neurological deterioration in these patients, any centre planning to manage such patients must have diagnostic and surgical facilities available 24 hours a day.

Degenerative spinal disease rarely requires surgery. When surgery is required, it is relatively routine and is seldom urgent or complex. Spine deformity surgery, while uncommon, is complex and intensive, but rarely urgent.

5.4 MANAGEMENT OF SPINAL TRAuMA

The presentation of trauma patients to an emergency department is unpredictable. Adequate access to appropriate diagnostic, resuscitative and surgical facilities is mandatory in a centre planning to care for patients who sustain spinal injuries. Such facilities must be available around the clock and must encompass access to laboratory and radiology facilities, including 24/7 CT and MRI access. This latter facility is currently available only in the National Spinal Cord Injuries Unit at MMUH. In addition, theatre access must be available 24 hours a day, with adequate peri-operative support in terms of ICU and HDU availability. In a spinal injuries context, a number of patient subgroups merit special attention.

5.5 NEuROLOGICAL INJuRy

Patients with neurological deficit present along a spectrum of urgency. The most urgent cases include 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. There should be immediate access to equipment (CT and MRI in particular), personnel with appropriate expertise, and interventional radiology. An increasing body of evidence demonstrates improved outcome following early surgical decompression in spinal cord injuries within 12-24 hours of injury (Fehlings et al. 2012).

The National Spinal Injuries Unit (NSIU) in MMUH provides a national service for patients with acute traumatic spinal cord injury. Protocols are in place for immediate transfer of patients directly to this unit from anywhere in the country for initial management and surgery. The unit has well-established links with the National Rehabilitation Hospital (NRH), Dun Laoghaire. It is envisaged that the specialised expertise available in the NSIU and the NRH will continue to provide a national tertiary referral service for patients with acute traumatic spinal cord injuries.

Partial neurological deficits associated with spinal trauma are quite common. Rapid access to timely surgical intervention is critical, in order to optimise outcome and maximise the potential for recovery. This service is best provided regionally and is currently provided in a number of locations in Dublin, Cork and Galway. Current surgical consultant staffing, however, is insufficient to provide a 24/7 emergency service in all sites. Outcomes following acute neurological deterioration are best if patients are treated in specialised spine centres capable of providing access to specialised surgical care 24/7. Furthermore, post-operative care of the spinal cord injured patient has been shown to be significantly improved if undertaken in a dedicated spinal cord injury centre.

5.6 POLyTRAuMA

Patients presenting with a spinal column injury are often the victim of a major trauma. These patients may require immediate access to theatre to deal with concomitant life- threatening injuries, while simultaneously maintaining spinal precautions. This adds significantly to the complexity of managing such patients' care. Decision-making is a key factor in their care, in terms of prioritising management of their injury pattern. Definitive management of such polytrauma patients is best undertaken in a unit where both general trauma and spine trauma are routinely managed.

5.7 REHABILITATION

Many patients presenting with neurological deficits following spinal injuries require prolonged specialist rehabilitation. This requires a multidisciplinary approach involving occupational therapy, physiotherapy, medical social work, nursing, and rehabilitation medicine. Patients with high cervical cord injuries represent a particularly challenging group due to their case complexity. Their care requires intensive nursing and medical input in a high dependency setting, and is best undertaken in a dedicated spinal injuries unit. Their clinical problems include ongoing issues with respiratory management, bowel, bladder and skin care, along with the life-threatening complication autonomic dysreflexia. A co-ordinated care pathway – from the acute setting through rehabilitation, back to the community – is fostered by the development of the multidisciplinary team approach, with continuity of care maintained through the patient journey. This structure is currently well developed in the NSIU, and it is envisaged that the NSIU would continue to provide this service at national level.

If a patient with a spinal cord injury (SCI) is ventilator dependent, they cannot be admitted to the National Rehabilitation Hospital (NRH), as the hospital does not currently take this cohort of patients. If NRH were to take such patients, there would be resource implications for its service. If services were to be developed in MMUH, they would have to include a dedicated rehabilitation ward with the necessary equipment, as well as a full multidisciplinary team comprising a case manager (as the discharge plan for this group of patients is very complex) and a psychologist (due to the impact that spinal cord injury has on a patient's life).

Strategic planning for rehabilitation of patients with less catastrophic neurological impairment is essential. Access to short-term, dedicated rehabilitation services for this large cohort of patients, from all three centres in Dublin, Cork and Galway, will facilitate efficient functioning of the surgical centres and provide quality care.

5.8 MANAGEMENT OF SPINAL TUMOURS

5.8.1 Role of spine surgery in metastatic spinal disease

Presentation of patients with spinal column tumours occurs in an unpredictable manner. These patients may have rapidly evolving neurological deficits or spinal instability, conditions which typically mandate urgent surgical intervention. As such, hospitals providing surgery for these patients require similar facilities to trauma centres in terms of diagnostic facilities and surgical facilities. In addition, the need for these patients to be cared for in a multidisciplinary setting is widely recognised.

The number of spinal tumour patients is increasing, as cancer survival rates improve due to an ageing population and improved oncology care. The management of such patients continues to pose unique challenges, notwithstanding the streamlining of cancer care throughout the HSE as a whole. All three proposed spine centres function as cancer centres with well-developed oncology services.

While the standard treatment for spinal cord compression caused by metastatic cancer was previously corticosteroids and radiotherapy, research over the past ten years has unequivocally demonstrated improved outcomes for surgery if patients with spinal metastatic disease are treated with surgical decompression and instrumentation, prior to radiotherapy.

In 2005, the results of a randomised, multi-institutional trial were published in The Lancet (Patchell et al, 2005). Patients with spinal cord compression caused by metastatic cancer were randomised to either surgery followed by radiotherapy, or radiotherapy alone. The primary endpoint was the ability to walk. Secondary endpoints were urinary continence, muscle strength and functional status, the need for corticosteroids and opioid analgesics, and survival time. All analyses were by intention to treat. Following an interim analysis, the study was stopped: because the surgery group was doing so much better, it was considered unethical to continue the trial. Significantly more patients in the surgery group (84%) than in the radiation group (57%) regained the ability to walk. Patients treated with surgery also retained the ability to walk significantly longer (122 days) than did those who were treated with radiotherapy alone (13 days). The need for corticosteroids and opioid analgesics was significantly reduced in the surgical group. The conclusions of this landmark study were that decompressive surgery plus post-operative radiotherapy was superior to treatment with radiotherapy alone for patients with spinal cord compression caused by metastatic cancer.

This paradigm shift has led to a new and significantly increased demand for surgical care in patients presenting with metastatic spinal tumours. Tumour work now accounts for approximately 50% of urgent spinal procedures. Oncology referrals are also a major source of orthopaedic inpatient consultations. Many patients' primary presentation with cancer is with a spinal metastasis. The resultant diagnostic process to identify the primary malignancy is onerous in terms of resource utilisation, including laboratory and radiology input. The spine service is often responsible for the patients' admission and work-up.

Given the implications of such a diagnosis, it is imperative that the diagnostic pathway be negotiated as quickly and as efficiently as possible.

At present, referral pathways between the spine service and oncology services are not clearly defined. Assessment by a spine surgeon is a critical part of the multidisciplinary approach to modern cancer care. Currently, no direct access to a spine surgical opinion exists in many of the regional oncology units, with referrals regarding the need for spine surgery being made on an ad hoc basis to the National Spinal Injuries Unit, MMUH, CUH and UHG.

The situation is easier within the three main spine units (MMUH, CUH and UHG), where inpatient consultations are possible between the spine service and oncology services, with multidisciplinary meetings being held on a weekly basis (MMUH).

Co-location of the various disciplines involved in cancer care has obvious advantages for the patient and also for the clinical team. It is proposed that a multidisciplinary team approach be adopted. In order to facilitate optimal care for patients, the team in the main centres would comprise the spine surgery service, as well as medical oncologists, radiation oncologists, primary treating surgeons (breast, gastrointestinal, urological) among others. The capacity for frequent and easy interaction between these disciplines is fundamental to the provision of an efficient and comprehensive service. Even with developments in teleconferencing technology, multidisciplinary conferences work best when all interested parties are on the same campus. Patients with metastatic spine disease need to have a clearly defined pathway of care (NICE guidelines on metastatic spinal cord compression). This cohort of patients – post-surgery and after wound healing – usually undergo further cancer work-up/ treatment; as a result, they may not be suitable candidates for rehabilitation in the NRH.

In addition, it is imperative that ready access to a specialist rehabilitation physician be available for oncology patients, as their requirements are significantly different from those of other patients. Specifically, a three-month wait for a rehabilitation bed is inappropriate for a patient with a life prognosis of six to twelve months. Thus, consultant spine surgeons appointed to the central spine unit would provide a clinical consultant-level service for inpatients and outpatients as well as for patients presenting with metastatic spinal disease in the peripheral "spoke" units.

Both degenerative and deformity spine surgery are planned. As such, demand can be extrapolated from year to year, thus enabling cogent planning and utilisation of limited resources. Patients who are scheduled for degenerative spine surgery or deformity spine surgery are not subject to the same time pressure as those with spine trauma and tumours. However, there remains a significant risk of neurological deficit or worsening deformity if patients' care is excessively delayed.

Those with degenerative spinal conditions comprise the main group of patients presenting with spinal disorders. Surgical treatment of spinal deformities has advanced significantly over the past 20 years, with a more profound understanding of the conditions and new surgical techniques allowing larger and safer corrections.

5.9 DEGENERATIVE SPINAL DISEASE (DSD)

The vast majority of patients with degenerative spinal conditions do not need review or intervention by the surgical service. Spinal degeneration is a ubiquitous condition, and typically associated with ageing. The degenerative process initially begins with degradation of the intervertebral discs. Increasing degeneration and ageing of the discs is followed by arthrosis of the facet joints. Neurological impingement or loss of spinal alignment may ultimately ensue.

Patients may present with back pain or neurological impingement in the form of sciatica, lumbar spinal stenosis, cervical radiculopathy or cervical myelopathy.

Demographic data from Sweden and other European countries with well-developed care pathways for conservative spinal treatments predict an annual need for spinal surgical intervention of 1,000 cases per million population per year. In the Irish context, this equates to between 4,500 and 5,000 cases per year.

While GPs may refer to primary care physiotherapy any patients whom they feel are unlikely to need surgery, many patients are also referred to orthopaedic, neurosurgical or rheumatology outpatients departments. This is clearly inappropriate for the majority of patients who will not need surgery. The increase in numbers presenting to spinal clinics results in longer waiting times for all, including for those patients who require surgery. A system based on agreed referral criteria involving specialist musculoskeletal physiotherapists is required nationally in order to address this issue.

The referral rate for surgical assessment following triage and treatment is approximately 15% (Dowling et al., personal communication).

The current system whereby patients attend an outpatients clinic without first undergoing an MRI scan results in an unnecessary second clinic visit following an MRI scan, coupled with a delay in the start of treatment. Direct access to MRI facilities by GPs who are concerned about the possibility of serious underlying pathology as a cause of back pain would also allow more patients to be treated in primary care in the first place. Guideline controlled, protocol-driven direct GP access to MRI would promote efficiency and potential cost-savings in management of patients with DSD. This may require some form of multidisciplinary team contact, for example, something along the lines of that demonstrated in a UK model where a hot desk is operated by a specialist physiotherapist with access to urgent scans and an orthopaedic surgeon.

5.10 SPINAL DEFORMITy SuRGERy: PAEDIATRIC AND ADuLT

Spinal deformity cases present some of the most complex challenges in spine surgery. The complexity of these cases arises from the invasiveness of the surgical procedure, coupled with the narrow margins for error and the potential for catastrophic complications. In the paediatric population in particular there is added pressure to undertake surgery in a timely fashion, so as to prevent further progression of deformity.

In order to minimise the risk of complications, it is vital that these surgical procedures are performed in units undertaking large volumes of spine surgery. Such institutions have developed a specialised team of surgical, anaesthetic, nursing and health and social care professionals who have a wealth of experience in the peri-operative management of these cases.

Also in order to minimise the risk of complications, adequate equipment must be available. This should include intra-operative spinal cord monitoring equipment, specialised operating tables, and cell savers. In addition, patients should have access to ICU beds in the post-operative period.

It is estimated that there is a requirement to perform surgical procedures on 200-250 major deformity cases per year in Ireland (i.e., 70-80% paediatric/adolescent cases, and 20-30% adult cases).

5.11 RECENT DEVELOPMENTS IN SPINE SuRGERy – INNOVATION AND INCREASING COMPLExITy

Spine surgery has been at the forefront of surgical innovation over the past 20 years. This has had the hugely beneficial effect of allowing spinal reconstruction for patients with previously inoperable spinal fractures and tumours. Hospital stay has been reduced and patient outcomes have improved.

Increased longevity in the general population has increased the requirement to treat degenerative spinal conditions, including spinal stenosis, degenerative spondylolisthesis and degenerative scoliosis. The increased population and higher birth rate over the past 20 years has also increased the requirement for paediatric spine surgery, particularly scoliosis. The increased complexity of the caseload has been matched by more advanced surgical techniques and instrumentation systems.

Minimally invasive spine surgery has revolutionised spine surgery. Peri-operative morbidity is decreased, as is hospital stay. However, this requires a much greater level of specialist training for all personnel involved. Intra-operative fluoroscopic imaging and specialised equipment are mandatory, with the availability of surgical navigation systems being preferable in more complex cases.

5.12 CuRRENT SERVICE PATHWAy

Spine surgery is currently undertaken in 15 adult centres and two paediatric centres. However, over the past 10-20 years a paradigm shift has occurred in terms of the provision of spine surgery at national level. Surgery, and particularly complex surgical cases, have become concentrated in a number of key centres staffed by fellowship trained consultant spine surgeons who are predominantly based in Dublin (MMUH), Cork (CUH) and Galway (UCHG). The bulk of adult spine surgery is undertaken in Dublin, Cork and Galway, with the most complex work focused in these larger, high-volume units i.e., in MMUH and Tallaght Hospital in Dublin, CUH in Cork and UHG in Galway.

Degenerative spine surgery accounts for the bulk of planned spine surgery cases, mostly involving the lumbar spine. This type of surgery is undertaken in the other units on an irregular basis.

5.13 PROPOSED MODEL OF SERVICE PROVISION

This Model of Care proposes the development of a nationally integrated spine service, with three major centres in Dublin (MMUH), Cork (CUH) and Galway (UHG). This service will interface with oncology, rheumatology, neurosurgery and rehabilitation services throughout the networks. The spine centres to be developed in these three locations nationally should provide more specialised services, including surgery for complex degenerative disease, spinal deformity, spinal

tumours and complex spinal trauma, as well as other acute spinal pathology. Strategic location of spine centres in Dublin, Cork and Galway will mean that specialised spine services can be developed regionally, serving patients in the broad geographical hinterland of each centre. The referral base for each of these three centres will by necessity extend beyond the confines of individual networks.

In Dublin, less complex spine surgery and OPD work can continue outside the major centres in the linked peripheral units. Spine surgeons will have joint appointments between MMUH and peripheral linked units, allowing them to refer and undertake more complex cases in the central unit while continuing to carry out less complex work in the peripheral centres. An ongoing consultation service for inpatient and outpatient care, in addition to involvement in oncology multidisciplinary work, would be provided by the spine surgeon in the peripheral units.

5.13.1 Level of care to be provided

Each of the main three centres will provide complete outpatient and inpatient care and acute rehabilitation services for patients with the following conditions:

- spine trauma: traumatic fracture, dislocation or fracture dislocation of the spine with or without partial or impending neurological deficit
- spine tumour: spinal tumour surgery, including resection and reconstruction, as appropriate, as part of a multidisciplinary approach to cancer care
- spine infection: spinal abscess with or without neurological deterioration and discitis requiring surgical intervention
- spine deformity: scoliosis, kyphosis and spondylolisthesis in adults. Deformity surgery for children will be provided in the (new) paediatric tertiary centre(s)
- spine degeneration and inflammatory arthritis: surgical care of the full spectrum of degenerative and inflammatory conditions of the spine from the cranio-cervical junction to the pelvis
- spinal cord injury will continue to be centred in the National Spinal Injuries Unit in MMUH.

The further development of an integrated national spine surgery service will require a co-ordinated approach to the development of these three units. Similar organisational structures and resources will be required in order to facilitate the development of each unit. However, the specific resources required by each centre will differ, depending on the projected complexity of their caseload in the future. In addition, the current resource complement in terms of staffing and facilities will play a role in dictating further investment. The current status and future requirements of the Dublin, Cork and Galway centres will be outlined in detail in the business case for reorganisation of spine surgery services, which is now in development.

5.14 TRIAGE AND TREATMENT SERVICE

Two excellent examples of innovation are the musculoskeletal physiotherapy triage and treatment service, and the back pain screening clinic model.

5.14.1 Physiotherapy musculoskeletal triage

The physiotherapy musculoskeletal triage service, which was established in July 2012, comprises senior physiotherapists working in close collaboration with orthopaedic surgeons. Patients are offered appointments based on the length of time they have been on a waiting list. In the first 18 months after the service was established, more than 18,000 patients were offered appointments. Eighty six percent of these patients were managed without being referred to a consultant clinic (see Figure 1). The vast majority were GP referrals (see Figure 3). To date, 25,000 patients have been removed from the waiting list as a result of this initiative. Musculoskeletal physiotherapy services are well developed, and can continue to function under the supervision of the relevant spine surgeons.

5.14.2 Physiotherapy back pain screening clinic

Another model that has been successfully implemented in the past is the back pain screening clinic. Patients with a history of spinal pain for less than three months are assessed by an advanced practice physiotherapist according to an agreed protocol. Research shows that 85% of patients are satisfactorily managed, with only 15% being referred for a surgical opinion. Just 5% of patients have an operation.

There is a significant need to markedly expand physiotherapy-delivered musculoskeletal services to treat the vast majority of patients who present with back pain and do not require surgical review.

5.15 KEy ACTIONS REquIRED TO SuPPORT CHANGE

Restructuring of current services model to provide:

- dedicated spine surgery clinics
- web-based protocol driven electronic GP referral system;
- direct GP access to MRI imaging, when indicated according to protocols
- musculoskeletal physiotherapy triage and treatment – expansion of the current service
- back pain screening clinic
- a clear pathway to a pain management service
- expansion of current resources to provide 24/7 dedicated

cover for spinal emergencies, and a comprehensive planned surgery service in each of the three centres
- staffing levels should be appropriate to the needs and complexity of care for each patient. The multidisciplinary team should include nurses, physiotherapists, occupational therapists, medical social workers, dieticians, speech and language therapists, pharmacists and rehabilitation medicine consultants
- increased number of orthopaedic spine surgeons pro rata increase in staffing in all disciplines involved in the spine team, including nursing, anaesthesia, radiology, radiography, occupational therapy, physiotherapy, speech and language therapy and medical social work
- seven-day access to MRI
- dedicated emergency spine theatre appropriately staffed and equipped
- 24/7 theatre on-call service for spinal emergencies
- dedicated spine theatres for planned surgery appropriately staffed and equipped
- dedicated post-anaesthetic care beds
- Advanced Nurse Practitioner/Clinical Nurse Specialist in spine surgery
- dedicated ward staffed by appropriately trained nursing and health and social care professionals (HSCPs)
- spinal cord monitoring service
- image guidance equipment in theatre
- development of step-down and rehabilitation facilities linked directly to the spine unit
- short-stay spinal rehabilitation ward/beds for ambulant patients
- community-based protocols for early return to activity
- service level agreement with the NRH for patients requiring specialised rehabilitation. Highly dependent rehabilitation patients who require ventilation and can no longer be managed in NRH will require rehabilitation beds in one of the three centres.

5.16 PATIENTS' JOURNEY THROUGH THE SYSTEM

Patients with back pain or radicular pain attend their GP. Those without "red flags" are treated by the GP with appropriate exercise programmes, analgesia and anti-inflammatory medication. The National Radiology Programme strongly agrees that guideline controlled, protocol-driven direct GP access to all radiology investigations (specifically including MRI) would promote efficiency and potential cost-savings across the entire system (both community-based and in hospitals), but it needs increased resources to be able to deliver this support. Patients who do not improve are referred for MRI imaging directly by the GP, according to agreed protocols. Based on the MRI findings, the GP decides whether or not to continue with primary care treatment.

Two referral options should be possible as follows:
- physiotherapy musculoskeletal triage clinic/back pain screening clinic for patients with non-urgent degenerative conditions or chronic conditions. This pathway would be suitable for a majority of patients presenting with axial back pain or acute sciatic symptoms
- direct access to the spine surgery clinic for patients deemed to be in need of relatively urgent surgery, such as patients with neurological deficit. Patients who require urgent surgery, such as those with cauda equina syndrome, should be referred to the emergency department. Although direct emergency access to a spine surgeon should be possible in a well-developed system, the emergency department in major hospitals is currently the only mode of access to hospital-based assessment. This situation must change. The proposed new structure aims to provide access to spine care without recourse to use of the emergency department, which should be used only in genuine emergencies.

A GP referral portal should be set up, so that referrals can be made online by completing a referral protocol that would be designed to help triage patients according to the urgency of their condition. The portal would allow patients to access a scheduled appointment and it would also give them the facility to cancel or postpone appointments, if necessary. Furthermore, it would ensure integration with the patient's clinical record, when this becomes available in electronic format, thus providing access to patient information at multiple locations.

Currently, patients often try to access different hospitals due to long waiting times, and therefore appointments and investigations are frequently unnecessarily duplicated. Integration of services would avoid such duplication.

If patients with back pain are seen quickly, then most can be treated efficiently and inexpensively. Conversely, if the waiting times are excessive, then many patients' condition will become chronic, and will be harder to treat. Excessive waiting time also leads to tests and scans being repeated at a cost to the HSE.

Once the referral has been triaged, patients with non-urgent degenerative conditions will be seen in the musculoskeletal physiotherapy clinic. Most will be treated and discharged. Those requiring a surgical opinion will be fast tracked to the spine surgery clinic. Patients triaged for urgent surgical

assessment will be offered an appointment in the spine surgery clinic promptly. Patients recommended for surgery should have the procedure discussed in the clinic and will be given the appropriate information sheet together with a consent form. The patient should be given as much time as they wish to consider their options, and once they have signed the consent form, the procedure will be scheduled.

5.17 KEy PERFORMANCE INDICATORS (KPIS)

From the outset, it is important to agree key performance indicators (KPIs) in order to monitor the performance, efficiency and outcomes of each spine surgery centre.

These KPIs should include:

- time from GP referral to triage
- time from triage to the spine surgery clinic
- time from the spine clinic to surgery
- length of inpatient stay
- morbidity and mortality audit
- functional outcome scores.

5.18 PAEDIATRIC SPINE SuRGERy

Skeletally immature children with spinal deformities can progress their curves at an average of one degree per month during the rapid adolescent growth phase; some may progress by much more than one degree per month. The deformity therefore worsens during the period between being listed for surgery and definitive treatment, sometimes by more than 20 degrees. Worsening deformity increases the complexity of definitive surgery. Other consequences include a requirement for additional theatre time, increased instrumentation with associated costs, increased potential for neurological injury, increased blood loss and morbidity, and the increased likelihood of multiple-stage surgery being necessary.

The complexity of patients being treated for spinal disorders in Ireland in the paediatric population is very high. Major units in Ireland treat a much higher proportion of children with complex congenital deformities and multiple comorbidities and syndromes than major units in other Organisation for Economic Co-operation and Development (OECD) countries. Many of these cases would benefit from two consultants operating together. Indeed, this is best practice currently in the National Health Service (NHS) in the UK, our best comparator in terms of models of care, and the benchmark against which we are generally measured from a medico-legal perspective. Freeing up an extra consultant for complex cases has an impact on service delivery in other areas and generates a requirement for extra appropriately trained consultant manpower.

Paediatric spinal deformity surgery is currently required for approximately 200 major cases per year. The historical deficit in the provision of capacity and resources for this volume of cases has led to significant waiting list difficulties for outpatient clinic appointments and investigations, as well as for inpatient surgical treatment.

To date, paediatric deformity surgery has been carried out primarily in Our Lady's Children's Hospital, Crumlin (OLCHC) and the Children's University Hospital, Temple Street (CUH, Temple Street) and to a lesser extent in Cappagh National Orthopaedic Hospital (CNOH).

5.18.1 Challenges to be met

The barriers to treatment are access to MRI, the requirement for additional paediatric spine surgeons, the requirement for additional spinal cord monitoring, and additional operating theatre sessions. Critical care/high dependency unit beds are required for a proportion of patients.

The delay in access to MRI is currently not a rate-limiting step, as the primary barrier is the availability of theatre sessions staffed with anaesthetists and experienced nurses. With increased availability of surgery, it will become a barrier – particularly for very young children who require a general anaesthetic or sedation in order for the investigation to be carried out.

Should additional theatre sessions become available, the limiting factors to utilising them are:

- access to MRI
- fellowship trained spine surgeons
- paediatric anaesthetists
- theatre nurses and support staff
- health and social care professionals
- technicians trained in intra-operative spinal cord monitoring. A national solution is required, as currently this service is provided from Belfast
- critical care and high dependency beds.

Cancellation of cases – with the loss of an entire theatre day due to unavailability of an ICU/HDU bed – is an occasional reality. With almost 100% ICU occupancy, a bed cannot be guaranteed currently.

5.18.2 Training of nurses and the essential skill set required

Broadly speaking, nurses working in this area would need to be both skilled and knowledgeable in all bodily systems in relation to spinal column/spinal cord injury. Currently, a Clinical Professional Development Programme in Spinal Column/Spinal

Cord Injury Nursing is being run in conjunction with MMUH, NRH and UCD. This programme has been awarded UCD Level 8, 10 credits. (For documentation on the programme and its background, see the appendix.)

Potentially, this programme could be developed to include other hospitals. It could also potentially be developed into a postgraduate diploma, thereby giving nurses working in this area a pathway for career progression.

5.19 NEW CHILDREN'S HOSPITAL (NPH) DESIGN

In the longer term, there is a sufficiently large paediatric population and demand to merit planning for at least one dedicated spinal operating theatre in the new children's hospital (NPH), with an adjacent theatre also having capability to carry out spine surgery and neurosurgery.

5.20 HSCPS IN THE NATIONAL SPINAL INJURY UNIT (NSIU)

The acute care of patients with acute spinal cord injury will be provided by a coordinated multi-disciplinary team of appropriately trained professionals.

The core NSIU Team staff numbers, qualifications and experience must be appropriate to meet the patient case load (including ITU and HDU staff). This team consists of core HSCP staff. The role of each HSCP in the NSIU is outlined below.

Staffing requirements for the NISU are outlined in Chapter 7 Health and Social Care Professions. The South of England Spinal Cord Injury Board, NHS standards, 2010 provide a reference for staffing levels in the NISU.

Role of the Occupational Therapist

The rehabilitation of the spinal cord-injured patient should be initiated within the first 48 hours of admission to the acute care setting. Patients who receive early intervention may be better prepared physically and psychologically to accept their disability and they may participate actively in setting realistic rehabilitation goals.

The occupational therapist assists each individual to set patient goals in conjunction with the interdisciplinary team to promote a maximum level of independence in the areas of self-care, domestic duties, work and leisure activities. (Guidetti et al, 2009).

An individual programme is created to meet the patient's needs and may include:

- Upper and lower limb management - splinting and positioning, use of functional activities to strengthen muscles, improve dexterity and develop hand function
- Self-care retraining - rehabilitation aiming to achieve maximum independence in everyday tasks such as feeding, grooming, bathing, dressing, bladder/bowel management and skin care
- Domestic and community living skills - provision of opportunities to develop new skills and techniques to manage meal preparation and clean up, cleaning, clothing care, shopping, money management, household, safety procedures and use of public transport
- Specialised equipment prescription - trial, provision and/ or prescription of adaptive equipment/assistive enabling technology to facilitate independence in activities of daily living, as required for discharge.

The acute phase may involve the following:

- Assessment of upper and lower limb management - splinting and positioning
- Seating assessment/posture management – for specialised or general seating system
- Cognition - assessment and implementation of strategies to minimise impact of any cognitive impairment on daily living
- Assistive technology assessment and intervention
- ADL retraining
- Referral to community services where indicated
- Rehabilitation
- Wheelchair mobility
- Further rehabilitation required for discharge and independent living
- Return to driving - referral to appropriate driving assessment service
- Vocational skills - support to pursue return to work or study options etc
- Home assessment and modifications - Identification of potential environmental barriers to hospital discharge and ensuring timely referral to an appropriate home modification service for assessment
- Other - pain management, education, group programmes, stress management.

Role of the Physiotherapist

The role of the physiotherapist in the acute spinal injury service is to maximise patients' ability and minimise disability. In line with best practice guidelines (PVA consortium for spinal cord medicine, 2005), all patients with an acute spinal cord injury are assessed by a physiotherapist within 24 hours, seven days a week. The aim of the physiotherapeutic management is:

- To deliver appropriate respiratory care, maximising the patient's respiratory potential
- To facilitate weaning from artificial ventilation
- To prevent re-intubation/intubation and the complications associated with same
- To provide full musculoskeletal assessment for patients and where appropriate deliver early rehabilitation to minimise neurological/musculoskeletal complications
- To advise on the positioning of patients with neurological/ musculoskeletal complications, therefore optimising long-term rehabilitation potential
- To be an integral member of the multidisciplinary team participating in ward and board rounds, case conferences, discharge planning, and clinical governance meetings
- To develop, implement and review evidence based protocols of care
- To implement audit, research and to develop evidence-based physiotherapy practice
- To provide education, training and clinical supervision to other physiotherapists and physiotherapy students in the MMUH
- To provide education and training of other members of the multidisciplinary team
- To be a national clinical resource.

Physiotherapy management of acute spinal injury patient:

Respiratory management:
Physiotherapists working in the NSIU work to the highest clinical standards to ensure best practice, and are key decision makers in the management of spinal injured patients. Physiotherapists are central to early detection of respiratory complications. Respiratory complications are the leading cause of morbidity and mortality in people with acute spinal cord injury (ASCI) and are more pronounced in individuals with higher anatomical level and with complete neurological deficits. A major contributor to respiratory illness in individuals with ASCI is secretion retention, particularly among individuals with cervical spine lesions. Physiotherapy treatment facilitates airway clearance and plays an important part in the management of an individual's secretions. Higher levels of ASCI result in impairment of cough and ventilation. An ineffective cough combined with mucous hyper-secretion can lead to serious respiratory complications in people with ASCI. Physiotherapists working with ASCI patients are central to early detection of respiratory complications. An integral component of physiotherapy respiratory assessment involves a forced vital capacity (FVC) assessment, an outcome tool used to detect/manage a respiratory emergency and complications associated with SCI respiratory distress. FVC is the best indicator of respiratory deterioration in patients with acute spinal cord injury. Physiotherapy intervention also includes leading, in collaboration with the intensivist, the weaning of spinal patients from mechanical ventilatory support. Evidence-based practice suggests that, for each week a patient with acute SCI remains ventilator-dependent, they will require one extra month in a rehabilitation setting (STATSCIS, 2009).

Patients with high cervical injuries require intensive daily physiotherapy treatment for secretion management. Average daily respiratory treatment session with these high dependency patients is 45 minutes. Patients may require frequent daily interventions, especially within the first weeks of injury.

Since the introduction of the progressive ventilator -free breathing weaning guidelines for patients with ASCI in 2011, the senior physiotherapist in the NSIU is responsible, under the guidance of the intensivist on the tracheostomy ward round, to lead in the weaning of spinal patients from mechanical ventilatory support. This requires intensive physiotherapy assessment and treatment for successful weaning. Treatment is always dependant on findings of a comprehensive physiotherapy assessment, including pre-existing co-morbidities, FVC results and associated injuries.

Musculoskeletal/Neurological management:
Spinal injured patients require on-going musculoskeletal and neurological physiotherapy to prevent secondary complications and promote independence where possible. This includes (a) positioning for pressure area management and to prevent muscle contractures, (b) spasticity management including a stretching and positioning programme, (c) standing frame and tilt table training, (d) range of movement and strengthening exercises to facilitate activities of daily living and transfers. Early rehabilitation includes initiation and progression of transfer training as appropriate.

Due to the limited number of beds available in the NRH and for high cervical injuries, patients can remain in the MMUH under the spinal injuries service for prolonged periods and require appropriate level of physiotherapy in line with appropriate level of staff and appropriate competencies (South of England Spinal Cord Injuries Board, 2010).

Role of the Dietitian

Patients with a spinal cord injury require assessment and ongoing intervention by the dietitian regarding their nutritional requirements, which change over their treatment and

rehabilitation course. The nutritional needs of every person with spinal injury are different, and reflect:

- Underlying nutritional status - patients vary from healthy young athletes to older patients with multiple nutritional co-morbidities e.g. obesity, alcohol dependence, diabetes
- Current treatment - nutritional requirements will differ while the patient is immediately post injury/surgery to later in their rehab phase. Immediately post injury, many factors will be taken into consideration when assessing their nutritional requirements e.g. level of injury, ventilation, skin integrity, repeat visits to the operating theatre for debridement of wounds, infection, concomitant brain injury etc
- Dysphagia or oral access - patients may be NPO due to intubation or have altered swallow due to dysphagia
- Positioning - lying in a flat position, with or without a neck collar, affects patient ability to eat
- Skin integrity - nutritional requirements will be higher for those with surgical wounds, pressure ulcers or those at risk of pressure ulcers
- Mood - depression and low mood are common and can affect dietary intake
- Dependence - lying flat and/or altered ability to self-feed post injury can impact the level of interest in eating during treatment and rehabilitation
- Bowel care - assessing and adjusting fibre and fluid intake is included in the nutritional assessment
- Other factors - Nutrition comorbidities and frequent fasting for theatre/dressings.

Malnutrition affects 44.3% of patients with spinal cord injury on admission (Wong et al, 2011). Initiation of feeding within 48-72 hours can reduce complications, improve clinical outcomes and decrease length of hospital stay (Consortium for Spinal Cord Medicine, 2008). The dietitian should work as part of the multidisciplinary team to ensure an appropriate nutritional care plan is in place for patients with spinal cord injury (Joint Standards Development Groups of the South England Review Group, 2010; American Dietetic Association, 2009). The nutrition care plan will include choosing an appropriate form of nutrition support (e.g. parenteral nutrition (PN) may be required due to ileus) and monitoring to avoid over or under-feeding. The dietitian will liaise with the multidisciplinary team to ensure the patient can meet their nutritional needs either orally with nutritional supplements/short/long-term feeding tube. Weight management advice may be required later in the rehabilitation phase, it is not usually appropriate in the acute phase.

Role of the Speech and Language Therapist

The role of (SLT) in working with patients in the NSIU is to work as an integral part of the acute spinal multidisciplinary team in order to provide assessments and treatment for swallowing, motor speech, voice, and cognitive–communication disorders. As a tertiary referral centre receiving national transfers of complex patients, patients received into the NSIU are at high risk of new onset dysphagia/communication difficulties for several reasons (RCSLT, 2013):

- Cervical spinal cord injury (SCI) may result in dysphagia secondary to cervical trauma and/or cervical surgery
- Endotracheal intubation or cervical surgery may result in pathological voice disorders
- Mechanical ventilation impacts both swallowing and communication. Some patients require access to alternative and augmentative communication (AAC) to support communication
- Traumatic brain injury (TBI) may be present and can result in communication and/or swallowing difficulties, particularly in patients admitted post poly trauma.

Communication and swallowing difficulties experienced by complex patients in the NSIU require highly skilled assessment and management. Patients are seen within one working day of referral. SLTs working with this group of patients need to be competent in managing ventilated and tracheotomised patients, as well as in performing and analysing instrumental assessment of swallowing.

The SLT role in NSIU includes:

- Addressing communication needs of patients on ventilation, tracheostomised patients and patients with voicing difficulties. Acute rehabilitation can range from adapting the communication environment, to assessing for and introducing low and high tech alternative and augmentative communication devices
- Management of swallowing in ventilator dependent and tracheostomised patients, contributing to the MDT assessment of weaning and ability to safely swallow oro-pharyngeal secretions
- Carrying out specialised instrumental assessment for swallowing difficulties such as (FEES) / Videofluoroscopy (VFU) where appropriate
- Provision of specific swallowing rehabilitation, goals, programmes, equipment and advice to optimise and maintain function
- Maximising patient autonomy in areas of communication and swallowing
- Acting as an education and training resource for other

SLTs, for the wider MDT as well as for patients and their families
- Patients who have impaired communication in particular may require SLT staff to advocate on their behalf
- Carrying out clinical audit and engaging in research and evaluation of outcomes of therapy and patient satisfaction

Failure to refer, or insufficient staffing resulting in absent or inadequate management of communication and swallowing difficulties poses clinical risk in terms of (Macht et al, 2011):
- Inability to communicate medical needs (including pain)
- Inability to communicate decisions
- Undiagnosed laryngeal injuries and voice disorders
- Aspiration pneumonia with increased acute length of stay
- Compromised nutrition and hydration
- Prevention of weaning
- Compromised psychosocial well being

Apart from clear quality of life effects of communication and swallowing difficulties, it is known that patients with communication difficulties are three times more likely to experience adverse incidents (Bartlett et al, 2008). Infections, slowed weaning and compromised nutrition and hydration contribute to extended lengths of stay and additional healthcare costs.

Role of the Medical Social Worker

Medical social work is concerned with providing both practical and emotional support to patients coping with acute or chronic health issues. Patients admitted to the spinal unit have a very particular set of needs which require comprehensive psychosocial assessment and ongoing support.

Social work assessments involve the exploration of the uniqueness of the individual and their specific reaction and response to trauma. A "one size fits all" approach to counselling is not appropriate for this cohort of patients and our skills allow us to adapt to the patients' needs as they present and change. We recognise that the patient is the expert in their own experience and part of the social work role is to be sensitive to the patient's readiness and openness to counselling support.

The medical social worker in the spinal unit should carry out an initial social assessment on all patients admitted to the unit. Through this, and participation in multidisciplinary team meetings, individual care plans are developed in line with the patient and their family's needs. This may involve the following work:
- Post-traumatic stress counselling and debriefing for the patient and their family;
- Immediate practical supports for the patient/family regarding accommodation, travel, employment etc;
- Advocacy work on behalf of the patient/family with external agencies as required;
- Liaison with appropriate specialist rehabilitation team regarding care planning and ongoing support requirements;
- Counselling for the patient/family to support grief and loss associated with the admission and developing prognosis;
- Discharge planning and liaison with community supports/ state agencies as required;
- Support for the patient/family in adapting to the changes in ability/role associated with admission to the spinal unit;
- Preparatory work with the patient/family for transfer to other rehab unit/long term care facility. This will involve practical supports along with counselling to support understanding and acceptance of altered life plans.

Role of the Psychologist

In the UK most spinal cord treatment units have a psychologist as part of their MDT.

The NHS's Spinal Standards (2010) document recommends that all patients are met with and assessed by a clinical psychologist within their first two weeks of admission.

Their standards also suggest that, where a co-existing acquired brain injury (ABI) may also be present that a formal neuropsychological screening should be completed as part of the MDTs comprehensive assessment.

The role of the psychologist is to:
Liaise with other clinicians and professionals as part of the multi-disciplinary team caring for the spinal patient within the hospital. Perform psycho-diagnostic evaluations of patients with a wide-range of levels of spinal cord injury, including the assessment for psychopathology.
- Screen for cognitive deficits, assess psychological and cognitive capacity and recommend interventions based on the assessment findings. For example, adjustment reactions, Post-traumatic stress disorder (PTSD), complicated grief, anger management, adherence to treatment and motivation
- Provide a full range of both short (assessment and brief intervention of 2-6 sessions) and longer-term therapeutic interventions as per best practice guidelines

- Assess appropriateness and readiness for some clinical interventions as requested by the Spinal team
- Take part in patient discharge planning and incorporation of psychological needs into their rehabilitation plan
- Consult with SCI and other hospital staff on a wide variety of patient care issues
- Provide staff support and education about psychological adjustment and treatments as well as well-being for staff working in the MDT
- Where appropriate, offer brief supportive and psycho-educational interventions for partners and family members
- Consult in other appropriate areas designated from time to time by management

Role of Therapy Assistant

The Expert Group on Various Health Professions (2000:15) report "the introduction of Assistant health and social care professional/ therapy assistant has the potential to provide the very necessary practical support for health and social care professionals in the delivery of an efficient and effective service". Assistant health and social care professionals can enhance team skill mix and facilitate extending the scope of practice of all health and social care professionals. Assistant health and social care professionals, under the supervision of appropriate staff grade, senior and clinical specialist health and social care professionals can support implementation and monitoring of individual and group interventions.

5.21 SPINAL ACTIVITy

Spinal surgical activity is split between planned and emergency activity. The table below summarises the spinal orthopaedic inpatient activity for the years 2010, 2011, 2012 and 2013 by hospital group. There has been a migration of emergency spinal activity towards one hospital group which accounted for almost half the emergency inpatient activity. Inpatients are 60% more likely to be admitted for a planned treatment compared to an emergency treatment. The table below summarises the spinal orthopaedic day case activity for the years 2010, 2011, 2012 and 2013 by hospital group. In 2013, 32% of emergency patients were discharged on the same day as they were admitted on, while 77% of planned patients were treated as day cases. Planned day cases are split evenly between the tertiary hospitals and the aggregate of all other hospitals.

Emergency	Inpatient 2010			Inpatient 2011			Inpatient 2012			Inpatient 2013		
Hsptl Grp	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**
Group 1	156	2,404	15.41	123	2,086	16.96	146	2,604	17.84	171	2,961	17.32
Group 2	54	771	14.28	60	1,522	25.37	44	852	19.36	23	618	26.87
Group 3	14	432	30.86	32	480	15.00	39	628	16.10	22	536	24.36
Group 4	7	87	12.43	9	87	9.67	11	73	6.64	9	60	6.67
Group 5	9	64	7.11	##	##	8.80	6	81	13.50	##	##	7.80
Group 6	61	512	8.39	33	278	8.42	39	221	5.67	41	307	7.49
Group 7	100	1,246	12.46	80	1,132	14.15	71	602	8.48	87	1,458	16.76
Total	401	5,516	13.76	342	5,629	16.46	356	5,061	14.22	358	5,979	16.70

Planned	Inpatient 2010			Inpatient 2011			Inpatient 2012			Inpatient 2013		
Hsptl Grp	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**
Group 1	104	813	7.82	108	821	7.60	80	726	9.08	115	819	7.12
Group 2	65	565	8.69	71	517	7.28	96	841	8.76	51	423	8.29
Group 3	26	180	6.92	24	256	10.67	29	320	11.03	40	453	11.33
Group 4	6	18	3.00	7	28	4.00	9	32	3.56	17	117	6.88
Group 5	96	901	9.39	110	845	7.68	107	744	6.95	124	1,031	8.31
Group 6	94	487	5.18	99	394	3.98	70	283	4.04	99	348	3.52
Group 7	92	597	6.49	100	589	5.89	87	562	6.46	131	862	6.58
Total	483	3,561	7.37	519	3,450	6.65	478	3,508	7.34	577	4,053	7.02

Table - Annual inpatient trauma orthopaedic activity annual summaries.
Annual hospital group emergency and planned inpatient volumes, bed days used and AvLOS for discharge in each year who had spine surgery. Data extracted from HIPE with values under 5 replaced by ##

Emergency	2010	2011	2012	2013	2010	2011	2012	2013
Hsptl Grp	**DC #**	**DC #**	**DC #**	**DC #**	**% DC**	**%DC**	**%DC**	**%DC**
Group 1	48	42	59	65	9.1%	29.4%	41.7%	36.4%
Group 2	##	##	##	##	0.0%	1.6%	0.0%	0.0%
Group 3	##	##	##	##	0.0%	5.9%	2.5%	15.4%
Group 4	##	##	##	##	0.0%	0.0%	0.0%	0.0%
Group 5	##	##	##	##	0.0%	0.0%	0.0%	0.0%
Group 6	##	##	##	##	4.7%	8.3%	0.0%	0.0%
Group 7	##	##	##	##	1.0%	1.2%	2.7%	0.0%
Total	52	49	62	69	11.5%	12.5%	14.8%	16.2%

Planned	2010	2011	2012	2013	2010	2011	2012	2013
Hsptl Grp	**DC #**	**DC #**	**DC #**	**DC #**	**% DC**	**%DC**	**%DC**	**%DC**
Group 1	##	##	25	5	2.8%	0.0%	23.8%	4.2%
Group 2	##	##	##	##	1.5%	2.7%	1.0%	0.0%
Group 3	##	##	##	##	16.1%	17.2%	0.0%	4.8%
Group 4	##	##	##	##	0.0%	0.0%	0.0%	0.0%
Group 5	##	14	19	23	5.0%	11.3%	15.1%	15.6%
Group 6	17	8	8	14	15.3%	7.5%	10.3%	12.4%
Group 7	##	##	##	##	0.0%	0.0%	0.0%	0.0%
Total	31	29	53	44	6.0%	5.3%	10.0%	7.1%

Table: Annual day case activity annual summaries.
Annual hospital group emergency and planned day case volumes and precentage of total discharged on the same date as admission dates. Annual discharge in each year who had spine surgery. Data extracted from HIPE with values under 5 replaced by ##

Emergency inpatients who had a spinal orthopaedic primary procedure have a significant annual average pre-operative lengths of stay of 3.7 days or nearly one quarter of the total length of stay. There is significant variation in monthly AvLOS values and the overall trend would indicate a slight increase in monthly AvLOS over the 48 month period evaluated.

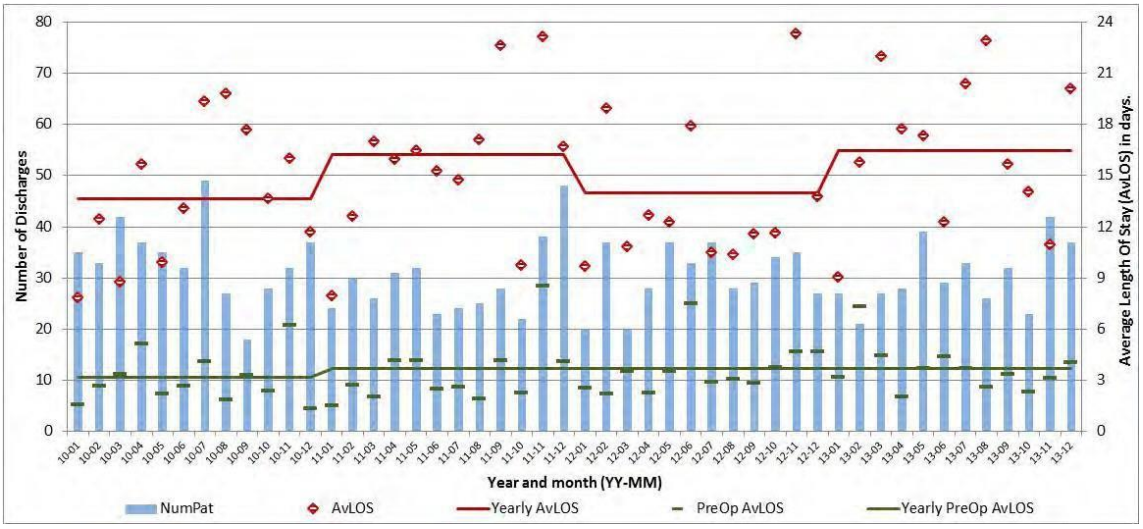


Chart: Monthly inpatient discharge volumes, AvLOS and Pre-Op AvLOS for discharges following an emergency spinal orthopaedic primary procedure. Monthly discharge volumes are shown as a bar chart, monthly AvLOS is represented by a red diamond, annual AvLOS as a red line, monthly pre-op AvLOS as a green dash and annual pre-op AvLOS as a green line.

2013 HIPE data										
Trauma most common procedres of spine	**Inpatient**						**DayCase**		**Total num**	**Add'l Wrk Load Non**
Specialty / Procedure	**Num**	**BDU**	**AvLOS**	**PreBDU**	**PreAvLOS**	**DOSA**	**Num**	**DC %**	**Prime Proc**	**Prime Procs**
Clsd rdctn fx/disloc spine w immobils (4769000)	27	249	9.22	74	2.74	22.2%	63	70.0%	90	9
Immobilisation fracture/disloc of spine (4768400)	71	928	13.07	97	1.37	64.8%	##	2.7%	73	24
Post spinal fusion laminectomy >= 2 lvl (4865700)	50	1,265	25.30	156	3.12	14.0%	##	0.0%	50	14
Decomp lmbr spinal cnl, >= 2 lvl (9002401)	30	535	17.83	101	3.37	26.7%	##	0.0%	30	##
Posterior spinal fusion, 1 or 2 levels (4864200)	26	362	13.92	92	3.54	11.5%	##	0.0%	26	12
Posterior spinal fusion, >= 3 levels (4864500)	24	558	23.25	75	3.13	8.3%	##	0.0%	24	13
Vertebroplasty, 1 vertebral body (3540000)	20	338	16.90	154	7.70	10.0%	##	16.7%	24	17
Spinal blood patch (1823300)	22	61	2.77	25	1.14	31.8%	##	0.0%	22	16
Decomp cervical spin cord w fus >= 2 lvl (4033500)	18	429	23.83	138	7.67	16.7%	##	0.0%	18	6
Discectomy, >= 2 levels (4030001)	16	136	8.50	79	4.94	31.3%	##	0.0%	16	##
Post spinal fusion w laminectomy 1 level (4865400)	12	87	7.25	23	1.92	25.0%	##	0.0%	12	##
Vertebroplasty, >= 2 vertebral bodies (3540001)	12	449	37.42	172	14.33	0.0%	##	0.0%	12	10
Simple internal fixation of spine (4867800)	10	154	15.40	43	4.30	20.0%	##	0.0%	10	25
Rev spin proc w R/O spinal fixation (9002501)	10	204	20.40	16	1.60	20.0%	##	0.0%	10	##
Ant decomp thoracolumbar spinal cord (4035100)	9	189	21.00	67	7.44	0.0%	##	0.0%	9	##

Table: Top 15 most commonly performed emergency spinal procedures discharge metrics in 2013. See column descriptions above. Data extracted from HIPE. Values less than 5 replaced by ##.

Planned inpatients who had a spinal primary procedure stay half as long as their emergency counter parts with an annual pre-operative length of stay averaging 1.1 days with an associated day of surgery admission rate of 42%.

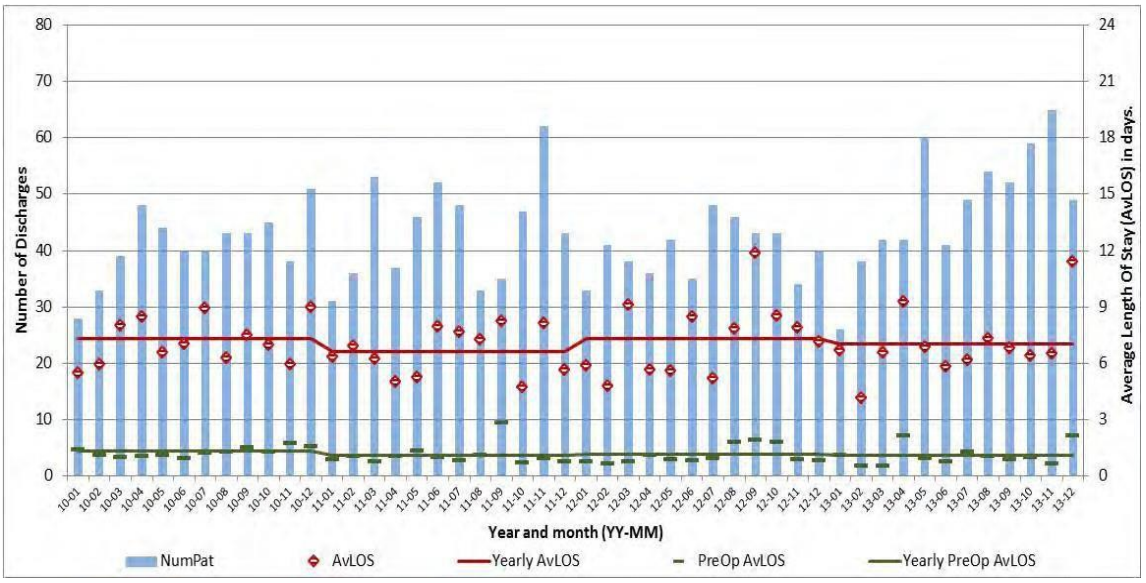


Chart: Monthly inpatient discharge volumes, AvLOS and Pre-Op AvLOS for discharges following a planned spinal orthopaedic primary procedure. Chart layout explained for emergency equivalent above.

2013 HIPE data										Add'l Wrk
Planned most common procedures of spine	**Inpatient**						**DayCase**		**Total num**	**Load Non**
Specilaty / Procedure	**Num**	**BDU**	**AvLOS**	**PreBDU**	**PreAvLOS**	**DOSA**	**Num**	**DC %**	**Prime Proc**	**Prime Procs**
Decomp lmbr spinal cnl, >= 2 lvl (9002401)	82	421	5.13	60	0.73	54.9%	##	0.0%	82	11
Posterior spinal fusion, >= 3 levels (4864500)	79	769	9.73	56	0.71	31.6%	##	0.0%	79	18
Rev spin proc w adjustment of spin fix (9002500)	45	138	3.07	41	0.91	17.8%	22	32.8%	67	16
Posterior spinal fusion, 1 or 2 levels (4864200)	55	553	10.05	167	3.04	36.4%	##	0.0%	55	28
Spinal rhizolysis with laminectomy (4033001)	51	192	3.76	34	0.67	45.1%	##	0.0%	51	##
Ant decomp thoracolumbar spinal cord (4035100)	47	423	9.00	51	1.09	48.9%	##	2.1%	48	##
Discectomy, >= 2 levels (4030001)	45	124	2.76	35	0.78	42.2%	##	0.0%	45	##
Post spinal fusion laminectomy >= 2 lvl (4865700)	34	441	12.97	41	1.21	38.2%	##	0.0%	34	##
Decomp cervical spin cord w fus >= 2 lvl (4033500)	33	370	11.21	32	0.97	33.3%	##	0.0%	33	##
Vertebroplasty, 1 vertebral body (3540000)	16	128	8.00	20	1.25	56.3%	14	46.7%	30	##
Post spinal fusion w laminectomy 1 level (4865400)	26	143	5.50	19	0.73	26.9%	##	0.0%	26	##
Posterolateral spinal fusion 1 or 2 lvl (4864800)	21	137	6.52	7	0.33	66.7%	##	0.0%	21	11
Simple internal fixation of spine (4867800)	15	47	3.13	9	0.60	86.7%	##	0.0%	15	116
Rev spin proc w R/O spinal fixation (9002501)	12	55	4.58	9	0.75	25.0%	##	14.3%	14	15
Vertebroplasty, >= 2 vertebral bodies (3540001)	10	91	9.10	53	5.30	40.0%	##	23.1%	13	##

Table: Top 15 most commonly performed planned spinal procedures discharge metrics in 2013. See column descriptions above. Data extracted from HIPE. Values less than 5 replaced by ##.

The split of inpatient emergency activity between hospitals can be access by comparing the volumes of activity, average length of stay, average surgical complexity of primary surgical procedures and the subsequent acute readmission of patients within 30 days. In 2013, average relative complexity of surgical primary procedure shows a marked difference in average relative complexity. Most of the spinal trauma cases are managed in model 4 hospitals. Some hospitals performing lower average complexity surgery have some of the highest AvLOS values. Readmission rates is also highest in relatively low volume model 4 hospitals which have high AvLOS values and moderate average surgical complexity.

Trauma Inpat Spinal surgery (2013 volumes, AvLOS, surgical complexity and readmission rates by hospital)

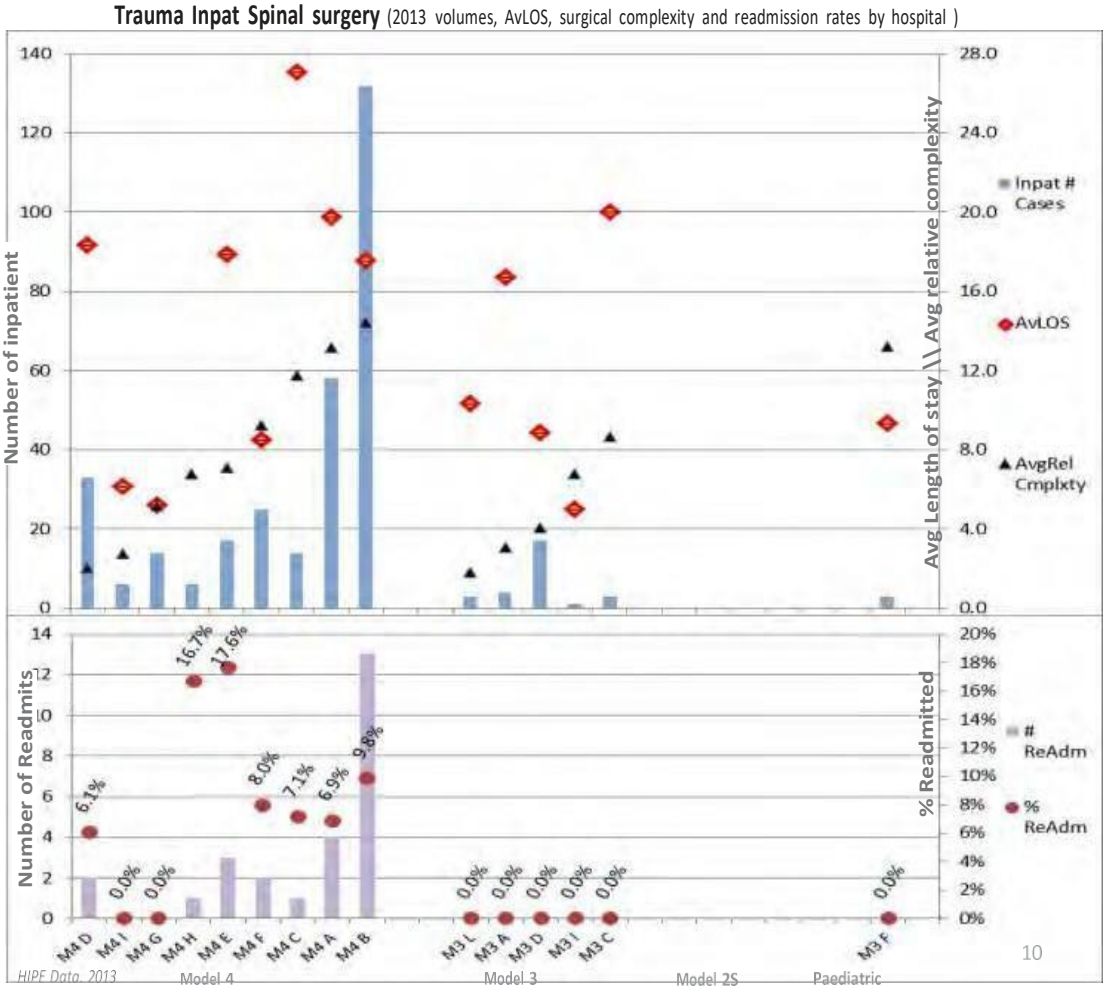


Chart: Displays volume of emergency discharge as blue vertical bars, AvLOS as red diamonds and average relative surgical procedure complexity as black triangles by hospital in the top chart. The lower chart shows the volume and rate of those discharges who return to the same hospital acutely within 30 day of their original discharges. Hospitals are ordered from lowest to highest average relative surgical procedure complexity within hospital model type. See appendix 8 for further explanation of relative surgical procedure complexity.

The split of inpatient planned activity was highest in one of the paediatric tertiary hospitals with a spread of activity in the larger model 4 hospitals, one model 3 and one elective surgery specialty hospital in 2013. The tertiary paediatric hospitals also have higher average relative complexity of surgical primary procedures.

The higher AvLOS values occur in the model 4 hospitals and not always for hospitals with the highest surgical complexity. One model 4 hospital has a higher readmission rate with mid-range AvLOS values.

Planned Inpat Spinal surgery (2013 volumes, AvLOS, surgical complexity and readmission rates by hospital)

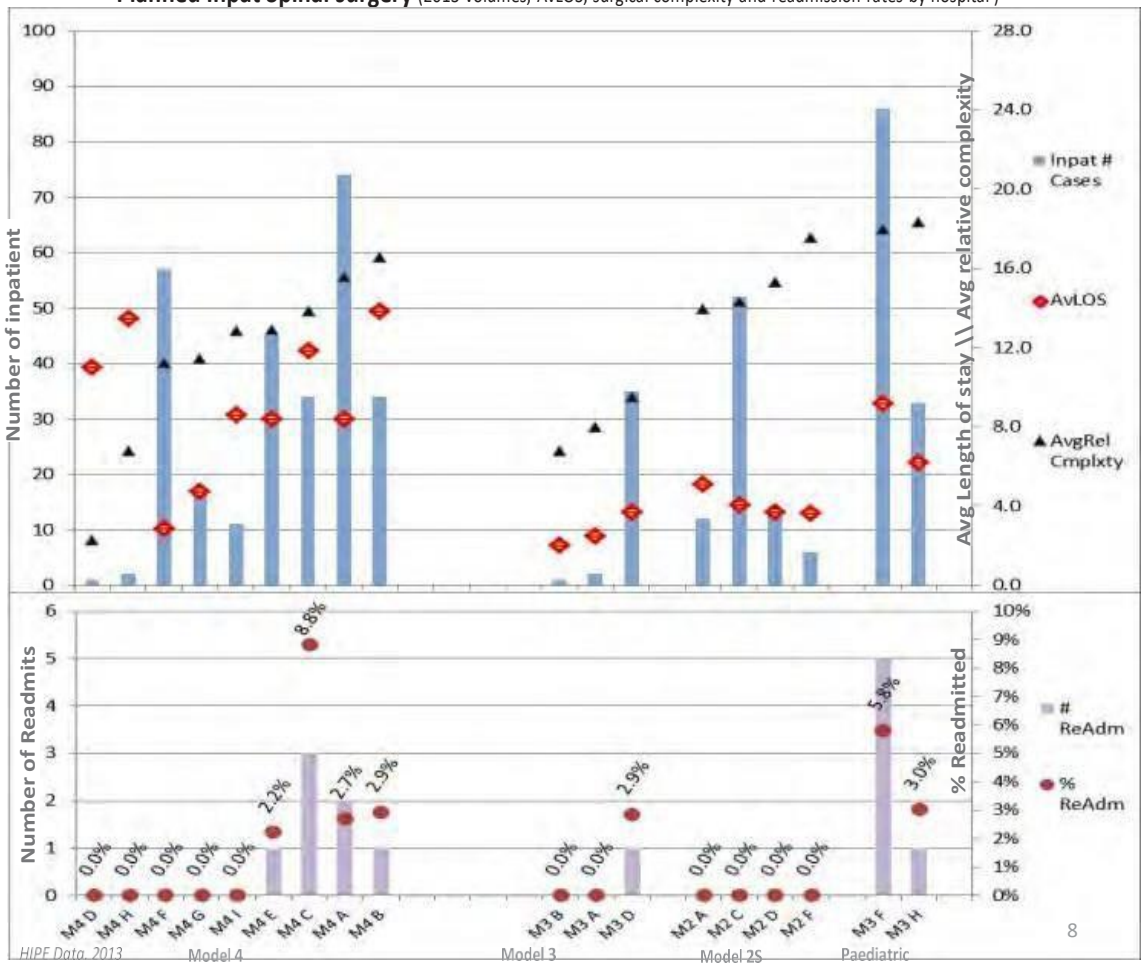


Chart: Displays volume of planned discharge as blue vertical bars, AvLOS as red diamonds and average relative surgical procedure complexity as black triangles by hospital in the top chart. Chart layout explained for emergency equivalent above.

6.0 Paediatric orthopaedics

6.1 PAEDIATRIC ORTHOPAEDICS COVERS THREE bROAD AREAS:

- The management of acute trauma and its sequelae
- The management of normal variation, postural and 'packaging' disorders and deviations in musculoskeletal development
- The provision of highly specialised orthopaedic services to children and young people with congenital conditions (congenital talipes equinovarus (CTEV), limb deformities and bone dysplasias), developmental dysplasia of the hip (DDH), neurological conditions and neuromuscular conditions (such as cerebral palsy, spina bifida and muscular dystrophies) and acquired musculoskeletal conditions (such as scoliosis, bone and joint infections, growth disturbance, bone and soft tissue tumours).

6.2 PAEDIATRIC TRAuMA

- The management of uncomplicated paediatric orthopaedic trauma (e.g. sprains, strains and simple fractures) traditionally has been undertaken:
  - 1.1 By general practitioners (GPs)
  - 1.2 By emergency departments and
  - 1.3 By all orthopaedic surgeons
- The management of more severe paediatric orthopaedic trauma is managed at the regional Level 2 and Level 3 orthopaedic centres. All orthopaedic surgeons trained in Ireland are proficient in the management of children's trauma
- Children with multiple injuries requiring paediatric ICU beds or children with simple trauma, who have associated complex comorbidities, are transferred to a tertiary paediatric centre.

6.3 RESOuRCE REquIREMENT FOR PAEDIATRIC TRAuMA

In the Report Commissioning Tertiary and Specialised Services for Children and Young People (UK 2004) it states that 'approximately 1 in 4 children each year will attend an A&E Department with an injury and a significant proportion of these will require orthopaedic referral and management'. The report goes on to say that there should be an orthopaedic surgeon responsible for the care of children within each district general hospital setting and that colleagues should form a rota to manage the more common children's fractures. The report also noted that 50% of children's fractures are to the forearm and can be safely managed in the district general hospital.

The orthopaedic surgeon requires inpatient paediatric support, nursing staff trained in peri-operative care of injured children, an appropriately trained anaesthetist to administer a safe anaesthetic for the fractures to be treated, and an appropriately trained physiotherapist to aid rehabilitation.

The National Clinical Programme in Trauma and Orthopaedic Surgery recommends the following for paediatric trauma:

- Care is in accordance with the British Orthopaedic Association's (BOA) "Children's Orthopaedic and Fracture Care"
- There are arrangements within hospitals/networks to treat the complex injured child appropriately. Most injuries will be treated within non tertiary centres
- There is daily access for children to dedicated orthopaedic emergency theatres
- Each centre has up to date guidelines available that
- Recognises available skills and limitations of the centre
- Outlines transfer arrangements to specialised paediatric centres within network and nationally.

There is currently no daily emergency theatre available for the care of children with fractures in Ireland, with most cases being done either out of hours or on an planned list thereby having the knock on effect of cancelling planned surgery for children.

There are approximately 3000 operative paediatric musculoskeletal trauma cases annually. All Level 2 and 3 centres currently cater for paediatric trauma including fracture clinics and fracture surgery. Arrangements should be put in place to ensure that paediatric patients are prioritised, on operating lists and at fracture clinics, in a child friendly environment. Appropriate accommodation for children should be provided, separate from adult patients, both in the theatre environment and the wards.

Theatre equipment and implants must be available that are appropriate in size for the patient profile.

6.4 NORMAL VARIANTS IN PAEDIATRIC ORTHOPAEDICS

The assessment of children with normal variations has traditionally been undertaken by the GPs, area medical officers (AMO), health and social care professionals and paediatricians.

There has been an increasing trend to refer these patients for a specialised paediatric orthopaedic opinion. The reason for this is multifactorial including increasing concern regarding the risk of litigation, increasing subspecialisation of orthopaedic surgeons, reduced orthopaedic training of GPs, reduced medical undergraduate musculoskeletal education and increased parental expectation.

Following the success of adult physiotherapy triage clinics,

a paediatric physiotherapy normal variant triage clinic was commenced in OLCH, Crumlin in 2011. The service reviews approximately 600 patients per annum with only ten percent of children requiring referral to an orthopaedic surgeon. This has had a positive effect on speed of access for normal variant children to assessment, but has conversely increased the complexity of cases being referred to the paediatric orthopaedic surgeon.

There is a concern that the availability of this service will further de-skill GPs, AMOs and paediatricians, and consequently increase the referral rate of normal children to the tertiary centres. A further concern lies with using scarce resources to assess normal children while more complex patients requiring treatment have poor access to services.

Specialised care is required for conditions such as:

- Spinal deformity (congenital, idiopathic and acquired)
- Congenital Talipes Equinvarus (CTEV)
- Developmental dysplasia of the hip (DDH)
- Limb deformities
- Bone dysplasias
- Neurological and neuromuscular conditions (cerebral palsy, spina bifida)
- The sequelae of acquired musculoskeletal conditions such as bone and joint infections, growth disturbance, slipped epiphyses and orthopaedic consequences of juvenile rheumatoid arthritis)
- Bone and soft tissue tumours.

The specialist paediatric orthopaedic services in Ireland are under considerable stress. There are 4.3 WTE paediatric orthopaedic surgeons employed between OLCH, Crumlin and CUH, Temple Street. There is a need for a minimum of ten WTE paediatric orthopaedic surgeons to meet the service demands nationally. Despite annual increasing surgical and OPD activity, the waiting lists for planned surgery and OPD attendance remain inappropriately high.

Many general orthopaedic surgeons are withdrawing from the care of children because of a preference to subspecialise in particular areas of adult practice, and a fear of the potential medico legal consequences of paediatric practice. Less operative work is being performed in the regional orthopaedic centres due to lack of paediatric anaesthesia and lack of theatre resources.

As a consequence, children and young people requiring orthopaedic care who previously would have been managed in regional centres are being referred more frequently to tertiary centres with no additional resources accompanying them.

Parents of children requiring highly specialised orthopaedic care report considerable levels of stress associated with difficulties accessing services and some believe that their children have suffered significant disadvantage as a result of delays in access. The objective of this model of care document is to enable the provision of high quality paediatric orthopaedic services that achieve an optimal balance between access, safety, effectiveness, appropriateness, efficiency and acceptability to children and young people and their families.

6.5 PAEDIATRIC ORTHOPAEDIC TERTIARy CARE

Two centres currently provide tertiary care for children namely OLCH, Crumlin and CUH, Temple Street. The National Paediatric Hospital (NPH) which is currently being planned will provide a single centre for tertiary care in the future. It will be associated with two ambulatory care centres in Dublin – one to be situated in Tallaght Hospital and one in Connolly Hospital.

Providing critical mass of sub-specialist care is the most important factor in delivering best outcomes for patients.

It has been clearly shown that:

- Consolidation of paediatric services leads to reduced mortality rate and improved clinical outcomes
- The Bristol inquiry states that "Where the interests of secured quality of care and the safety of patients require that there only be a small number of centres offering a specialist service, the requirements of quality and safety should prevail over considerations of ease of access"

6.6 PAEDIATRIC ORTHOPAEDIC RESOuRCE AND MANPOWER PLANNING bASED ON POPuLATION

In 2011, there were children 1,092,822 aged sixteen and under living in Ireland (Department of Children and Youth Affairs, 2012). The child population of Ireland increased by 13.4% between 2002 and 2011 (CSO, 2011).

50% of the population lives within one hour of Dublin.
75% of the population lives within two hours of Dublin.

The provision of paediatric orthopaedic surgery nationally is dependent primarily on the availability of anaesthetists with paediatric expertise.

6.7 PAEDIATRIC ORTHOPAEDIC SERVICE FRAMEWORK

Four levels of paediatric orthopaedic care, as defined according to the complexity of care required, are described in Table 1. A care bundle describing the work to be undertaken at each level is set out in Table 2.

Table 1 Levels of Paediatric Orthopaedic Care

Level	Description
Level 1	A Level 1 hospital is predominantly adult-based. • The facility is staffed and equipped to manage children presenting to the ED with minor musculoskeletal injuries. This may include the management of sprains and undisplaced fractures. • Paediatric orthopaedic presentations requiring surgery or inpatient care are initially stabilised and transferred to a higher level of service. • No paediatric orthopaedic outpatient clinics are provided.
Level 2	A Level 2 hospital includes and exceeds the characteristics of a Level 1 hospital. • It has the capacity for managing a wider range of uncomplicated paediatric trauma presenting to the ED when compared with a Level 1 hospital. • Orthopaedic surgeons provide management for certain paediatric fractures. These include fractures that do not involve potential or actual neurovascular complications or injuries to the growth plate with high risk of growth arrest. • Orthopaedic patients requiring hospitalisation are admitted to a general paediatric ward/unit. • Planned paediatric orthopaedic surgery is generally not provided. • A Level 2 hospital provides a general fracture and orthopaedic clinic, which children may attend. • May include screening for neonatal developmental dysplasia of the hip (DDH) and management with Pavlik harness.
Level 3	A Level 3 hospital includes and exceeds the characteristics of a Level 2 hospital and • Provides a general paediatric orthopaedic service to its local population; it has the capacity for managing paediatric trauma where appropriate. • Provides some planned paediatric orthopaedic services for the region. • A consultant orthopaedic surgeon who has undertaken fellowship training in paediatric orthopaedics provides such services. • The site is also staffed by a range of health and social care professionals with paediatric orthopaedic expertise. • May have joint paediatric orthopaedic appointments with the Level 4 hospital. • Formal links with the Level 4 hospital for the purpose of referrals and collegiate networking. • Provides professional leadership within its region. It may have a teaching and research role. • An identifiable general paediatric orthopaedic outpatients and fracture clinic.
Level 4	A Level 4 hospital has the capacity to provide non-operative and surgical treatment for the full spectrum of paediatric orthopaedic conditions. • It has a national referral role for paediatric major trauma and for highly complex, low volume planned paediatric orthopaedic procedures. • There is a consultant paediatric orthopaedic service at all times. The orthopaedic department provides a 24-hour, seven days a week trauma service by consultants and registrars for paediatric orthopaedics only. • The orthopaedic department is staffed by at least three orthopaedic consultants with fellowship training in paediatric orthopaedics who have a substantial commitment to paediatrics (≥0.5 WTE). • Paediatric orthopaedic services are provided by a multidisciplinary highly specialised team, which include clinical nurse specialists (CNS) for complex conditions and advanced scope practitioners. • It has a designated paediatric orthopaedic ward. • It has designated paediatric orthopaedic theatres. • It provides national leadership in service delivery models, teaching and research in paediatric orthopaedics. • It has access to a full complement of co-located paediatric subspecialty services. • It provides a fully integrated paediatric orthopaedic ambulatory care service. It has formal links with Level 3 hospital services for the purpose of referrals and collegiate networking.

Adapted from Paediatric Orthopaedics: recent achievements and future directions May 2009
(Victorian Government Department of Human Services Melbourne)

Table 2 Care bundles associated with Levels of Care

Orthopaedic Condition	Level 1	Level 2	Level 3	Level 4
Distal radius and ulna fracture	No	Diagnosis Treatment	Diagnosis Treatment	Diagnosis Treatment
Supracondylar Fracture	No	Grade 1-3	Grade 1-3	Grade 1-3
Tibial Fracture	Undisplaced	Displaced Treatment	Displaced Treatment	As for Level 3 plus Children with comorbidity (e.g. cardiac, bleeding disorders)
Developmental dysplasia of the hip (DDH)	Newborn screening and refer to Level 3 or 4 for management	As for Level 1 plus orthotic management	Diagnosis Orthotic Management Closed and open reduction Osteotomies	As for Level 3 plus: Syndromic conditions Dysmorphic syndromes
Congenital talipes equinovarus (CTEV)	Newborn screening and refer	Newborn screening Ponseti method Idiopathic CTEV	Diagnosis Ponseti method	As per Level 3 plus: Non-idiopathic CTEV
Slipped upper femoral epiphysis (SUFE)	Diagnosis and referral	Diagnosis Pinning of stable and mild or moderate slip	Diagnosis Pinning of stable and mild or moderate slip	As for Level 3 plus: Surgical management of severe slip
Management of bone tumours	Diagnose and referral for appropriate management	Diagnosis Referral	Diagnosis Referral	Management
Spasticity in children with complex disabilities	No	No	Botulinum toxin A Muscle-tendon procedures	As for Level 3 plus: Bone osteotomies Gait reporting for surgical decision making
Scoliosis	No	No	Diagnosis	Spine surgery

Adapted from Paediatric Orthopaedics: recent achievements and future directions May 2009
(Victorian Government Department of Human Services Melbourne)

6.8 PAEDIATRIC ORTHOPAEDIC ANAESTHETIC SERVICES

Anaesthetics should be provided within a safe working environment with adequate and appropriate facilities, drugs and equipment to safely anaesthetise and manage planned and emergency surgery and critically ill children. When a child undergoes anaesthesia, the anaesthetist should be supported by staff who have undergone paediatric training and experience, and who have maintained their skills. These skills should also extend into the post-operative/recovery phase, when children should be managed by designated staff with up-to-date paediatric competencies, particularly resuscitation (RCOA, 2014).

A full range of monitoring devices and paediatric anaesthesia equipment should be readily available in theatres and other areas where children are to be anaesthetised and recovered (Association of Anaesthetists of Great Britain and Ireland, 2007). Equipment must be capable of being used for infants and children of all ages and sizes.

Resuscitation medications and equipment, including an appropriate defibrillator, should be readily available wherever children are anaesthetised (RCOA, 2014). Paediatric high dependency and intensive care facilities should be available and delivered within a network of care that supports major/complex surgery and critically ill or injured infants or children (RCOA, 2014).

While it is acknowledged that critical care facilities for children are not available in all hospitals that anaesthetise children, facilities for initiating intensive care prior to transfer/retrieval to a designated regional PICU/HDU facility should be available. This may involve the short-term use of adult/general ICU facilities (Paediatric intensive care society, 2010).

Multi-modal analgesia for children should be available in all settings; they should comply with the guidelines laid out in the Model of Care for Paediatric Anaesthesia (NCPA, 2015:13).

In 2014, the Royal College of Anaesthetists issued comprehensive guidelines on the provision of paediatric anaesthesia services. When considering the provision of anaesthesia, the Royal College of Anaesthetists recommends that the following areas should be addressed. The goal is to ensure a comprehensive, quality service dedicated to the care of patients and to the education and professional development of staff.

Anaesthesia for children should be undertaken or supervised by consultants who have undergone appropriate training. The service should be led and organised by consultants who maintain competencies to anaesthetise children and young people. The anaesthetist must at all times have a dedicated assistant who maintains competencies in the peri-operative care of children and young people.

A full range of monitoring devices and paediatric anaesthetic equipment should be readily available in theatres, and all other areas where children are anaesthetised and recovered. Equipment must be appropriate for use in babies and children of all sizes and ages and include:

- airway management and monitoring equipment including capnography
- paediatric pulse oximetry sensors and blood pressure cuffs
- vascular access equipment, including intraosseous needles
- burettes and syringe pumps to allow rapid and accurate fluid and drug delivery
- fluid and external warming devices
- temperature probes
- ultrasound devices (for central venous and nerve identification). Resuscitation drugs and equipment, including an appropriate defibrillator, should be readily available wherever children are anaesthetised (Wilkinson et al, 2015)
- child and parent-friendly facilities with children managed ideally in a separate environment from adults
- the WHO Safe Surgery Saves Lives checklist should be in operation
- analysis of adverse events and regular audit should take place at a local, regional and national level
- it is recommended that there should be a pre-operative assessment and acute pain service where pain scoring is routinely performed and documented.

6.9 DEVELOPMENTAL DySPLASIA OF THE HIP (DDH)

DDH describes a developmental disorder of the newborn infant's hip. There is a wide spectrum of severity. At one end there are infants with unstable dislocated hips where the head of the femur is outside the acetabulum, while at the other there are infants with stable hips with a shallow acetabulum. There is considerable confusion about the definition depending on whether one includes unstable hips only or whether one counts in any infant with acetabular dysplasia. Previously only unstable hips were included but more recently the net has widened to include infants with hip dysplasia only.

The clinical examination (using Ortolani and Barlow method) can by its nature only detect hips that are unstable. Dysplastic hips that are clinically stable cannot be identified at the newborn or subsequent examinations.
When identified all those infants with unstable hips are placed in a Pavlik harness and referred to the orthopaedic surgeon for further management. It is important to bear in mind that there can be false positive diagnoses of DDH.

The role of newborn hip examination and the hip examination at six weeks needs to be understood. At the newborn examination one undertakes two tests. The Ortolani test examines for a dislocated hip, on abduction the head of the femur returns into the acetabulum with a clunk. Barlow's test examines for a dislocatable hip, the head of the femur can be dislocated from the acetabulum by applying lateral pressure. At age six weeks Ortolani and Barlow tests are difficult to perform due to tightening of muscles. At six weeks and beyond it is more important to look for any limitation in hip abduction.

The most important risk factors for DDH are family history and breech presentation. A positive history in a first degree relative (father, mother, brother, sister) increases the risk of DDH fivefold.

Breech presentation can increase the risk up to 17 fold. Together the risk factors of positive family history and breech presentation account for 40% of DDH cases. However the mode of delivery of the breech infant has a significant impact on the likelihood of a hip problem. The current policy of delivering all breech presentations by caesarean has resulted in a more than twofold reduction in DDH.

The approach to the infants with a stable hip at newborn examination who have a risk factor is debatable and variable in Ireland. All hospitals should undertake an additional screening test.

Other countries, for example, Austria perform universal screening using hip ultrasound. This is a major undertaking in terms of time and personnel. The recent Cochrane review casts doubts that any screening programme significantly reduces the problem of DDH.

All newborn infants should have a clinical hip examination by 24 hours of age. If the hips are stable the infant should be re-examined at six weeks.

If the infant's hips are stable but there is a risk factor such as family history or breech an ultrasound should be arranged. If this imaging test is abnormal immediate orthopaedic referral should be arranged. The orthopaedic group strongly support universal screening with hip ultrasound in Ireland.

In the community setting any hip concern by the GP, public health doctor or public health nurse should generate an x-ray (Under three months they should be referred to the local paediatric orthopaedic service).

All leading authorities agree that these 'at risk' infants should be singled out for greater attention. In addition to careful clinical examination, they should have a hip imaging procedure undertaken. The two available procedures are a hip x-ray and a hip ultrasound. The hip x-ray is not as effective as the hip ultrasound because of timing considerations. The hip ultrasound can be reliably performed at six weeks whereas the hip x-ray can only be undertaken when the infant is four months old. In the case of a dislocated hip the use of an x-ray rather than a hip ultrasound will lead to delays of at least three months duration.

There are 19 maternity hospitals in the State. Most of these rely on the hip x-ray at four months as the screening test for 'at risk' infants. Currently only a small number of units routinely provide hip ultrasound screening at six weeks. The challenge is how to provide hip ultrasound screening at six weeks for all 'at risk' infants in the State. It is reliably estimated that 20% of infants are at risk which amounts to 15,000 examinations annually.

International Practice: The European Society of Paediatric Radiology's Task force group on DDH has produced recommendations on hip screening. It recommends selective hip ultrasound screening in infants at increased risk of DDH. The document urges the implementation of:

- A standardised ultrasound technique
- A standardised report form
- A feasible screening strategy
- Training and accreditation schedules.

The earlier detection and treatment of infants with DDH will improve resource utilisation. When identified in the first two months most infants require non-invasive abduction splinting only. The early detected group seldom require hospitalisation. Late diagnosis usually requires a protracted course of treatment consisting of either closed reduction, open reduction or a pelvic osteotomy. All these treatments require a hospital admission, theatre time and multidisciplinary care. The long term outcome for the infant is not as good. There is disruption to the family caused by the hospitalisations and the travel involved. The other consideration is the saving in relation to litigation risks arising out of late or missed diagnosis. The early detection and effective treatment of infants with DDH is an important matter of public health concern.

We propose the nationwide introduction of hip ultrasound screening of infants at risk of development dysplasia of the hip.

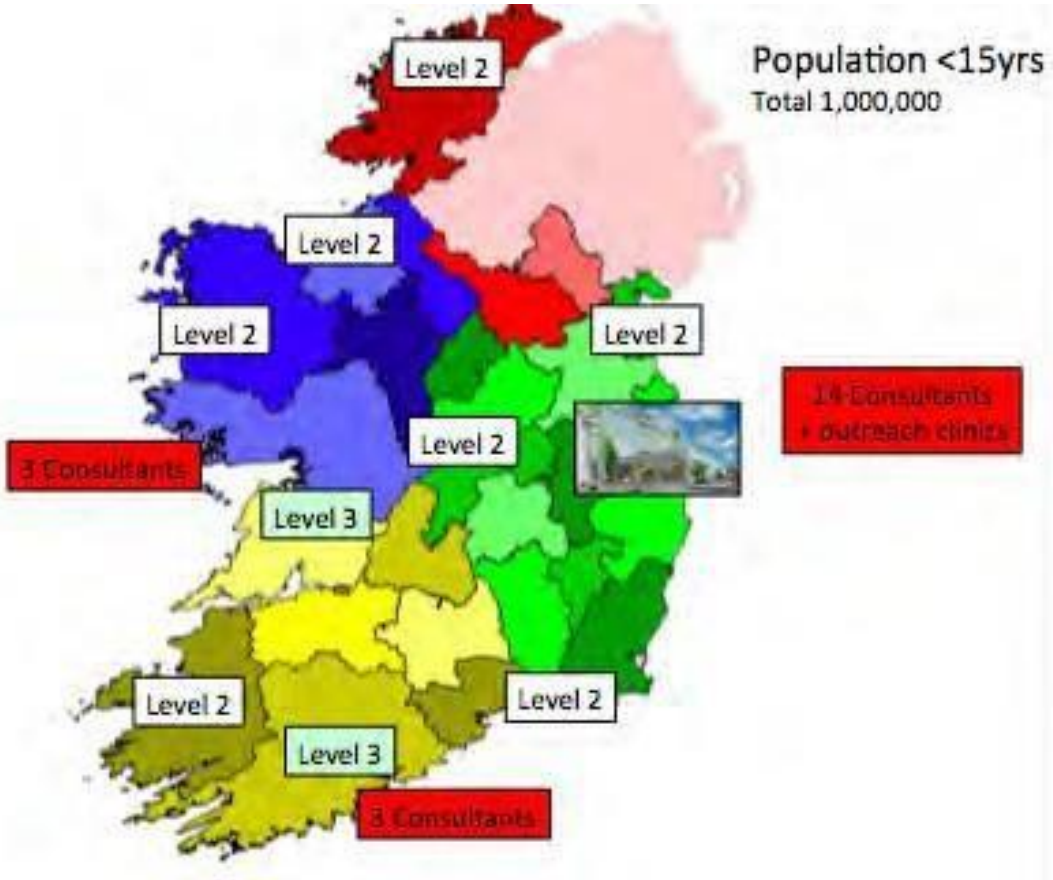
6.10 CONGENITAL TALIPES EQUINOVARUS (CTEV)

Ponseti manipulation and casting is the preferred method for treating CTEV in all hospitals. Subsequent to a national consensus meeting of all Ponseti groups in Ireland, it has been recommended that immediate referral (within two weeks) to the regional centre take place. It was agreed that a hospital should perform approximately ten cases/year to maintain skill mix. Clinical outcome and audit should be performed.

The following are the hospitals who currently practise the Ponseti method:

- Our Lady's Children's Hospital, Crumlin
- Children's University Hospital, Temple Street
- Cork University Hospital/ South Infirmary Victoria University Hospital
- Galway University Hospitals
- University Hospital Limerick
- Letterkenny General Hospital


REQUIREMENTS TO DELIVER INTERNATIONAL BEST PRACTICE IN TERTIARY PAEDIATRIC SERVICES
Goal
Primary component for delivery of goal
Secondary components for delivery of goal
Critical enablers
Lowest possible morbidity and mortality levels
Depth of services
Breadth of services
Quality
Outreach and retrieval services
Accessible by public transportation
Contains facilities to house families*
Breadth & depth of services
Efficiency from an operational and capital expenditure perspective
Produces cited research
Important education and research role
Strong fundraising ability (depending on degree of government support)
Paediatric 'bench-to-bedside' bridge
Reputation attracts and retains high-calibre physicians, nurses and support staff
Access
Recruitment and retention
Academics, and research
Efficient use of resources
Critical mass
Co-location


Population <15yrs
Total 1,000,000
Level 2
Level 2
Level 2
Level 2
Level 2
Level 3
Level 2
Level 2
Level 3
3 Consultants
3 Consultants

6.11 PAEDIATRIC ORTHOPAEDIC PROPOSED NATIONAL MODEL OF CARE

Level 4 centre in NPH (with two level 2 satelite centres)

Two Level 3 centres - Cork and Galway with an orthopaedic paediatric appointment in Limerick to work part of either Galway /Cork Centre.

6.12 PAEDIATRIC ORTHOPAEDIC ACTIVITy

Paediatric orthopaedic services may be emergency or planned. Table 3.1 summarises the orthopaedic activity inpatient for children under 16 years of age for the years 2010, 2011, 2012 and 2013 by hospital group. The tertiary hospitals account for approximately one third of emergency inpatients and two thirds of planned inpatients. Inpatient are three time more likely to be admitted for an emergency treatment compared to planned treatment. The table below summarises the orthopaedic activity day case for children under 16 years of age for the years 2010, 2011, 2012 and 2013 by hospital group. In 2013, 32% of emergency patients were discharged on the same day as they were admitted on, while 77% of planned patients were treated as day cases. Patients for planned day cases are split evenly between the tertiary hospitals and the accumulative of all other hospitals.

Table – Annual Inpatient trauma orthopaedic activity annual summaries

Emergency	Inpatient 2010			Inpatient 2011			Inpatient 2012			Inpatient 2013		
Hsptl Grp	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**
Group 1	10	50	5.00	12	16	1.33	7	28	4.00	7	10	1.43
Group 2	198	366	1.85	228	411	1.80	200	412	2.06	222	469	2.11
Group 3	311	513	1.65	296	511	1.73	346	646	1.87	450	824	1.83
Group 4	288	588	2.04	227	448	1.97	252	479	1.90	257	512	1.99
Group 5	1,372	3,727	2.72	1,222	3,454	2.83	1,187	3,355	2.83	1,029	3,213	3.12
Group 6	875	1,814	2.07	834	1,561	1.87	779	1,490	1.91	728	1,397	1.92
Group 7	697	1,312	1.88	681	1,145	1.68	577	984	1.71	565	944	1.67
Total	3,751	8,370	2.23	3,500	7,546	2.16	3,348	7,394	2.21	3,258	7,369	2.26
% Tertary	*37%*	*45%*		*35%*	*46%*		*35%*	*45%*		*32%*	*44%*	

Planned	Inpatient 2010			Inpatient 2011			Inpatient 2012			Inpatient 2013		
Hsptl Grp	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**	**#Pat**	**BDU**	**AvLOS**
Group 1	92	328	3.57	82	313	3.82	54	176	3.26	67	252	3.76
Group 2	25	31	1.24	22	84	3.82	24	37	1.54	22	28	1.27
Group 3	55	108	1.96	51	113	2.22	31	42	1.35	17	41	2.41
Group 4	77	168	2.18	70	137	1.96	68	139	2.04	62	132	2.13
Group 5	752	3,260	4.34	712	2,860	4.02	680	2,557	3.76	715	2,627	3.67
Group 6	68	205	3.01	78	112	1.44	101	180	1.78	136	333	2.45
Group 7	53	73	1.38	49	83	1.69	71	88	1.24	60	131	2.18
Total	1,122	4,173	3.72	1,064	3,702	3.48	1,029	3,219	3.13	1,079	3,544	3.28
% Tertary	*67%*	*78%*		*67%*	*77%*		*66%*	*79%*		*66%*	*74%*	

Table: Annual hospital group emergency and planned inpatient volumes, bed days used and Average Length of Stay for discharges in each year who had orthopaedic surgery or who were admitted to hospital under the care of trauma orthopaedic surgeons. Tertiary children's hospitals include activity from OLCHC, CuH Temple St and Tallaght Hospital under 16 activities. Data extracted from HIPE.

Table – Annual day case emergency and planned orthopaedic activity annual summaries

Emergency	2010	2011	2012	2013	2010	2011	2012	2013
Hsptl Grp	DC #	DC #	DC #	DC #	% DC	%DC	%DC	%DC
Group 1	##	##	##	##	9.1%	29.4%	41.7%	36.4%
Group 2	78	81	57	82	28.3%	26.2%	22.2%	27.0%
Group 3	162	130	149	225	34.2%	30.5%	30.1%	33.3%
Group 4	59	48	68	60	17.0%	17.5%	21.3%	18.9%
Group 5	410	372	362	483	23.0%	23.3%	23.4%	31.9%
Group 6	400	383	383	383	31.4%	31.5%	33.0%	34.5%
Group 7	348	424	342	330	33.3%	38.4%	37.2%	36.9%
Total	1,458	1,443	1,366	1,567	28.0%	29.2%	29.0%	32.5%
% Tertary	28%	26%	27%	31%				

Planned	2010	2011	2012	2013	2010	2011	2012	2013
Hsptl Grp	DC #	DC #	DC #	DC #	% DC	%DC	%DC	%DC
Group 1	420	349	369	352	82.0%	81.0%	87.2%	84.0%
Group 2	100	112	153	149	80.0%	83.6%	86.4%	87.1%
Group 3	78	144	182	146	58.6%	73.8%	85.4%	89.6%
Group 4	291	269	392	320	79.1%	79.4%	85.2%	83.8%
Group 5	2,422	2,759	1,994	1,960	76.3%	79.5%	74.6%	73.3%
Group 6	467	477	473	516	87.3%	85.9%	82.4%	79.1%
Group 7	228	212	278	233	81.1%	81.2%	79.7%	79.5%
Total	4,006	4,322	3,841	3,676	78.1%	80.2%	78.9%	77.3%
% Tertary	60%	64%	52%	53%				

Table: Annual hospital group emergency and planned day case volumes and percentage of total discharged on the same date as admission dates. Annual discharges in each year who had trauma orthopaedic surgery or who were admitted to hospital under the care of orthopaedic surgeons. Tertiary children's hospitals include activity from OLCH Crumlin, CuH Temple St and Tallaght Hospital under 16 activities. Note: quantities under six are replaced by ##. Data extracted from HIPE.

Emergency activity volumes for under 16's has dropped slightly over the years 2010 to 2013 and the percentage of patients admitted and discharges on the same date has increased slightly. Activity follows a seasonal pattern with significantly increased activity in the middle of each year and reducing in the winter months.

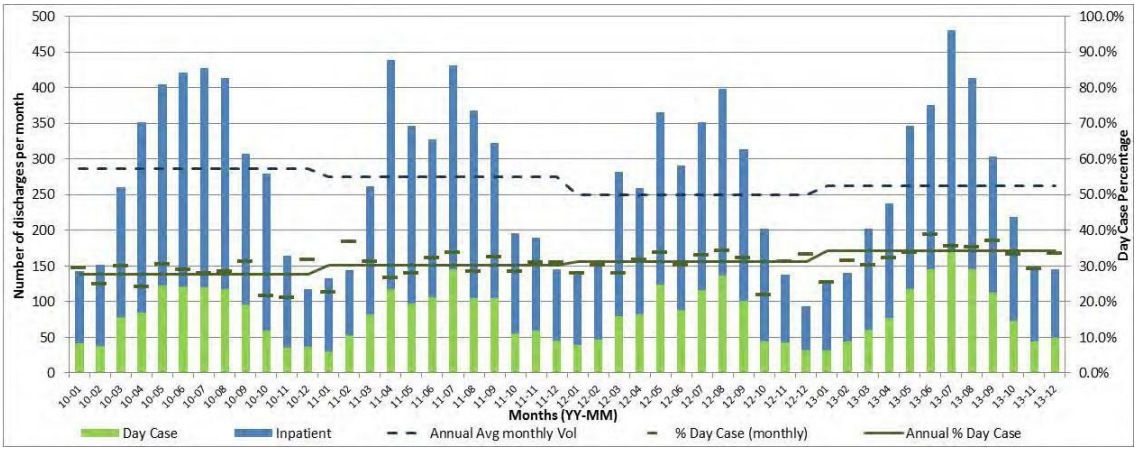


Chart: Monthly emergency discharge volumes and day case rates for patients who had orthopaedic surgery or who were admitted to hospital under the care of orthopaedic surgeons. Monthly day case and inpatient discharge volumes are shown as a stacked bar chart, annualised monthly volume is represented by a dashed blue line. Monthly percentage discharged is shown as a green dash and annual as a green line. Data extracted from HIPE.

Planned activity volumes for under 16's has increased slightly over the years 2010 to 2013 and the percentage of patients treated as day cases has increased slightly. Monthly volumes tend to drop in December & January each year.

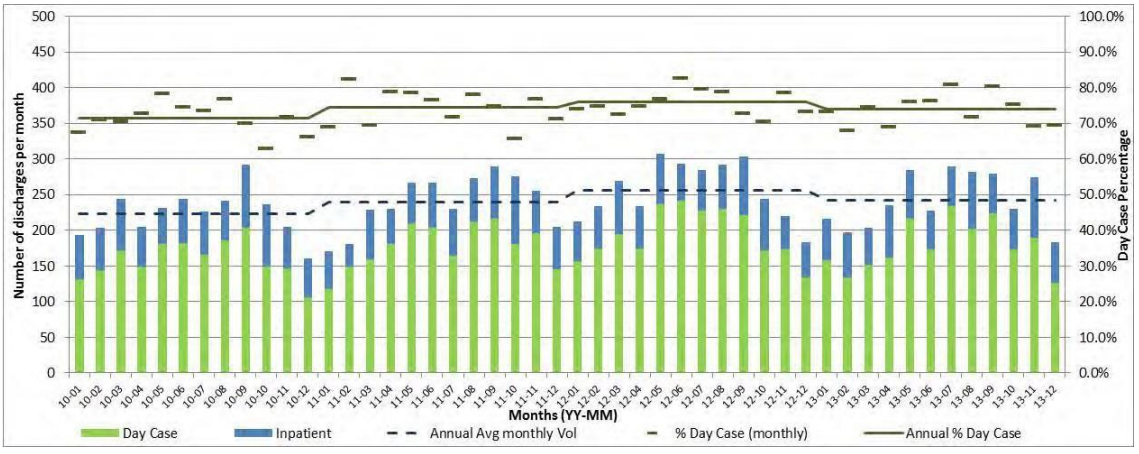


Chart: Monthly planned discharge volumes and day case rates for patients who had orthopaedic surgery or who were admitted to hospital under the care of an orthopaedic surgeon. Chart layout explained for emergency equivalent above. Data extracted from HIPE.

Emergency inpatient activity for under 16's who had a trauma orthopaedic primary procedure follows a seasonal pattern with significantly increased upper limb activity in the middle of each year and reducing in the winter months. During the increased upper limb activity monthly AvLOS (average length of stay) generally drops increasing in the winter months.

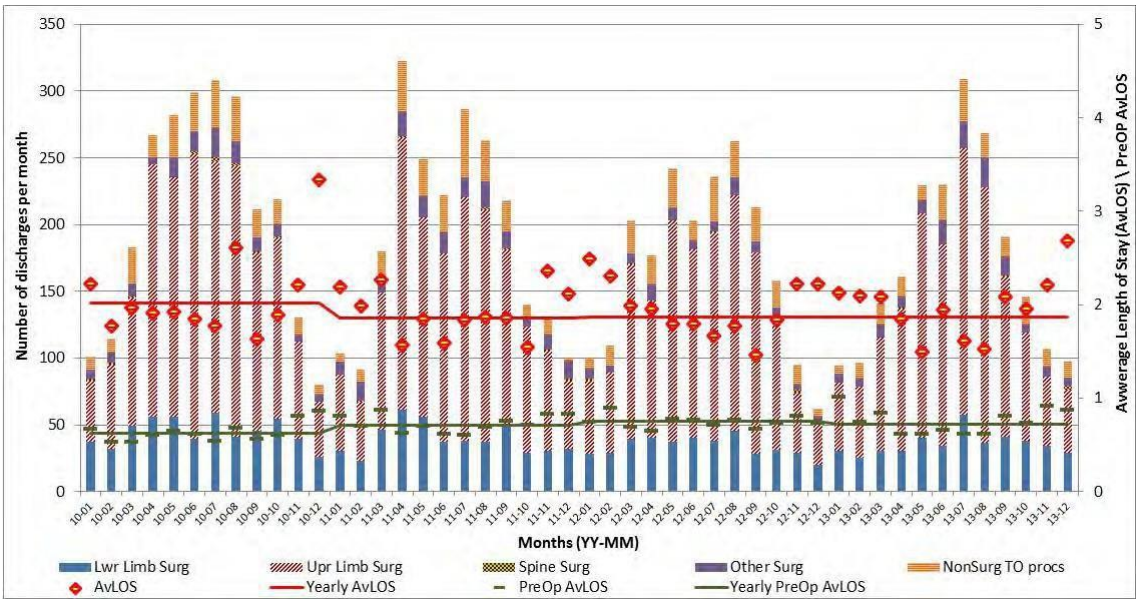


Chart: Monthly discharge volumes, AvLOS and Pre-Op AvLOS for discharges following an emergency orthopaedic primary procedure. Monthly Discharge volumes for the subspecialties are shown as a stacked bar chart, monthly AvLOS is represented by a red diamond, annual AvLOS as a red line, monthly pre-op AvLOS as a green dash and annual pre-op AvLOS as a green line. Data extracted from HIPE.

Planned monthly inpatient activity for under 16's who had an orthopaedic primary procedure is more level with no marked seasonal difference. Planned spine surgery is a noticeable portion of planned activity but relatively smaller portion of emergency activity.

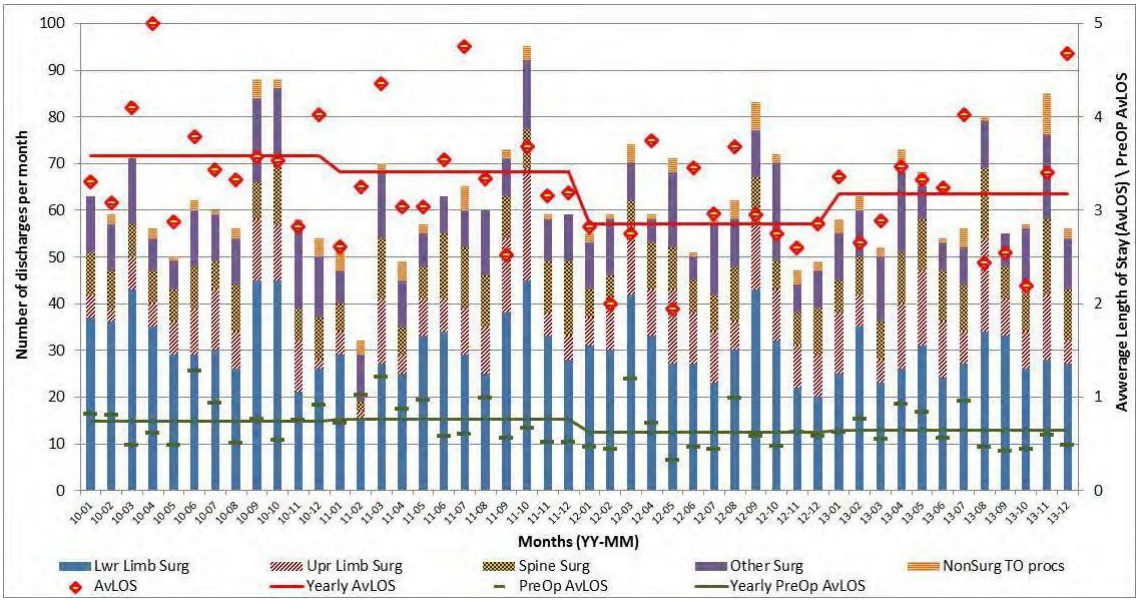


Chart: Monthly discharge volumes, AvLOS and Pre-Op AvLOS for discharges following a planned orthopaedic primary procedure. Chart layout explained for emergency equivalent above. Data extracted from HIPE.

The split of inpatient emergency activity between hospitals can be access by comparing the volumes of activity, average length of stay, average surgical complexity of primary surgical procedures and the subsequent acute readmission of patients within 30 days. In 2013, average relative complexity of surgical primary procedure is similar across the hospitals, except for hospitals doing low volumes of activity where relative complexity is higher.

Trauma Inpat U16s---trauma orthopaedic surgery (2013 volumes, AvLOS, surgical complexity and readmission rates by hospital)

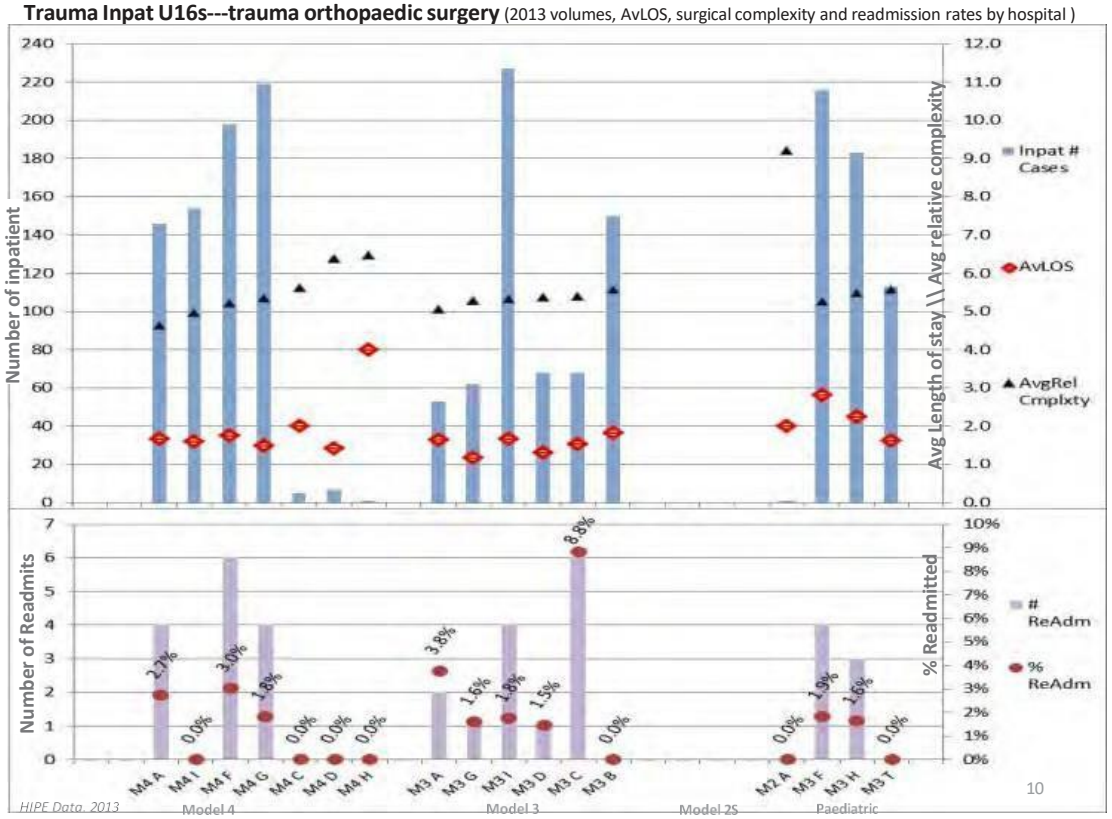


Chart: Displays volume of emergency discharge as blue vertical bars, AvLOS as red diamonds and average relative surgical procedure complexity as black triangles by hospital in the top chart. The lower chart shows the volume and rate of those discharges who return to the same hospital acutely within 30 day of their original discharges. Hospitals are ordered from lowest to highest average relative surgical procedure complexity within hospital model type. See appendix 8 for further explanation of relative surgical procedure complexity. Data extracted from HIPE.

The split of inpatient planned activity was much higher in two of the paediatric tertiary hospitals in 2013. The tertiary hospitals also have significantly higher average relative complexity of surgical primary procedures however the AvLOS values planned inpatient activity are significantly higher in only one of the tertiary hospitals.

Planned Inpat U16s---trauma orthopaedic surgery (2013 volumes, AvLOS, surgical complexity and readmission rates by hospital)

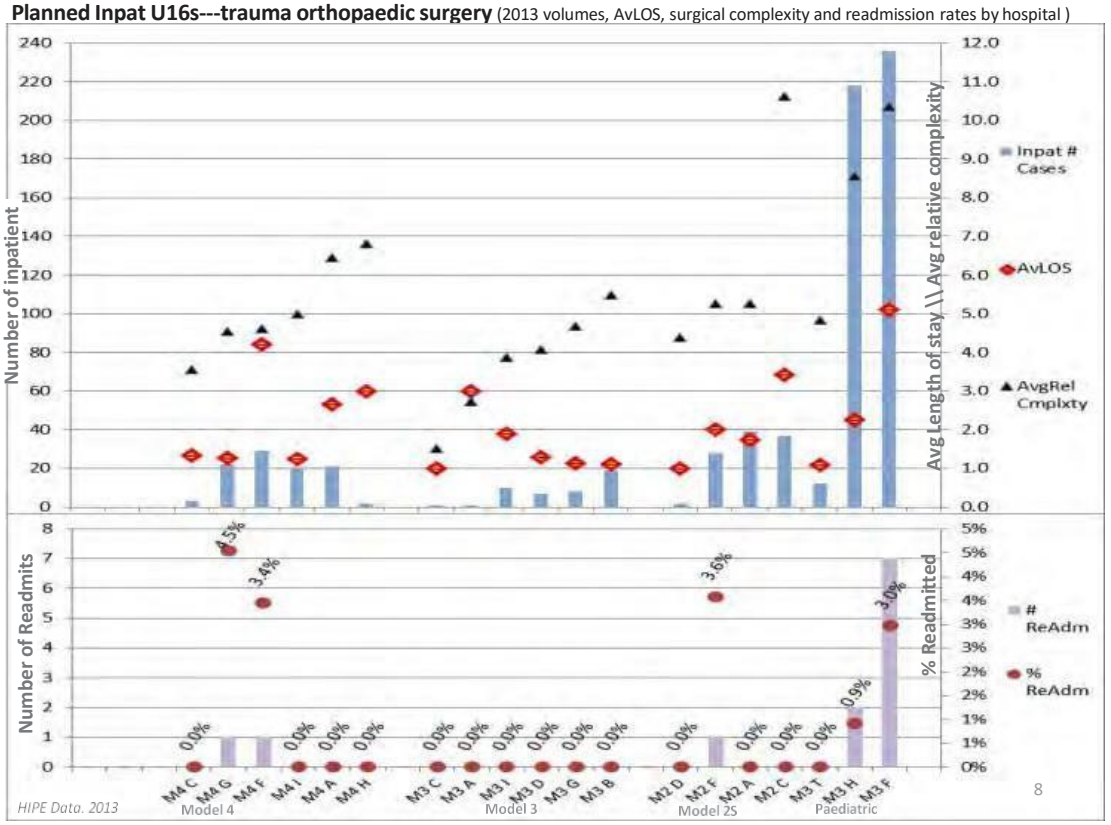


Chart: Displays volume of planned discharge as blue vertical bars, AvLOS as red diamonds and average relative surgical procedure complexity as black triangles by hospital in the top chart. Chart layout explained for emergency equivalent above. Data extracted from HIPE.

7.0 Health and social care professionals (HSCPs) and Pharmacy

7.1 SCOPE

Health and Social Care Professionals (HSCPs) are highly educated and skilled professionals with significant contributions to make to the health, well-being and quality of life of the population by providing a broad range of services and interventions in diagnostic, therapeutic and social care domains across all areas of the health services. HSCPs are a core provider of orthopaedic services.

The Department of Health identifies a list of 50 professions as HSCPs. For the purpose of state regulation, HSCPs comprise 12 professions. In some countries, HSCPs are referred to as allied health professionals (AHPs) and, more historically, as professions allied to medicine (PAMs). These groupings comprise different combinations, depending on the country.

DoH HEALTH and SOCIAL CARE PROFESSIONS		
Professions to be Regulated by CORU		
Therapy Professions		
1. Dietetics 2. Occupational Therapy 3. Orthoptists 4. Physiotherapy 5. Podiatrists 6. Speech and Language Therapy	7. Clinical Biochemists 8. Medical Scientists 9. Psychology 10. Radiography 11. Social Care Workers 12. Social Workers	13. Neurophysiologists 14. Prosthetist 15. Orthotist (35 additional professions on DoH list.)

Table HSCP Professions in Ireland

7.2 HSCPS' ROLE IN THE CONTINuuM OF TRAuMA AND ORTHOPAEDIC CARE

Therapy professions work across the continuum of care in various settings. Orthopaedic surgery requires HSCPs to deliver integrated care throughout the patient pathway. HSCPs provide both pre- and post-surgical care in both primary and secondary care settings.

Active acute rehabilitation, early supported discharge and community rehabilitation schemes enable a higher proportion of patients to return directly to their home, with reduced length of stay (BOA, 2007:39). In line with the development of specialisation in orthopaedic care, there is an increasing demand for specialisation within and between HSCP services.

The following table outlines the continuum of care and where services are provided in the current model of care.

Continuum of Care	Where the services are delivered
• Prevention • Assessment • Treatment • Rehabilitation post-surgery or trauma • Re – ablement • Long-term gain	• Primary Care Teams • Network Services in Primary Care • Musculoskeletal Triage Assessment Clinics • Acute services Outpatients • Acute Services Inpatients - Post-operative care - Rehabilitation within acute services or specialist centres.

Table Continuum of Care and Service Settings

Service integration, as well as multidisciplinary care and interdisciplinary care are key to the delivery of care from health and social care professionals. (Quality Watch, 2014).

7.3 HSCPS AND CLINICAL PATHWAyS

Defining clinical pathways can make a significant difference in clinical outcomes for patients affected by musculoskeletal injury. Examples of HSCPs' role in such pathways are detailed in the UK document MSK Toolkit – Maximising allied health professionals' contribution to the delivery of high quality, and cost effective patient care' (NHS London).

Adequate rehabilitation in the appropriate setting ensures that patients realise their functional potential; it also ensures that multidisciplinary intervention consistently benefits patients across the rehabilitation continuum.

Specialist Area	General Presenting Conditions	Professions Involved	Comment
Paediatrics	• Talipes Equinovarus • Hip dysplasia • Torticollis • Foot problems • Neonatal assessment • Development delay • General orthopaedic conditions fractures	Dietetics Medical Social Work Occupational Therapy Physiotherapy Podiatry Psychology Speech and Language Therapy	Children with developmental conditions require complex orthopaedic surgery. The relationship between acute and primary care service providers is key to delivering appropriate care to these patients
Spinal	• Spinal treatment ranges from generalised low back pain to • Complex surgery post spinal injury	Medical Social Workers Occupational Therapists Orthotists Physiotherapy Psychology Speech and Language Therapists	Delivery of care in a variety of settings from primary care to specialist rehabilitation post spinal injury.
Joint Arthroplasty	• Pre-admission assessment • Post-operative rehabilitation. • Arthroplasty follow up clinics	Occupational Therapy Physiotherapy Medical Social Work	Therapy led arthroplasty clinics (Occupational Therapy and Physiotherapy)
Lower Limb	• Surgical options for patients with hip and knee problems have greatly increased expectation and demand from young and older patients & athletes • Ankle / foot surgery	Medical Social Work Occupational Therapy Physiotherapy Podiatry	Occupational Therapy, Physiotherapy provided essential pre op and follow up care for, hip and knee problems and combined with Podiatry for foot problems. Custom made Orthotics
Upper Limb	• Advances in shoulder and elbow joint replacement have improved quality of life for many patients in particular those with advanced pain and disability. • Management of upper limb tendonitis / nerve compressions / pain	Medical Social Work Occupational Therapy Physiotherapy	Occupational Therapy and Physiotherapy Led upper limb clinics
Hand Surgery	• Tendon lacerations / ruptures • Nerve lacerations / ruptures • Blood vessel lacerations • Fractures • Joint replacements	Medical Social Work Occupational Therapy Physiotherapy	Surgical and therapy management of hand injuries is very advanced and therapy interventions have ensured that patients with extensive injuries have improved outcomes when seen by an occupational therapist with expertise in hand therapy. Specialist pre and postoperative care.

7.4 HSCP REGULATION, COMPETENCY AND GRADING STRUCTURE

7.4.1 Professional regulation

CORU, the health and social care professionals' Regulator, was established in 2005 in accordance with the Health and Social Care Professionals Act 2005, as amended. CORU comprises the Health and Social Care Professionals Council and 12 Registration Boards, one for each profession named in the Act.

The role of CORU is to protect the public by promoting high standards of professional conduct, education, training and competence through statutory registration of health and social care professionals.

7.4.2 Competency and grading structure

In 2008, the Therapy Project Office HSE developed a framework to identify the professional competencies of therapists across the three professions of occupational therapy, physiotherapy and speech and language therapy.

Areas of competency are outlined as follows:

Profession	Competency
Occupational Therapy	• Occupational Therapy Process • Communication • Practice Responsibilities • Education and Development
Physiotherapy	• Professional Practice • Providing a Quality Service • Education and Development
Speech and Language Therapy	• Professional Practice • Providing a Quality Service • Education and Development

The following outlines the Therapy Projects Office competency framework as it applies to physiotherapy, as an example. This is replicated for the other professions in relation to the competencies listed above.

Grade	Competency	Competency required in
Staff Grade Graduate/ Entry level	Professional Practice	Professionalism Communication
	Providing a Quality Service	Caseload Management Assessment Intervention Documentation Providing and Maintaining a Quality Service Research and Evidence based Practice
	Education and Development	CPD Education
	Providing a Quality Service	Planning and Maintaining a Quality Service Leadership and Service Development Managing People Research and Evidence Based Practice
	Education and Development	Acting as a Clinical resource CPD Education

Senior	Professional Practice	
	Providing a Quality Service	Planning and maintaining a quality service Leadership and Service Development Managing people Research and Evidence Based Practice
	Education and Development	Acting as a Clinical Resource Continuing Professional Development Education
Clinical Specialist	Professional Practice	As for senior with increased competency level
	Providing a Quality Service	As for senior with increased competency level and specific competency requirements for • Evidence Based Practice • Research (dedicated time commitment for this role)
	Education and Development	Acting as a Clinical Resource Continuing Professional Development Education
Advanced Practice	Autonomy	Advanced Practitioners are accountable and responsible for advanced decision making and caseload management, applying critical thinking skills to practice
	Expert Clinical Practice	Advanced Practitioners demonstrate high level of clinical skills and knowledge in addition to post graduate qualification (generally at least to level 9 or equivalent as determined by the professional body) and a commitment to continuing education, leading to development of advanced competencies in their area of practice.
	Clinical Leadership	Advanced Practitioners continually evaluate their practice and incorporate new information and knowledge to develop and allow innovative practice. They actively engage in a two way process of supervision and educate members of their own profession and other health care professionals in their area of expertise.
	Research	Advanced Practitioners incorporate research and audit into practice, continually appraise new information to develop and maintain competencies, and lead evidence based practice.

Table Grade and Competency for Physiotherapy as a sample of HSCP Competency frameworks

7.5 WORKFORCE PLANNING FOR HSCPS

Orthopaedic surgery requires appropriate HSCP services to deliver comprehensive orthopaedic services. Currently, there is no workforce plan in place that is specific to HSCPs working in orthopaedics in the Irish healthcare setting.

The following are the priority workforce issues for HSCPs:

- Staffing
- Recruitment and retention
- Development pathways of care between primary and secondary care
- Competency and grade
- Education and training
- Research and evidence-based practice

7.5.1 HSCP staffing

Little or no data exist to assist in determining HSCP service requirements for patients with orthopaedic complaints. The existing recommended staffing ratios in some areas are based on complexity, and some ratios have not been updated for a number of years.

To estimate staffing requirements in the short term, existing staff-to-patient complexity ratios can be matched to HIPE data, in order to identify staffing for all services including trauma and orthopaedic services. The competency analysis for the professions can then be used to determine the appropriate grade for the service being provided, based on the complexity and capacity demand.

Sufficient resources are required in order to ensure appropriate service provision, staff, student and postgraduate training, as well as adherence to agreed protocols and standards of care, including targets on throughput and discharge.

The HSCP caseload and the number of staff required to provide the service will depend on many factors, including the type of patients/casemix, experience of managing a specific condition and other non-clinical responsibilities, such as staff supervision, teaching and research, skill mix of the team, and expertise and use of a wide variety of grades, including therapy assistants.

7.5.2 Recruitment and retention

Efficient recruitment processes are required in order to ensure continuity of services. It is also important that these processes facilitate the recruitment and retention of staff with specialist skills. Delays in recruitment and recruiting from generic panels are challenging the delivery of services.

Given the complex nature of certain services within orthopaedics, HSCP services need to ensure that backfill for leave entitlements is appropriately managed, so as to guarantee that cover is provided by clinicians who are skilled in this speciality.

Succession planning is also required, in order to ensure that where skills in trauma and orthopaedics are developed, staff are retained and can develop further in this area. It is also important that the development of roles at senior, clinical specialist and advanced practice levels are supported, in order to deliver more effective and efficient services and provide career progression within the specialty of orthopaedics.

7.5.3 Development of pathways of care between primary and secondary care

The restructuring of orthopaedic services will require health and social care professionals to be involved in designing pathways of care between the newly formed hospital groups and the community health organisations in each geographical area. This will require the following:

- The continuum of care will need to be mapped in the various service settings in order to support recovery before and after orthopaedic surgery
- The development of financial and budget systems that support the delivery of the pathways of care e.g., funding for home equipment on the patient's discharge and continuation of therapy services should not obstruct the pathway of care and cause delayed discharge or follow-up care
- Addressing the levels of service and competency, so as to ensure access to timely post-operative orthopaedic care that is in line with agreed guidelines and protocols
- Staff in both primary and secondary care need to work collaboratively to meet the requirement for general and specialist orthopaedic intervention
- Integrated pathways of care need to be developed
- An early supported discharge scheme is desirable for elderly trauma patients.

HSCPs also enhance the interface between orthopaedic secondary care and GPs with initiatives such as interface clinics or common assessment teams (CATS).

7.5.4 HSCPs' competency

Referral to competent registered (registration pending) HSCPs is critical for the successful delivery of the model of care within orthopaedics.

HSCPs' skills, competency and grade need to be considered in service planning, recruitment, continuous professional development and training requirements, in order to ensure that safe, effective and efficient pathways of care are delivered for orthopaedic services.

Service developments such as those for advanced practice require the development of competency frameworks and new methods for skills acquisition in relation to developing roles.

7.5.5 Competency in specialist area – upper limb/hand therapy

Hand therapy is one example of specialist HSCP services. It is provided by skilled hand therapists to patients who have suffered hand injury or disease. Hand therapists may be either qualified occupational therapists or physiotherapists who, through advanced continuing education, clinical experience and independent study, have gained proficiency in the treatment of upper extremity conditions resulting from trauma, disease, or congenital or acquired deformity (EFSHT, 2012). Therapists restore hand function using specialist assessment and therapeutic skills. The role of the specialist hand therapist in hand therapy is outlined as follows:

- The assessment and restoration of function after hand and upper limb disorders, surgery or trauma: this is crucial in

supporting an orthopaedic and trauma service to optimise the patient's functional recovery. Knowledge of pathology, physiology, anatomy, kinesiology, biomechanics and evidence-based practice are essential in order to tailor each assessment and treatment intervention

- A comprehensive hand therapy assessment includes the full musculoskeletal assessment and differential diagnosis. The therapist also considers the psychological, emotional, employment and social implications of every injury as an integral part of the overall management
- Restoration of hand function using a variety of therapeutic modalities: core skills include wound care, oedema management, exercise therapy, desensitisation techniques, scar management, sensory re-education, pain management, manual therapy, electrotherapy, training in activities of daily living (ADLs), occupational activity, ergonomic modification, activity modification, vocational assessment, work hardening/retraining and education of patients
- Splinting is an essential skill and is an integral part of the management of hand trauma. Customised static / mobilisation splinting (static progressive and dynamic) and prefabricated static are used to facilitate a variety of therapeutic goals, including wound/joint/limb protection, stabilisation and/or mobilisation
- Provision of assistive enabling devices/equipment is an integral component of occupational therapy where the patient's limitations are overcome, and continued independence in functional tasks is promoted and maximised
- Addressing the psychosocial elements and the psychological components of injury and the associated issues, including, for example, role performance and coping skills.

7.6 HSCP GRADING STRUCTURE FOR ORTHOPAEDIC SERVICES

Demand, the service complexity and the proposed role within trauma and orthopaedic team will determine the appropriate grade required.

Grade	Responsibility/ Value to Orthopaedic Services
Staff Grade Graduate/Entry Level	• Rotate between clinical areas within hospital based on service demand, are initially gaining experience from senior staff in that area • Work in dedicated teams in Primary Care • Have professional specific knowledge and skills which contribute to orthopaedic services. • Provide assessment and treatment in collaboration with other health and social care professionals • Translate research evidence and use it to implement effective interventions; • Prepare and present appropriate information to the senior health and social care professional to support operational and strategic planning. • Provide under graduate training under supervision of clinical tutor and senior clinician.
Senior HSCP	• Dedicated to specific areas e.g. Orthopaedic Inpatients or Outpatients to manage the caseload, staff and liaise with service managers and ensure best use of resources within that area. • Deliver services with higher level of clinical competency • Lead clinical developments in line with evidence based practice. • Apply research outcomes to improve the delivery of service • Provide advanced assessments and interventions in complex cases and as part of a multidisciplinary team approach. • Plan and implement individual and group interventions, discharge, follow up and onward referrals. • Provide training and support to staff and assistant health and social care professionals; • Provide under graduate training under supervision of clinical tutor, practice educator (where available) or senior therapist.
Advanced Practitioners/ Clinical Specialist HSCP	• Provide specialist expertise e.g. hands therapy at advanced level. • Developing standards of practice; • Engaging in research, • Evaluating outcomes and effectiveness of services; • Contributing to strategic planning and delivery of services; • Provide education and training of health and social care professionals, medical and nursing colleagues. • Work at advanced level with orthopaedic surgeons in triage clinics providing advanced level assessments to support waiting list management.

Therapy Assistant Employed as Occupational Therapy Assistants or Physiotherapy Assistants.	• Are employed to work under the supervision of appropriate staff grade, senior and clinical specialist health and social care professionals • Provide assistance in patient handling, supervision of patients doing exercises and daily living skills so therapist's skills can be appropriately used for patients requiring assessment, diagnosis and initial treatments. • The Expert Group on Various Health Professions (2000) report "the introduction of Assistant health and social care professional has the potential to provide the very necessary practical support for health and social care professionals in the delivery of an efficient and effective service".

Table Grading and responsibility for therapy professions.
Note: Medical Social Work and Psychology have alternative grading structure.

7.6.1 Advanced practice for health and social care professions

In recent years a growing number of therapists have been developing their role as advanced practice practitioner (sometimes referred to as extended scope practitioners (ESPs) or advanced practice practitioners. The impact has been twofold, in that the waiting list for the consultant has reduced and a greater number of patients have been triaged through the therapy-led clinic and listed directly for surgery with the consultant orthopaedic surgeon. This development impacts on the workload of the consultant, who clinically governs such a service.

One such initiative, musculoskeletal physiotherapy clinics were introduced in 2012 by the Orthopaedic and Rheumatology Clinical Programmes where physiotherapists were assigned as clinical specialists to triage patients on the rheumatology and orthopaedic waiting lists. Data from this programme indicate proven benefits in waiting list management and patient satisfaction with the initiative.

In several hospitals Occupational Therapy Practitioners have developed emergency department hand services. In addition, in some hospitals Occupational Therapy Departments have established, a holistic comprehensive hand therapy service for patients referred from orthopaedic clinics with elbow, wrist and hand pathology. There are also integrated hand therapy services (Occupational Therapist and Physiotherapist working in generic roles) which have been established in Ireland which provide hand therapy to plastic surgery teams. Hand therapy led clinics can manage certain hand surgical conditions in the orthopaedic trauma clinic following the initial assessment initially by the orthopaedic surgeons.

Over the past decade, specialist occupational therapists working as hand therapists have facilitated the development of ESP clinics within the United Kingdom and Ireland. A review of the literature on ESP in the area of hand therapy identified a series of clinical audits and research which indicate that ESP clinics have the potential to improve the patient pathway by providing earlier access to a specialist opinion for diagnosis and management of both trauma and planned hand conditions, thereby improving service delivery (Katsoulis et al., 2005; Branstiter et al., 2010; BJHT, Peck F et al.; 2001, Lee-Rose et al. 2009; Warick et al., 2004; Imperial College Healthcare NHS Trust, 2010; BJPS, 2004).

In orthopaedic trauma clinics, physiotherapists undertake post-operative management of upper and lower limb orthopaedic cases, in line with agreed protocols. Appropriate resources, including time and training, will be required in order to ensure that such extended roles are supported for occupational therapists and physiotherapists alike. There is potential for similar initiatives in podiatry. These developments impact favourably on the appropriate use of consultant and medical staff time.

7.6.2 Education and training

HSCPs undertake undergraduate and postgraduate training to various levels including PhD level. In line with CORU's requirements for state registration, they are responsible for keeping their skills up to date and for developing skills and competencies in line with improved models of care and service demands.
Time and resources must therefore be available for post-qualification education, both in-service and externally.

7.6.3 Research

There is a growing need to evaluate whether our health services are operating efficiently, whether they are engaging in evidence based practice and whether they are meeting our performance goals such as achieving desired treatment outcomes. Frontline health and social care professionals are well placed to actively lead such enquiry in our complex and sometimes hard to define real world health services. (2011 Survey of Research Activity, Skills and Training needs of HSCPs in Ireland).

HSCPs can contribute significantly to advancements in orthopaedic treatment of musculoskeletal disease through research, thereby leading to a reduction in disability, with its inherent personal and social costs.

7.7 HSCPS' ROLE AND STAFFING

The HSCP discipline role in the orthopaedic model of care is outlined below for:

- Dietetics
- Occupational therapy
- Physiotherapy
- Podiatry
- Speech and language therapy

The role and staffing requirements for each discipline are outlined. A section on hand therapy and the role of occupational therapy and physiotherapy is also included.

7.8 DIETETICS

7.8.1 Dietetics role

Nutrition contributes to health and the ability to recover from illness. All patients undergoing orthopaedic procedures should have a nutritional screening undertaken at the pre-operative assessment clinic, or on admission, to identify malnutrition risk. Patients who have pre-existing dietary requirements such as diabetes, chronic kidney disease, etc should also be identified as having special dietary requirements on admission.

Malnutrition is very common and one of the strongest predictors of poor outcomes after orthopaedic surgery (Jensen 1982) and after hip fractures (Batella- Carretero, 2012). The primary aim of dietetic management in orthopaedics and rehabilitation following surgery is to promote normal nutritional status, thereby optimising functional status, reducing medical complication rates and minimising length of stay. Correction of nutritional depletion and attention to abnormal biochemical parameters is often required before physical therapies can maximise their intervention to improve functional status.

The role of the dietitian in orthopaedics and rehabilitation is to assess a client's nutrition-related needs, implement a nutrition care plan, provide regular monitoring of dietetic intervention and participate in discharge planning. Nutrition care plans involve consultation with food services, provision of therapeutic diets, dietetic counselling, and oral, enteral or occasionally parenteral nutrition support.

In the orthopaedic setting, there are a wide range of co-morbidities which require dietetic intervention in addition to the primary reason for admission:

- Frail elderly- the frail elderly are a significant cohort of orthopaedic trauma and patients. These patients often have a history of falls, low weight, renal disease, diabetes, etc. and should have access to a dietitian to ensure their acute nutritional needs are assessed, and appropriate onward referral e.g. Bone clinic, falls clinic etc
- Dementia- patients with dementia may suffer an acute deterioration in nutritional intake due to, acute illness, pain, change in environment, food service is different to usual meals and meal pattern dissimilar to normal care environment
- Dysphagia- patients with dysphagia require nutrition support advice to meet nutritional requirements on modified consistency diets
- Delayed wound healing/pressure ulcers- patients with increased requirements for wound healing will require nutrition support
- Falls- dietary advice for falls prevention including prevention and treatment of malnutrition and ensuring adequate calcium and vitamin D intakes in those at risk should form part of the dietetic assessment in primary care services.

7.8.2 Staffing

Nutrition assessment, and the training and implementation of nutrition assessment and recognition tools are time consuming and intensive. Appropriately trained and adequate staff ratios would be required in order to provide a quality service.

Staff numbers and the grade of staff required for general inpatient services with a non-specialised acute and planned surgical caseload are dependent on the clinical caseload, length of stay, bed occupancy rate, skill mix of the team and the variety of personnel grades, including support workers.

The size of a dietitian's caseload will depend on many factors, including the type of patients/casemix, the type of nutrition intervention required post assessment, and the dietitian's experience of managing a specific condition. Their other non-clinical responsibilities, such as staff supervision, teaching and research, also need to be taken into account. Further reduction of inpatient length of stay can only be achieved with a significant increase in the levels of dietetic staffing. There is increased cost associated with treatment of infection where the patient has poor nutritional status. Urgent planned cancer patients and those with scoliosis, for example, are usually neurologically intact and, like the general public, they tend to have normal/high BMI. It is essential therefore that the dietetic inpatient service is led by an orthopaedic dietitian.

Clinical nutrition and dietetic professionals use the Australian Faculty of Rehabilitation Medicine for standards in relation to the provision of inpatient adult rehabilitation medicine services in public and private hospitals.

Clinical Nutrition and Dietetic Staff ratio for Orthopaedics for 10 patients

Location of Care	Complexity	Patient Ratio For 10 Inpatients
Orthopaedic inpatients	Amputation	0.4
	Orthopaedic	0.4
	Major Trauma	0.4
	Spinal Cord Dysfunction	0.4
	Reconditioning and Restorative	0.5
	Intensive Care	1.0

7.9 OCCUPATIONAL THERAPY

7.9.1 Occupational therapy role

Occupational therapy is a patient-centred health profession concerned with promoting health and well-being through occupation. The primary goal of occupational therapy is to enable people to participate in the activities of everyday life. Occupational therapists achieve this outcome by working with people and communities to enhance their ability to engage in the occupations they want to, need to, or are expected to, or by modifying the occupation or the environment to better support their occupational engagement (WFOT, 2012).

By promoting health and well-being through the use of occupation, (Law et al., 1998) occupational therapy practitioners play an integral role in the rehabilitation of orthopaedic and trauma patients. Their interventions include maximising the patient's functional independence, making recommendations for services, prescribing enabling technology/assistive devices that are required to ensure the desired performance and participation outcomes in their daily activities.

Facilitating earlier discharges and reducing re-admissions

The occupational therapist plays a key role in the safe and successful discharge of patients and reduces length of stay within the acute setting (Sutton, 1998) and facilitates early discharge (AOTA, 2012). Recommendations are made at various points along a continuum of care to ensure a safe and successful discharge from therapy to home or community living with appropriate integration with PCCC services (including potential care package support) required to address ongoing needs and prevention/ minimization /remediation or management (as applicable) of functional disability.

In addition, occupational therapy practitioners conduct falls risk assessments and environmental/safety/hazards risk assessments, which are effective in decreasing falls in older people (Gillespie et al., 2003; Close et al., 1999), thus reducing the risk of hip, wrist and pelvic fractures. They are also effective in increasing functional ability, (Cameron et al., 2000; Hart et al., 1990; Liddle et al., 1996), reducing risk of falls (Cumming et al., 1999; Pardessus et al., 2002; Gitlin et al., 2001), and reducing the risk of early re-admission.

Promoting independence

Other research demonstrates that occupational therapy improves physical health, mental health, social well-being and life satisfaction (Clarke et al., 2001); improves the quality of life, mood and health status of both patients and caregivers (Graff et al., 2007), and improves functional mobility, self-care and home management activities (AOTA, 2012).

Occupational therapy practitioners play an important role in facilitating early mobilisation, restoring function, preventing further decline, and co-ordinating care, including transition and discharge planning (Bondoc, 2012).

This includes:

- remediating upper extremity weakness and/or abnormal muscle tone through exercise and relevant simulated activities (AOTA, 2012)
- prescribing/fabricating customised splinting to preserve/ improve muscle balance and range of motion (AOTA, 2012)
- assessing and prescribing medical and surgical equipment as well as appliances such as wheelchairs, hoists and assistive technology which are deemed essential for supporting patients at home
- developing home programmes and educating patients, family members and caregivers in how to use the programmes to continue rehabilitation after discharge (AOTA, 2012).

Following orthopaedic trauma/injury

Occupational therapists play a significant role in pre-operative assessment in advance of planned surgery. Research provides strong support for early mobilisation of patients in acute hospital and critical care settings (Needham, 2008).

They provide the following: education, advice and support for patients and their carers on appropriate management techniques and strategies for home exercise programmes; weight bearing status; manual handling techniques; safe functional mobility around the home; compensatory/adaptive techniques with self-care tasks; falls prevention; pain management; fatigue management; tissue viability management; structural adaptation and level of carer support required.

In trauma cases where cognitive sequelae present, the occupational therapist conducts cognitive assessments, and provides recommendations to support the impact of cognitive deficit on activities of daily living. Alternatively, due to a neurological/organic condition, or age-related decline, cognitive deficits may present, and these deficits are then addressed by the treating occupational therapist.

7.9.2 Hand therapy

According to the Hand Therapy Certification Commission (HTCC), "85% of Certified Hand Therapists (CHTs) worldwide are occupational therapists" (www.httc.org/httc). Hand therapy is a specialist area of occupational therapy. It is provided by skilled occupational therapists to patients who have suffered hand injury or disease and who, through advanced continuing education, clinical experience and independent study, have gained proficiency in the treatment of upper extremity conditions resulting from trauma, disease, or from congenital or acquired deformity (EFSHT, 2012).

Early access to occupational therapy hand therapy led clinics ensure better outcome for the patient and can free up orthopaedic consultant clinic slots for other patients. This area of occupational therapy is outlined in section 7.4.2 where the competency required for specialists areas is described (Katsoulis et al, 2005).

Occupational therapists working in orthopaedics / hand therapy require the following:

- provision of an appropriate treatment space for assessing / treating patients including splinting area and for storage of consumables
- necessary equipment including splint pans, wax bath, fluidotherapy machine, hydroculator, CPM machines for elbow, wrist and hand
- adequate administrative support is essential to enable the occupational therapist to practise effectively
- opportunity for referral to other services such as counsellors, clinical psychologists and pain management clinics.

Vocational rehabilitation

Many patients who present to an occupational therapy practitioner in an orthopaedic/trauma service have either been injured on the job, or have an injury which may impact on their ability to continue to work, or to return to their job. A specialist assessment is conducted by the occupational therapist to determine the patient's ability to continue working, to return to their job, or to alternative work. Utilising their knowledge of surgical and medical interventions and the disease process, the occupational therapist compares the patient's health status, body functions and structures to the demands of a job and a work environment.

A study entitled Vocational Rehabilitation For Clients With Chronic Pain And Musculoskeletal Disorders In Ireland: A Handbook For Occupational Therapists was undertaken in 2012. The publication details the valuable role which occupational therapy contributes to this growing field.

7.9.3 Occupational therapy staffing

The number and grade of occupational therapy practitioners is dependent on several factors, including the complexity of the caseload covered, the bed occupancy rate, the average length of stay for inpatients, and the duration of treatment for outpatients. Additional factors such as the availability of intensive rehabilitation, step-down rehabilitation beds and discharge co-ordination will impact on clinical outcomes. Specialised surgery, including surgery on the spine and hand, and major trauma and complex revisions will all require more intensive occupational therapy input, when compared with routine, planned orthopaedic or joint replacement cases.

Staffing ratios for occupational therapists specialising in hand/upper limb therapy should be based on the patient's complexity and needs. Complexity and a patient's unique presentation will dictate the frequency, intensity and duration of therapeutic input and are not specifically related to the number of patients per consultant, or the number of consultants in a facility.

Effective rehabilitation management requires regular, timely and sometimes highly intensive interventions and interdisciplinary teamwork, as well as a holistic patient-oriented approach. In general, an initial evaluation requires between 45 and 60 minutes, with additional time being allocated if splinting is required. In

instances where complex dynamic (mobilisation) splints are being custom fabricated, additional time is required. Complex treatments are generally allocated 60 minutes, while non-complex treatments such as digital fractures are allocated 30 minutes. An overview of the ratios for different complexities for in and outpatient care is outlined below:

Location of Care	Complexity	Patient Ratio	Volume of patients per / timeframe
Orthopaedic inpatients	High	1:5	1 / hour
	Intermediate	1:10	2 / hour
	Low	1:15	3 / hour
		1:1	1 / hour
		1:1	1 / 45 minutes
		1:1	1 / 30 minutes

Table Occupational Therapy ratios for orthopaedic inpatients and outpatients presenting with different levels of complexity.

Patients presenting with multiple pathologies or with additional complexities, such as patients with cognitive, mental health or emotional dysfunction, dementia and/or learning disabilities, necessitate consideration for their individual preferences and needs. Patients presenting with a high BMI or marked residual neurological deficit may require additional staff input in order to ensure the safety of the staff member and patients alike.

A seven-day service should be available to reduce patient length of stay and optimise safe discharge to their home/alternative environment. Clinical specialist expertise will be required in order to lead the occupational therapy team, and also for the fabrication/ provision of specialist splinting and bracing, and the provision of specialist spinal and complex trauma rehabilitation services.

7.10 PHySIOTHERAPy

7.10.1 Physiotherapy role

Physiotherapy is the health profession with expertise in movement and exercise prescription throughout the lifespan across the health spectrum. Physiotherapy involves specific interventions to individuals and populations where movement and function are, or may be, threatened by illness, ageing, injury, pain, disability, disease, disorder or environmental factors. Such interventions are designed and prescribed to develop, restore and maintain optimal health.

The Irish Society of Chartered Physiotherapists is the sole professional body representing chartered physiotherapists in Ireland. Professional accountability of chartered physiotherapists is clearly defined by the Irish Chartered Society of Physiotherapy (ISCP) in its Rules of Professional Conduct and Scope of Practice. The Irish Society of Chartered Physiotherapists defines the standards for physiotherapy practice in Ireland.

Physiotherapy views movement as central to health and well-being. Physiotherapists aim to identify and make the most of movement ability by health promotion, preventive advice, treatment and rehabilitation. Early and appropriate mobilisation and strengthening – correctly managed in line with the patient's healing and recovery – is essential to ensure that the patient obtains the desired outcomes following orthopaedic surgery.

In many acute orthopaedic centres physiotherapists provide a seven-day service, to facilitate early mobilisation which impacts positively on patient outcome and length of stay. Core skills used by chartered physiotherapists include manual therapy, therapeutic exercise and the application of electrophysical modalities.

Physiotherapists take into account the psychological, cultural and social factors that influence their patients. They aim to involve patients in activities that facilitate maximum independence and function. Inpatient, secondary care, outpatient, rehabilitation and primary care physiotherapy services are necessary in order to support the trauma and orthopaedic services.

Physiotherapists require:

- appropriate equipment to facilitate effective clinical practice, such as parallel/walking bars, continuous passive motion machines, tilt tables, and cryotherapy facilities
- adequate space for providing treatment, as well as safe mobilising areas located near the orthopaedic ward
- a wide range of walking appliances, splints, collars, wrist supports etc. should be available, with access to expertise and facilities for the making of simple, custom-made splints and the provision of appropriate forms of advice
- hydrotherapy should be available for appropriate patients.

7.10.2 Physiotherapy staffing

In order to provide adequate cover for general inpatient services with a non-specialised acute and planned surgical caseload, the following factors must be taken into account:

- The physiotherapy inpatient service must be led by a specialised orthopaedic physiotherapist.
- Staff numbers and type are dependent on the clinical caseload, length of stay, bed occupancy rate and the availability of step-down rehabilitation beds. Cases that require more intensive physiotherapy input, and therefore a higher physiotherapist/patient ratio, are as follows: major trauma, pelvic fractures, specialised spine surgery, major hand cases and complex revision of joint replacements. When in the initial stage of rehabilitation, obese patients and those with co-morbid conditions require additional input and treatment by two or three physiotherapists
- Specialist physiotherapist expertise in the areas of hand surgery and management of patients with neurological, respiratory and paediatric disorders, should be available for consultation
- A seven-day service should be available, in order to optimise patient length of stay
- A 24-hour/seven-day respiratory on-call and emergency service should be available
- Liaison with occupational therapists, podiatrists, orthotists and prosthetists is important in facilitating patients to achieve optimal functioning of patients.

Physiotherapy staffing ratios are currently under review by the Irish Society of Chartered Physiotherapists. Currently, many managers use the UK staffing ratios (Calculating staffing requirements for the physiotherapy profession in Wales, December 2008).

Location of Care	Complexity	Patient Ratio	Volume of patients per / timeframe
Orthopaedic inpatients	High	1:5	1 / hour
	Intermediate	1:10	2 / hour
	Low	1:15	3 / hour
Orthopaedic outpatients	High	1;1	1 / hour
	Intermediate	1;1	1 / 45 minutes
	Low	1:1	1 / 30 minutes
Musculoskeletal Triage		5 patients per 3 hour session (HSE Business Case 2010)	

Table: Physiotherapy ratios for orthopaedic inpatients and outpatients presenting with different levels of complexity.

7.11 PODIATRy

7.11.1 Podiatry role

Podiatrists assess and diagnose foot and ankle pathologies in order to maintain and enhance locomotive function of the feet and legs, alleviate pain, and reduce the impact of disability.

Musculoskeletal biomechanics is an important component of podiatry practice, and involves multidisciplinary and interdisciplinary work across primary, secondary and tertiary care. This collaboration can extend to hospital prosthetists and orthotists in orthotic and therapeutic footwear provision (The Society of Chiropodists and Podiatrists, 2010).

UK data show that musculoskeletal foot and ankle conditions comprise approximately 8% of consultations in general practice (Mentz et al., 2010). Of this cohort, 79% relate to non-traumatic presentations.

Data from UK primary care orthopaedic triage services indicate that, of the referrals received, approximately 70% were seen, managed and discharged without the need for onward referral to a consultant; 60% were managed by podiatry, 20% by physiotherapy, with the remainder referred to other services such as occupational therapy and orthotic services (Watmough et al., 2005).

The role of a podiatrist working within the planned and trauma orthopaedic service includes maximising a patient's functional independence with integration with Primary Community and Continuing Care (PCCC) services. Specifically, it includes the following:

- conservative management of musculoskeletal foot and ankle complaints in adults and children
- requesting appropriate diagnostic tests in relation to foot and ankle conditions
- acting as liaison between primary care podiatry services and the orthopaedic department
- assessing for, and fitting of, insoles, functional orthoses and bracing
- requesting therapeutic footwear.

7.11.2 Podiatry staffing

The level of staffing in terms of numbers and grades required will be dependent on the size and nature of the orthopaedic department concerned.

Location of Care	Complexity	Patient Ratio For 10 Inpatients
Orthopaedic inpatients	1 WTE Specialised foot and ankle surgeon	1 WTE Clinical specialist podiatrist per surgeons caseload
	1 Orthopaedic surgeon with general foot and ankle patients	1/3 WTE Clinical specialist podiatrist per surgeons caseload

Table: Podiatry ratios for orthopaedic inpatients and outpatients presenting with different levels of complexity.

7.12 PROSTHETICS AND ORTHOTICS

7.12.1 Role

Prosthetists and orthotists are health care professionals concerned with the assessment, casting, measuring, and fitting of prosthetic and orthotic devices. They practise often as part of a multidisciplinary team that may include health care professionals such as rehabilitation consultants, consultant orthopaedic surgeons, consultant vascular surgeons, physiotherapists, occupational therapists and podiatrists.

Orthotics is the medical field concerned with the application and manufacture of orthoses, which are devices for the support or correction of the function of a limb or the torso. An orthosis is an externally applied device used to modify the structural and functional characteristics of the neuromuscular and skeletal system. An orthosis may be used to:

- Control, guide, limit and/or immobilise an extremity, joint or body segment for a particular reason
- Restrict movement in a given direction
- Assist movement generally
- Reduce weight bearing forces for a particular purpose
- Aid rehabilitation from fractures after the removal of a cast.

Orthosis are used to correct the shape and/or function of the body, to provide easier movement capability or reduce pain. Sciences such as materials engineering, gait analysis, anatomy and physiology, and psychology contribute to the work done by orthotists.

Prosthetics: A Limb prosthesis is a functional or cosmetic artificial replacement device for any or all parts of a missing extremity. Prosthetics are typically used to replace body parts lost by injury (traumatic), through diseases (most often vascular diseases) or missing from birth (congenital). Prosthetic devices should not be confused with orthotic devices, although in certain circumstances a prosthetic device might end up performing some or all of the same functionary benefits as an orthotic device. Prostheses are technically the complete finished item. For instance, a C-leg knee on its own is not a prosthesis, but only a prosthetic component within a prosthesis. A complete prosthesis consists of the residual limb attachment or suspension system, a socket and all the components, down to and including the distal limb extremity. The provision of a prosthetic service includes a number of sciences such as materials engineering, gait analysis, anatomy and physiology, and psychology.

The HSE orthotist and prosthetist/orthotist are involved in a National Programme for Footwear, Orthotics and Prosthetics, to set out guide lines and regulate prosthetics and orthotics in Ireland.

In 2012 the I.A.P.O. (Irish Association of Prosthetists and Orthotists) was founded and in the process of regulation under CORU.

7.12.2 Staffing

Staffing levels for prosthetists and orthotists in terms of numbers are only available from the NRH and are different for a prosthetist or orthotist.

1 WTE clinical specialist prosthetist per rehabilitation consultant.
0.25 WTE clinical specialist orthotist per rehabilitation consultant or orthopaedic consultant.

Depending on the complexity of the prosthetic or orthotic intervention, treatment times can be from 20 minutes to several hours this includes the time needed to adjust, repair or adapt the prosthesis or orthosis.

7.13 SPEECH AND LANGUAGE THERAPY

7.13.1 Speech and language therapy role

Speech and Language Therapists (SLT) have core clinical skills and expertise to identify, assess, diagnose and manage swallowing (dysphagia), cognitive linguistic and communication difficulties associated with trauma and orthopaedic injuries.

SLT's work across a wide range of clinical specialties which includes orthopaedic and trauma admissions. SLT intervention is most likely to be required where a patient has experienced significant or poly trauma, or for those with spinal cord injury.

The SLT's role includes:

- Within critical care, SLT's work as an integral member of the multidisciplinary team with ventilator dependent and tracheotomised patients targeting (laryngeal) weaning to enable return of laryngeal sensory and motor function to enhance management of dysphagia and facilitate communication
- Instrumental evaluation of swallowing physiology is conducted by SLT's when clinically indicated to obtain an objective measure of swallow function i.e. Fibreoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopy (VFU), in line with best practise models of care
- SLT's role within rehabilitation is to assess, diagnose and manage swallowing and/or communication difficulties through identification of rehabilitation goals and provision of therapeutic programmes to optimise and maintain function
- SLT's provide ongoing education and support to families and carers about clinical findings, rehabilitation goals and therapy programmes
- Provision of education and training resources for therapy profession, wider MDT, patients and their families
- SLT's have a role in patient advocacy. Patients who have communication difficulties, or who are medically unwell with associated swallowing difficulties, are particularly vulnerable. The SLT may act as a patient advocate during healthcare decision making and multidisciplinary team working;
- Engage in clinical audit and research to ensure best practice
- Engage in development of clinical care pathways to ensure standards of care
- Pre-operative input for planned spine surgery to inform/ counsel patients when dysphagia and dysphonia already exist, or possible post surgery.

7.13.2 Speech and language therapy staffing

Requirements of patients on orthopaedic and trauma wards will be predicated by caseload and case complexity, and therefore staffing requirements will vary accordingly. SLT intervention may be required at various stages of the patient journey – for example, in pre-operative assessment clinics, acute inpatient treatment, inpatient rehabilitation and outpatient treatment in the community, or in acute/post-acute sites.

There are currently no published staffing standards for SLT service to a general orthopaedic/trauma population. Staffing based on referral rates and complexity of presentation should be provided. For complex presentations and patients with critical care requirements SLT staff with senior skills will be required to deliver the service.

Location of Care	Complexity	Patient Ratio For 10 Inpatients
Orthopaedic inpatients	Acute Spinal unit	1 WTE Clinical Specialist SLT
	Orthopaedic Ward	0.25 WTE Staff Grade SLT

Table: Speech and Language Therapy ratios for orthopaedic inpatients and outpatients presenting with different levels of complexity.

7.14 PHARMACy

Pharmacy is a distinct profession governed by a separate regulatory authority, the Pharmaceutical Society of Ireland, and with a distinct legislative framework, the Pharmacy Act 2008.

Scope

All pharmacists are highly trained health care professionals, who undertake specialist undergraduate and postgraduate study before registration with the Pharmaceutical Society of Ireland. This training and registration is required irrespective of the different practice settings in which pharmacists may deliver care – community, hospital, industry or academia.

Within the hospital setting in particular, pharmacists have established further expertise and specialisation in particular areas of clinical practice, such as trauma and orthopaedics.
Pharmaceutical technicians assist the pharmacist in their duties and typically have undertaken specialist training to diploma level. However, they are not registered professionals and must work under the supervision of a registered pharmacist.

Role (general)

Pharmacists are experts in medication, and their duty of care extends beyond the traditional perceived role as the suppliers of medication to maximising the therapeutic effects of drugs to individual patients while minimising associated risks and respecting patient choice.

Given the significant advances in drug therapy in recent years and the central role of medication in the management of the majority of patient conditions, all patients and all specialities will have contact with pharmacy services. As such, pharmacists are an integral part of the multidisciplinary team.

Role (trauma and orthopaedics)

There are specific roles for the hospital pharmacist working in trauma and orthopaedics. These can be grouped under supply-related medicines management functions and clinical pharmacy activities.

Medicine Management

- Procurement and supply
  Pharmacists maintain the pharmaceutical supply chain for patients and those involved in their care. Medications are complex, regulated products and do not lend themselves to general procurement practices. Pharmacists in a hospital setting maintain supply of medication for other medical conditions that the patient may be taking. In specialities such as orthopaedics, pharmacists are involved in the sourcing and supply of specialist products, an example for orthopaedics would be specific products such as bone clement.

- Medicines evaluation
  Principally related to new chemical entities, pharmacists use their expertise by evaluating medications for efficacy in clinical use, place in therapy, presentation, cost effectiveness, and safety.

  Formulary maintenance is the remit of the pharmacy department. The formulary is reviewed regularly and streamlined as appropriate taking into account changes in clinical practice. Submissions for formulary additions are made to the pharmacy department who in turn present them after review to the Drugs and Therapeutic Committee ensuring an objective assessment.

- Aseptic services
  The Joint Commission International quality standards require that medication be supplied by pharmacy departments “in the most ready to use form”.

  Thus, pharmacy aseptic compounding units prepare ready-to-use injectable products to reduce the risk of error and contamination that may occur from preparation at point of use.

Clinical Pharmacy

Clinical pharmacy has been demonstrated to reduce mortality and morbidity in the hospital setting (Bond and Raehl, 2007). With specific reference to orthopaedics, in the paper “Prevention of Medication Errors” the American Academy of Orthopaedic Surgeons (AAOS) states that “One of the least expensive and most easily accessed tools is the utilization of staff pharmacists when making medication decisions”. (AAOS, 2013).

- Pre-assessment
  For planned orthopaedic procedures patients are, generally, reviewed in an anaesthetic-led pre-assessment clinic where they are medically evaluated for suitability for surgery. At this stage a pharmacist can take a medication history, note drug allergies, previous problems with medications (adverse events, ineffective, potential interactions etc), ensure smooth transition with medication

continuity and peri-operative "holding" of drugs where appropriate.

- Admission
  In both planned and trauma admissions it is important to have a full medication reconciliation, to ensure all information regarding the patient's medication history is captured. Arrangements must be put in place to ensure prompt continuity of medication, especially difficult when there is an emergency admission.

- Ward Service
  It is critical that an active Clinical Pharmacy service is available at ward level. Ideally, the appropriateness of any medication should be assessed by a Clinical Pharmacist prior to the first dose, and if not, as soon as possible after the medication has been initiated. Some key areas are expanded upon below:

  Pain Management - This is a crucial part of medication use in the orthopaedic setting. Pharmacist involvement in pain rounds and the management of pain, in general, can help optimise drug choice and minimise adverse events.

  Antibiotic Use - Clinical pharmacists play a vital role in the safe, appropriate and effective use of antibiotics for orthopaedic patients, both in prophylaxis and treatment and many hospitals have dedicated SARI pharmacists to undertake this role

  Discharge - The seamless transition of the patient from hospital to community is an important patient safety role. Many patients leaving the orthopaedic setting will be on new medications (for pain, thromboprophylaxis, etc) so ensuring the prescription is correct, the patient is counselled on the new drugs and the medication is available in the community are important pharmacy functions.

- Medicine information
  With an increasing complexity of medications and the medication regimes of individual patients, the need for up-to-date and knowledgeable medicines information for all professionals is more pronounced. The appropriateness of a given medication in a particular patient, given their medical history and concurrent medications is an important safety issue. Pharmacists provide this service at local level in their own departments, with dedicated medicines information pharmacists in some of the larger teaching hospitals.

- Audit
  The value of monitoring practice cannot be over emphasised. Audit performs this function in terms of ensuring compliance with guidelines. In the orthopaedic setting this includes monitoring adherence to guidelines on thromboprophylaxis.

- Policy Formation
  Development of polices for the safe and appropriate use of medication is fundamental to providing quality healthcare. Pharmacists' expertise is crucial to this process. Policy development committees allow for a multi-disciplinary approach and pharmacists are heavily involved in committees overseeing medication use such as Drug and Therapeutics, Medication Management, Pain Management, Infection Control, paediatrics, etc.

Regulation

Pharmacy and pharmacists are protected terms which can only be used by premises and professionals registered with the Pharmaceutical Society of Ireland (PSI) and regulated under the terms of the Pharmacy Act 2007. Only registered pharmacies/ pharmacists can provide pharmacy services, be it supply of pharmaceutical goods or clinical services associated with the concept of "pharmaceutical care". Each registered pharmacy, in all practice settings, must have a superintendant pharmacist who is professionally and legally responsible for the pharmacy services delivered by the registered pharmacy business.

Competency

Professional regulation with the PSI requires all registered pharmacists to operate within a core competency framework and to participate in Continual Professional Development (CPD). The latter is managed via the professional college, the Irish Institute of Pharmacy (IIoP).

In addition, there are opportunities for pharmacists to obtain further postgraduate qualifications in specialist areas of practice e.g. MSc in Community Pharmacy, MSc in Clinical Pharmacy.

Grading

Different grading structures may exist in different practice settings, across public and private sectors.

In hospital pharmacy practice in Ireland, there are four recognised

pharmacist grades. However, there has been a comprehensive review of this structure and this grading structure is in the process (as at June 2015) of being changed significantly, with the introduction of clinical pharmacy specialists and associated grades. The latter will provide an opportunity for those pharmacists working in specialities such as trauma and orthopaedics to have this more formally recognised in their grading.

Pharmacy Workforce Planning –Staffing

At present, there are limited hospital pharmacy staffing posts and consequently limited numbers of pharmacists, restricting the ability to deliver specialist pharmacy services, However, the ongoing Pharmacy Care 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.

In terms of international comparators for orthopaedics, the standards for hospital clinical pharmacy practice produced by the Society of Hospital Pharmacists of Australia recommend a ratio of 1 WTE clinical pharmacist for every 25 inpatient beds, based on a 5-day week service. Additional staffing would be required for medication management services, outpatient clinic services, etc.

Abbreviations / Glossary of Terms

AAC	Alternative and Augmentative Communication
ABF	Activity Based Funding
ABI	Acquired Brain Injury
ACETABULUM	The cup shaped socket at the hip joint.
ACL	Anterior Cruciate Ligament
ADL	Activities of Daily Living
AHP	Allied Health Professional
AIS	Abbreviated Injury Scale
AMO	Attending Medical Officer
ANP	Advanced Nurse Practitioner
AOP	Association of Orthopaedic Practitioners
ARTHRODESIS	Fusion of a joint by bone, as a planned outcome of a surgical procedure
ASCI	Acute Spinal Cord Injury
AvLOS	Average Length of Stay
BMI	Body Mass Index
BOA	British Orthopaedic Association
BOI	Burden of Illness
BPF	Best Practice Framework
BPT	Best Practice Tariff
CAPNOGRAPHY	Is the monitoring of the concentration or partial pressure of carbon dioxide (CO2) in the respiratory gases
CATS	Common Assessment Teams
CCST	Certificate of Completion of Specialist Training
CCrISP	Care of the Critically Ill Surgical Patient
CELL SAVER	Commonly known as a “cell saver”, the intraoperative cell salvage machine suctions, washes, and filters blood so it can be given back to the patient’s body instead of being thrown away.
CNM	Clinical Nurse Manager
CNOH	Cappagh National Orthopaedic Hospital
CNS	Clinical Nurse Specialist
CPD	Continuous Professional Development
CONTRACTURE	A permanent shortening of a muscle or joint
CT	Computerised Tomography
CTEV	Congenital Talipes Equinovarus
CUH	Children’s University Hospital, Temple St.
CUH	Cork University Hospital
DALYS	Disability Adjusted Life-Years
DDH	Developmental Dysplasia of the Hip
DEXA	Dual-Energy X-ray Absorptiometry. Scan that is used to measure bone density and assess the risk of bone fractures. It is often used to help diagnose bone-related conditions such as osteoporosis (or the risk of developing it).
DH	Department of Health (UK)
DoH	Department of Health
DNA	Did Not Attend
DOSA	Day of Surgery Admission
DRG	Diagnostic Related Group
DSD	Degenerative Spinal Disease
DYSPHAGIA	Difficulty Swallowing
ED	Emergency Department
EMP	National Emergency Medicine Programme
ESP	Enhanced Scope Physiotherapist
EWTD	European Working Time Directive
FAW	Forced Air Warming
FEES	Fibreoptic Endoscopic Evaluation of Swallowing
FLS	Fracture Liaison Service
FRACTURE	A fracture is a break in the continuity of the bone usually as a result of four main causes: a single traumatic incident, stress fracture, fragility fracture or pathological fracture.
FVC	Forced Vital Capacity
GCS	Glasgow Coma Scale
GMC	General Medical Council
GP	General Practitioner
GPRD	General Practice Research Database
HCA	Health Care Assistant
HDU	High Dependency Unit
HEPA	High Efficiency Particulate Air
HG	Hospital Group
HIPE	Hospital Inpatient Enquiry Scheme
HIQA	Health Information and Quality Authority
HSCP	Health and Social Care Professionals
HSSD	Hospital Sterile Supply Department
HSE	Health Service Executive
HTA	Health Technology Assessment
IAPO	Irish Association of Prosthetists and Orthotists
IASM	Irish Audit of Surgical Mortality
ICP	Integrated Care Pathway
ICT	Information and Communications Technology
ICU	Intensive Care Unit
IHFD	Irish Hip Fracture Database
IITOS	Irish Institute for Trauma and Orthopaedic Surgery
ILEUS	A painful obstruction of the ileum or other part of the intestine
INOR	Irish National Orthopaedic Register
ISS	Injury Severity Score
JCST	Joint Committee on Surgical Training
KPI	Key Performance Indictor

K-WIRE	Kirschener wires. Surgical wires that are used to hold bone in a corrected position following surgery.
LGH	Letterkenny General Hospital
MDT	Multidisciplinary Team
MFTP	Money Follows The Patient
MMUH	Mater Misericordiae University Hospital
MPUH	Merlin Park University Hospital
MRC	Medical Research Council
MRI	Magnetic Resonance Imaging
MRSA	Methicillin-Resistant Staphylococcus Aureus. A bacterium responsible for several difficult-to-treat infections in humans
MSD	Musculoskeletal Diseases
MSK	Musculoskeletal
MTC	Major Trauma Centre
NCAPOP	National Council on Aging and Older People
NoFF	Neck of Femur Fracture. A fracture near the top end of the femur or neck of the femur close to the hip joint, usually occurring in the elderly.
NCH	New Children's Hospital
NCHD	Non Consultant Hospital Doctor
NCPCC	National Clinical Programme for Critical Care
NCPS	National Clinical Programme in Surgery
NEMA	National Emergency Medicine Audit
NHS	National Health System
NICE	National Institute for Health and Care Excellence
NIMIS	National Integrated Medical Imaging System
NMBI	Nursing and Midwifery Board of Ireland
NOCA	National Office of Clinical Audit
NPO	Nil Per Os. (Nothing by Mouth). A medical instruction meaning to withhold oral food and fluids from a patient for various reasons.
NRH	National Rehabilitation Hospital
NSIU	National Spinal Injuries Unit
NTAC	National Trauma Audit Committee
OA	Osteoarthritis
ODA	Operating Department Assistant
ODP	Operating Department Practitioner
OECD	Organisation for Economic Co-operation and Development
OLCHC	Our Lady's Children's Hospital Crumlin
ONMSD	Office of the Nursing and Midwifery Services Director
OPD	Outpatient Department
ORIF	Open Reduction Internal Fixation
OSPIP	Outpatient Services Performance Improvement Programme
OT	Occupational Therapy
PA	Physician Assistant
PAC	Pre-admission Assessment Clinic
PACS	Picture Archiving and Communication System
PAMS	Professions Allied to Medicine
PbR	Payment by Result
PCC	Peri-operative Care Collaborative
PCCC	Primary Community and Continuing Care
PDS	Professional Development Scheme
PCC	Peri-operative Care Collaborative
PN	Parenteral Nutrition. Feeding a person intravenously, bypassing the usual process of eating and digestion.
PONSETI	Ponseti Method. A manipulative technique that corrects congenital clubfoot without invasive surgery.
PTSD	Post Traumatic Stress Disorder
QPSD	Quality and Patient Safety Division
RACS	Royal Australasian College of Surgeons
RCN	Royal College of Nursing
RGN	Registered General Nurse
RCSENG	Royal College of Surgeons in England
RCSI	Royal College of Surgeons in Ireland
RIMD	Removable Invasive Medical Devices
SA	Surgical Assistant
SAC	Specialist Advisory Committee
SCI	Spinal Cord Injury
SDU	Special Delivery Unit.
SENIC	Study on the Efficacy of Nosocomial Infection Control
SIVUH	South Infirmary Victoria University Hospital
SOP	Standard Operating Procedure
SLT	Speech and Language Therapy
SpR	Specialist Registrar
SSI	Surgical Site Infection
TARN	Trauma Audit and Research Network
THR	Total Hip Replacement is common surgery for those who have suffered damage to their hip joint usually as a result of osteoarthritis, rheumatoid arthritis or hip fracture. The hip joint is removed and replaced by an artificial hip joint.
TKR	Total Knee Replacement
TN	Trauma Network
TPOT	The Productive Operating Theatre

TORTICOLLIS	A condition in which the head becomes persistently turned to one side, often associated with painful muscle spasms.
TOST	Trauma and Orthopaedic Services Team
TU	Trauma Unit
UCA	Ultra Clean Air
UCD	University College Dublin
UCV	Ultra Clean Ventilation
UHG	University Hospital Galway
UHL	University Hospital Limerick
UHW	University Hospital Waterford
VFC	Virtual Fracture Clinic
VFU	Videofluoroscopy
WHO	World Health Organisation
WTE	Whole Time Equivalent

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Appendix 1

Principles of day of surgery admission (DOSA) (NCPS, 2011)

A day of surgery admission (DOSA) refers to a planned, stay case inpatient who is admitted on the day of their intermediate or major surgical procedure, all necessary work-up having been carried out prior to admission. It does not include day cases or minor operations. The ability of a hospital to provide DOSA for multi-day stay planned surgery patients is dependent on maximising quality and efficiency in pre-operative patient management and hospital bed management.

Previous practices of unco-ordinated pre-operative admissions resulted in:

- high cancellation rates of elective cases;
- ineffective theatre utilisation;
- prolonged patient length of stay;
- patients being admitted in late afternoon or evening, often by non-team members, with investigations and consent delayed until the morning of surgery;
- decreased patient satisfaction and psychological stress;
- loss of training opportunities.

DOSA has been shown to improve resource utilisation resulting in:

- Reduced cancellations of planned surgery;
- Better theatre utilisation;
- Improvement in throughput and case-mix;
- reduced patient length of stay and disruption;
- reduced surgical bed requirement;
- reduced running costs of surgical wards;
- reduced waiting time for elective surgery.

The optimal situation is when a patient arrives in hospital on the morning of planned surgery, having attended a pre-admission assessment clinic, is admitted promptly by a nurse or doctor, and then undergoes an anaesthetic assessment. The patient consents to their operation, the operative site is marked by a member of the surgical team, and the patient is then taken to theatre for their procedure.

The DOSA unit

Patients arriving in hospital on the morning of their operation should have been fully pre-assessed within the past month and should have all the information they require. It is essential that their admission bed is protected or 'ring-fenced'. Bed protection can be instituted on regular inpatient wards, but in an environment of unpredictable emergency admissions this is unreliable and it is better to earmark a dedicated area for DOSA admissions. This can be multidisciplinary between surgical specialties and need not be a fully staffed and equipped surgical ward. It requires a waiting area, male and female changing rooms, toilet facilities, secure lockers for patient property and patient medications. A screened examination area and couch is necessary in order to ensure patient comfort and confidentiality. After their surgery, when patients have completed their initial recovery, they will be transferred to th eir designated bed on the 'stay' ward.

The clerical process

On the scheduled day of surgery, patients should attend at the designated time, at which point they will be registered. They should have a consultation with a staff nurse where personal details, documentation and consent are checked. If the patient is scheduled early on the operating list, they are prepared for surgery. A registrar or consultant who is a member of the orthopaedic surg ical team should then review the planned operation and consent, check the investigations (any radiology should have been performed at p re-assessment), and mark the surgical site on the patient.

Medical assessment of DOSA patients

DOSA patients should follow an integrated care pathway (ICP). However, DOSA patients or procedures are, by definition, more complex than their day surgery equivalents. Checks may therefore need to involve more detail and, while repetition will reduce the possibility of error, some repetition is inefficient, wasteful and tiresome for the patient. Nutritional assessment should be performed on all patients in order to pick up malnutrition that would adversely affect clinical outcomes. Similarly, pregnancy testing should be performed where appropriate. Methicillin-resistant staphylococcus aureus (MRSA) screening will have been performed at pre-assessment. In the surgical clinic, the patient will have had a focused and documented history and physical examination. At t he pre-admission assessment clinic, a further history will have been taken and a nurse-led general physical assessment will have been carried out in addition to appropriate pre-operative investigations, with appropriate follow-up of abnormal/positive results in advance of DOSA.

blood transfusion requirements in DOSA patients

A specific difference between DOSA patients and day surgery patients is their increased likelihood of requiring transfusion of blood or blood products. Most patients undergoing surgery only need a group and hold sample, but the sample cannot be used for issu ing group-specific blood or for cross-matching, unless it has been taken in accordance with strict identification procedures, i.e., the patient is asked to identify themselves, and the details are checked against the patient wristband.

If patients only provide a group and hold sample on the morning of surgery, they may go to theatre without their blood group being known to the team and their antibody screen result may not be readily available. Consequently, if the patient needs blood in an emergency, they may have to be given O negative blood.

In order to be sure that the blood group and antibody screen are available during surgery, blood samples can be taken in the pre-admission assessment clinic, but absolute precautions must be taken to exclude ‘wrong blood in tube’ errors. Any precautionary process that is agreed must conform to locally developed practices and guidelines drawn up with laboratory and blood transfusion services.

The protocol currently employed in some hospital units is as follows:

At the pre-admission assessment clinic, the patient is correctly identified, an identity (ID) band is put on, and the patient’s blood sample is then taken. When the patient leaves the pre-admission assessment clinic, the ID band is stored with the patient’s chart until admission. When the patient is admitted, a new ID band is issued. The information on the new ID band must match the patient’s ID band information written at the time the blood sample was taken in the pre-admission clinic. This preserves the link, and makes it possible to use the sample taken at the pre-admission clinic for cross-matching.

Appendix 2

Standard operating procedures for pre-admission assessment clinics

Multidisciplinary pre-admission assessment should occur prior to surgery, with sufficient time for team members to act on any issues raised during the assessment. The assessment should include the following:

- anaesthetic and suitability for surgery review;
- nursing review and information provision about infection control protocols;
- MRSA swabs taken;
- physiotherapy assessment;
- occupational therapy assessment, including functional review;
- discharge and post-operative care planning, with referral for social work assessment if delayed discharge issues arise;
- standardised patient information and education should be provided to enable the patient to give informed consent. Information in languages other than English should be available;
- the clinic assess all planned day surgery and day of surgery admissions (DOSAs);
- working group led by a consultant anaesthetist should be established to oversee the clinic;
- additional staff should include a lead nurse at CNS/CNM2 grade, and adequate support nurses and staff who have the necessary competencies;
- HSCP staff are included in the pre-assessment process, as appropriate;
- the clinic is assigned a discrete area that is in close proximity and concurrent with surgical clinics, where possible;
- investigations, where necessary, are carried out, reported and followed up in a timely manner, according to protocol;
- cancellation of planned surgery rates should be less than 5%;
- activity, patient experience and audit is monitored through the working group at regular meetings.

The patient should be given an information leaflet in the outpatients department. Pre- and post-operative group therapy 'classes' enable efficient use of physiotherapists and other HSCP staff. This concept of pre-habilitation is well established. The patient may benefit from contact with others who have had a similar experience.

Appendix 3

Pre-admission assessment clinics for surgery

Safe and efficient surgical and anaesthetic practice requires an optimised patient. All patients who are due to have planned surgery should undergo outpatient pre-admission assessment that is centred on preparing the patient and their family for the operation.

The primary goals of pre-operative evaluation and preparation are to:

- provide the patient with a hospital identity and records;
- assess the patient's health status, investigate medical risk factors and optimise their condition;
- assess the patient's suitability for DOSA, which should be the standard admission route, unless clinically inappropriate;
- screen for MRSA;
- integrate social, personal, laboratory and radiology information from primary care into hospital records, electronically if possible; educate the patient about any planned surgical and anaesthetic procedures and their pre-admission and pre-operative care plan;
- perform pre-operative investigations and screening, as appropriate, and have a clear process for the management of abnormal results in advance of admission;
- assess the patient's level of independence, home support, social circumstances and expectations;
- begin the discharge process.

Appendix 4

Indicators of quality for DOSA patients

There is a clear ICP for patients undergoing DOSA. As follows:

- admission from the surgical outpatient clinic to discharge;
- DOSA patients' beds are 'ring-fenced', preferably within a discrete unit, and are based on predicted demand;
- there is a designated person responsible for waiting list and admission co-ordination for planned surgery patients;
- pre-admission assessment is undertaken on all DOSA patients;
- Seventy five percent, or more, of elective surgical procedures are performed as DOSAs;
- DOSA activity is monitored by the working group;

Appendix 5

The discharge process

Before admission, all patients are given an estimated length of stay. This should be discussed and agreed with the patient an d their family, and it should be documented. Ideally, for efficient patient flow in the acute hospital sector, the discharge plan should form part of the contract for surgery between primary and secondary care. Perhaps it is time to view the patient journey as a contract between the patient/GP/hospital/surgeon/step-down facility.

At the pre-admission assessment clinic the discharge plan should be confirmed, taking into account the patient's age, co-morbidities, home circumstances and availability of carers after discharge. In order to avoid last-minute cancellations, patients should be instructed to telephone the admissions office if there is any change to their health status. Knowing the patient's post-discharge expectations and any concerns or issues that they might have helps with optimising their health status and allows for planning the support they will require from the primary care team and all relevant HSCP services (medical social work, occupational therapy, physiotherapy, dietetics). Clear protocols should be developed with regard to referrals to all relevant HSCP services. HSCPs should in turn liaise with their colleagues within primary and community care. Access to rehabilitation beds should be available.

The patient's GP should be informed well in advance of the expected admission via a letter written at the time of booking the procedure, or during the pre-admission assessment of the patient; the GP should also be informed about the procedure and the discharge plan for the patient. Where possible, electronic communication between the hospital and the GP should be used. The letter to the GP should be approved by a senior member of the surgical team.

An immediate discharge letter should be issued. This record is of relevance to all hospital medical and nursing staff, HSCPs, GPs, community nurses and pharmacists. The record should ensure that medication changes and instructions for care are clearly highlighted. Clear arrangements should be formalised regarding liaison between hospitals, GPs, public health nursing and pati ents/ carers with regard to expected patient recovery and outpatient follow-up or treatment where deemed appropriate by the surgical team. Unexpected re-admissions should be direct and streamlined through an admission process facilitated by the surgical team, thus avoiding the traditional emergency department route. The quality standards of care which now apply at pre-admission clinics and pre-operative planning influence the patient's length of stay and patient outcomes. Care pathways, leading to criteria-based discharge plans, optimise patient care through promotion of best practice. They are also a means to reduce cost and optimise use of resources. Criteria-led discharge protocols which are developed in conjunction with the consultants for nursing staff, physiotherapists and occupational therapists, help define when a patient is ready for discharge. This process prevents delays in discharge and variation in clinical best practice. However, the surgeon in charge of the patient is ultimately responsible for the patient's care, and should remain in control of the clinical decisions that need to be taken.

Appendix 6

Elements of the enhanced recovery programme

1. Improve pre-operative care

   For complex surgery in particular, it is important to involve family and carers, as well as the patient's GP, in all pre-operative education and planning processes. This maximises the chances of the patient understanding and acting on the advice given.

   The aim of pre-operative assessment is to ensure that:

   - full assessment, including consultation with an anaesthetist, takes place as soon as the decision to operate has been made;
   - the patient has the maximum opportunity to get his/her body as fit as possible for surgery and anaesthetic (for example, eat the right food, mobilise joints);
   - the patient fully understands the proposed operation and is ready to proceed;
   - staff identify and co-ordinate all essential resources and discharge requirements;
   - dates for the operation and discharge are in everyone's diary.

2. Reduce the physical stress of the operation
   - Apply best practice, in order to reduce the physical stress of the operation as much as possible.
   - Use minimally invasive operation techniques: either smaller incisions or a laparoscopic approach.
   - Use intra-operative fluid management technologies.
   - Use epidural local anaesthesia;
   - Keep patients warm during the operation.

3. Increase comfort post-operatively
   - The focus is to get patients moving and eating normally as soon as possible after their operation.
   - 'Vigorously treat' post-operative pain, in order to reduce surgical stress responses.
   - Try to get patients moving by administering a suitable low-dose epidural (special pumps are helpful to allow easy mobilisation).
   - Help patients to resume a normal diet as soon as possible (include nausea management).

4. Improve post-operative care
   - the aim is to continue enabling patients to mobilise and also place the focus on nutrition.
   - continue to manage post-operative pain;
   - strong focus on nutrition and mobilisation;
   - clear discharge and post-discharge arrangements;
   - develop systems to measure patient re-admission rates, patients' length of stay.

Further information is available at:

The Royal College of Anaesthetists Patient Liaison Group
www.rcoa.ac.uk

The Royal College of General Practitioners Patient Partnership Group: www.rcgp.org.uk
The Royal College of Surgeons (England) Patient Liaison Group: www.rcseng.ac.uk
http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/enhanced_recovery_programme.html#sthash.maBCZakf.dpuf

www.rcoa.ac.uk/erp-summary

Appendix 7

Hospital sterile supply department (HSSD)

"Decontamination is the combination of processes (including cleaning, disinfection and sterilisation) used to render Removable Invasive Medical Devices (RIMDs) safe for handling by staff and for use on service users. Effective decontamination of RIMDs is an essential component in the prevention of healthcare-associated infection. The effectiveness of decontamination is determined by all elements of the RIMD life cycle, which includes selection, specification, purchase, transport, storage and eventual disposal of RIMDs and purchase, validation, maintenance and testing of associated decontamination equipment and processes. All aspects of the l ife cycle need to be controlled and managed if decontamination is to be fully effective."(HSE, 2011:8-9)

At present, many departments and facilities have difficulty coping with the volume and complexity of modern orthopaedic instrumentation. Adequate instrumentation to cover the whole range of modern procedures in orthopaedics and trauma must be available, supported by a mechanism for testing, maintenance and replacement of instruments. Sufficient quantities of equipment should be available, in order to maintain throughput. Fast turnaround of equipment is essential for many procedures; for example, arthroscopic surgery and effective and rapid sterilisation of such equipment is essential for a quality theatre throughput. Rapid decontamination of RIMDs through a sterile services department can vary from three to four hours' duration in order for the decontamination process to be completed.

The HSSD should be located near the operating theatre. It must meet HSE standards and recommended practices for central decontamination units. It must also be able to process used instruments and provide packs in an efficient and timely manner.

Systems should be in place to record the decontamination process used on RIMDs (tracking) and link these devices with the service users on whom they have been used (tracing). The tracking system should record the progress of sets of RIMDs or individual suppleme ntary RIMDs through each stage of the decontamination process, and enable retrospective demonstration that a particular set and the set contents or supplementary RIMDs have been correctly decontaminated. The tracing system should permit retrospective tracing of the RIMD history, including the service user on whom the RIMD was used. As a minimum, records should be kept that permit t he tracking of RIMDs to the cleaning process used and the steriliser in which they were sterilised. The HSE has implemented a fi ngerprint traceability system in several hospitals across Ireland; implementation commenced in June 2011. The system ensures full traceability of any instruments that have been used, with individual instruments trace back to the patient concerned. This is important, as i t ensures that the relevant service users can be identified in the event of exposure to potential risk (HSE, 2011:77).

As a minimum, sets of RIMDs should be individually identified with a Global Standard 1 (GS1) Global Individual Asset Identifier (GIAI) code.

It is recommended that two sets of instruments are available for each case. Intra-operative delays prolong anaesthesia and expose the patient to undue risks of surgical site infection. It is the operating surgeon's responsibility to collaborate with the clinical nurse manager in orthopaedics to have relevant RIMD sets available for surgery. Clinical nurse managers collaborate with the Steril e Services Department.

Appendix 8

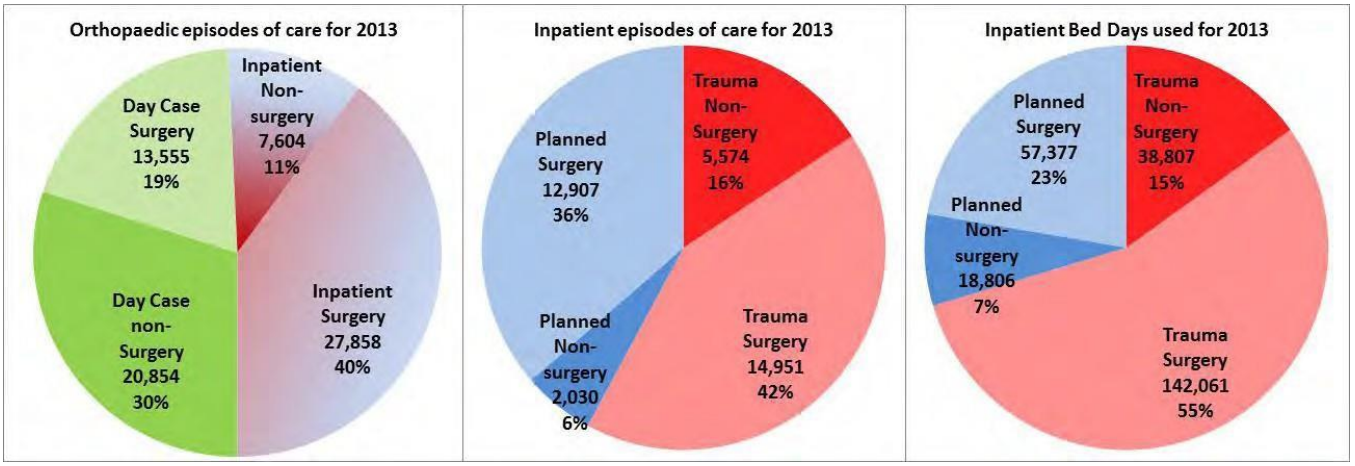
Trauma and planned orthopaedic workload metrics

Overview and method

The Hospital In-Patient Enquiry system (HIPE) is managed by the Irish National Healthcare Pricing Office. Public hospitals create an electronic record in HIPE for each inpatient or day case episode of care following discharge; this record details diagnoses i dentified, procedures performed, administrative data, as well as anonymised patient demographics. HIPE teams in hospitals have been using the International Classification of Diseases 10th revision, Australia Modification version 6 (ICD 10 AM v6); the Australian C lassification of Health Interventions (ACHI); the Australian Coding Standards (ACS), augmented by Irish Coding Standards to code and rank diagnoses, procedures and other related health data on each HIPE record. The NCPS uses these data to perform a detailed analysis of day case rates, inpatient AvLOS (average length of stay), inpatient pre-operative primary procedure AvLOS. The NCPS has reviewed all individual primary procedures performed more than 20 times in either 2010, 2011, 2012 or 2013, and has mapped them to one of 19 surgical specialties (four trauma and planned orthopaedic groups of procedures performed on lower limb, upper limb, spine or other parts of the musculoskeletal system) or other groupings for endoscopes, injections or CT scans. The identified surgical procedures have been classified into one of 25 levels of relative surgical complexity by clinicians from each of the surgical specialties; th is classification is used to support casemix surgical complexity differentiation in specific analysis. The NCPS also uses the Clinical Classification System (CCS) for diagnoses to aggregate the potential 18,995 different primary diagnoses into 264 clinically meaningful CCSs, in order to support interpretation of the data.

Trauma and planned workload

Finalised HIPE files for 2013 reported 484,167 discharges from all HSE-funded hospitals in the Republic of Ireland following a surgical primary procedure, or where the patient was admitted by a surgeon and then did not have a surgical primary procedure. A total of 41,513 patients had an orthopaedic surgical primary procedure (i.e., 27,833 inpatients and 13,541 day cases) and a further 28,498 patients were admitted by orthopaedic surgeons without having a surgical primary procedure (e.g., radiology intervention, physiotherapy intervention or no recorded procedure). A total of 60% of orthopaedic episodes of care were acute admissions, and these admissions accounted for 70% of bed days. AvLOS for those having surgery was 9.50 days for acute discharges and 4.45 days for planned discharges, whereas for discharges who did not have surgery acute AvLOS was 6.96 days and planned AvLOS was 9.26 days.

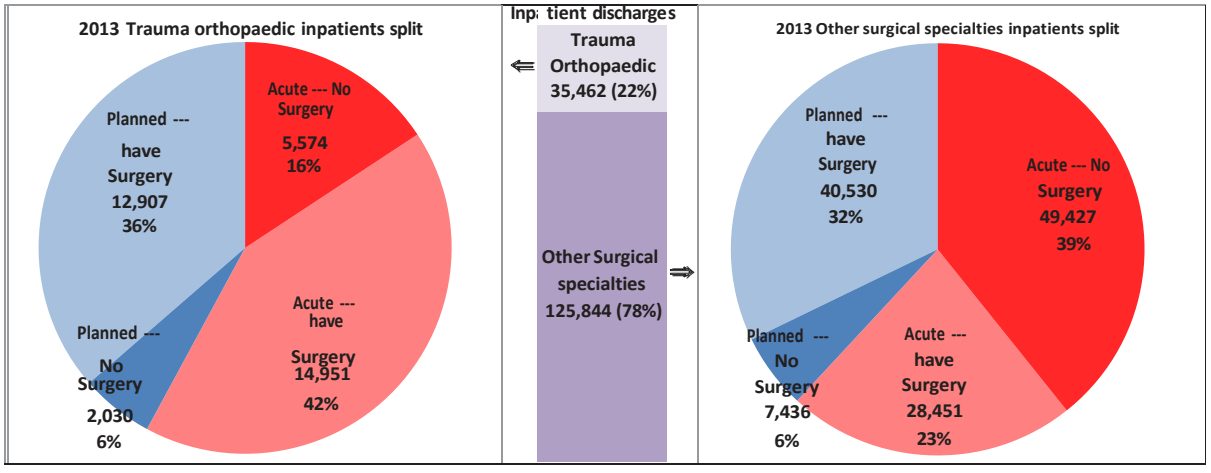


Trauma and planned workload can be split between orthopaedic surgical care of the lower limb, upper limb, spine, other orthop aedic surgical care, and non-surgical care of patients where the orthopaedic surgeons are the primary consultants managing the patient's episode of care. Seventy eight percent of orthopaedic inpatients have a surgical primary procedure. Patients undergoing spine surgery have the longest AvLOS and pre-operative AvLOS. Patients who are admitted under the care of orthopaedic surgeons, but then do not have surgery, tend to stay slightly longer in hospital then patients who have surgery.

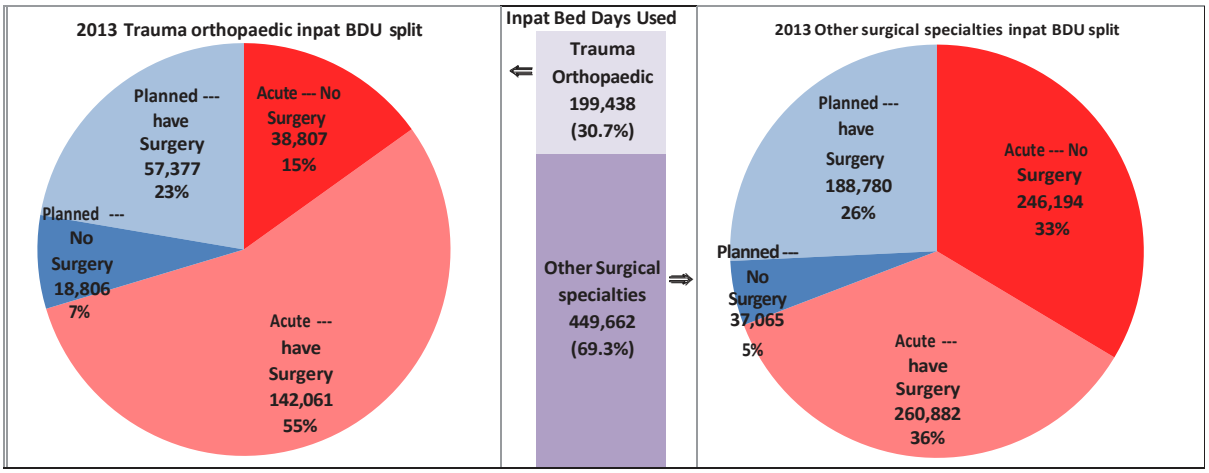
2013 Surgical Specialty report for										
Trauma and Planned activity summary	**Inpatient**						**DayCase**		**Total num**	**Add'l Wrk Load Non**
Trauma orthopaedic sub---specialties	**Num**	**BDU**	**AvLOS**	**PreBDU**	**PreAvLOS**	**DOSA**	**Num**	**DC %**	**Prime Proc**	**Prime Procs**
Lower limb surgery	16,684	146,222	8.76	19,126	1.15	54.9%	4,184	20.0%	20,868	1,941
Other trauma orthopaedic surgery	2,090	17,929	8.58	4,160	1.99	45.7%	3,123	59.9%	5,213	2,611
Spinal surgery	940	10,043	10.68	1,984	2.11	36.0%	114	10.8%	1,054	421
Upper Limb surgery	6,873	17,614	2.56	5,035	0.73	52.6%	5,865	46.0%	12,738	1,017
Prorata unmapped proc's (< 20 PerA)	1,246	7,764	6.23	1,383	1.11	56.2%	255	29.0%	1,500	
Sub---total --- have surgery	27,833	199,572	7.17	31,688	1.14	53.0%	13,541	32.7%	41,373	
Trauma Orthopaedic admit --- non surgical primary procedures										
Non---surgical common proc (20 or more PerA	4,342	44,750	10.31	8,357	1.92	39.5%	4,246	49.6%	8,560	
Non---surgical Trauma Orthopaedic	732	3,866	5.28	1,025	1.40	44.9%	12,455	94.4%	13,187	3,465
No primary Procedure coded	2,214	6,735	3.04				3,775	63.0%	5,989	
Prorata unmapped proc's (< 20 PerA)	341	2,128	6.23	379	1.11	56.2%	392	29.0%	734	
Sub---total --- do not have surgery	7,629	57,479	7.53	9,761	1.28	29.3%	20,868	73.2%	28,498	
Grand Total	35,462	257,051	7.25	41,449	1.17	47.9%	34,409	49.2%	69,871	

How does the orthopaedic surgical workload fit within the overall workload?

Workload in a hospital is split between patients who are admitted acutely in an unplanned emergency context and those who are admitted electively for planned care. Trauma and orthopaedic surgeons provided principal care for 22% of surgical inpatients discharged in 2013. Trauma and orthopaedic inpatients are 42% more likely to have a surgical primary procedure, and clinicians are 2.1 times less likely to admit a patient without that patient subsequently having a primary surgical procedure during their episode of care.

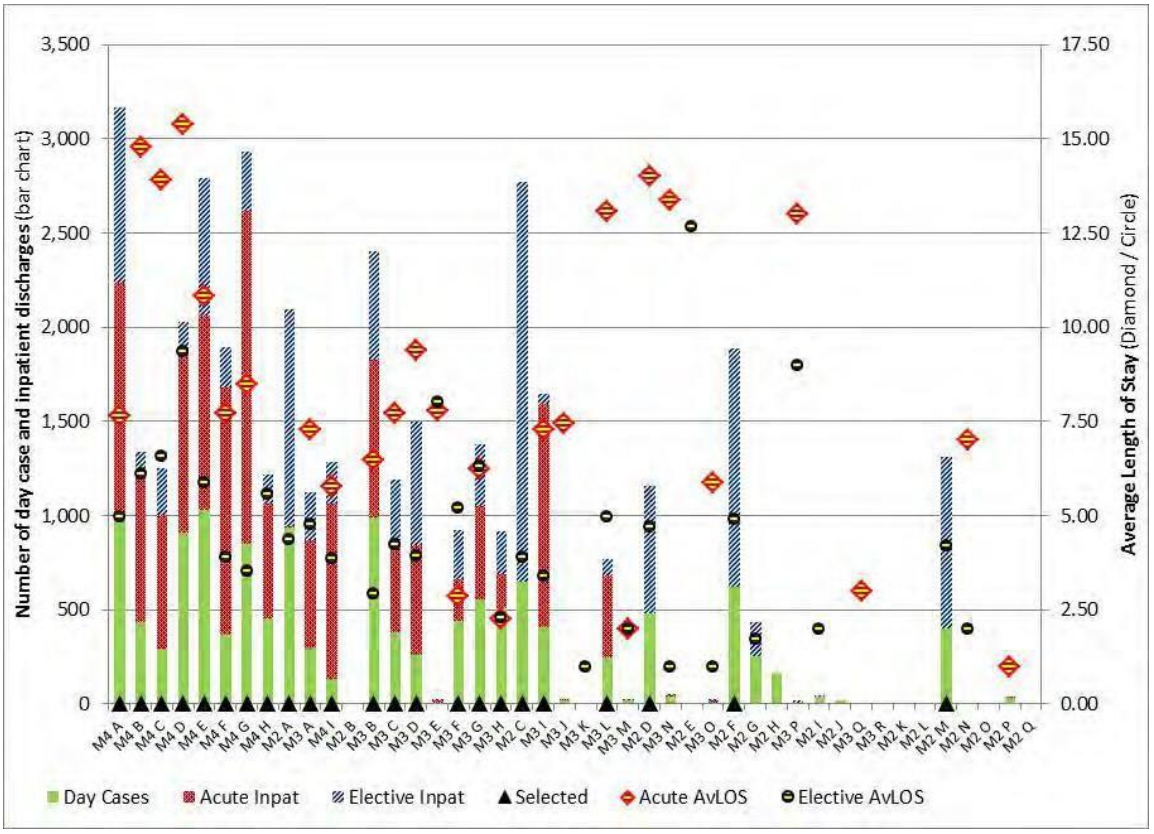


On average, the length of hospital stay for trauma and planned orthopaedic patients is slightly longer than the average length of hospital stay for patients undergoing all other surgical specialty procedures combined. Trauma hip fracture treatment accounts for 21.3% of all orthopaedic bed days used (e.g., hemiarthroplasty of femur – 1,426 inpatients with AvLOS 20.8 days, and IF fracture trochanteric/subcapital femur – 1,096 inpatients with AvLOS 20.7 days).



Trauma and planned hospital split

Trauma and orthopaedic surgical workload is split between 16 trauma and orthopaedic hospitals providing trauma and planned care; two paediatric specialty tertiary hospitals, and five designated orthopaedic hospitals. A small amount of low-acuity trauma orthopaedic-type procedure activity takes place in a further 14 hospitals. Tallaght Hospital activity will be split between adult and paediatric care as part of the formation of the paediatric hospital group post -2013. The chart below shows volume as a stacked bar chart for each hospital (day case in solid green, trauma inpatient in hashed red and planned inpatient in striped blue) and inpatient AvLOS for trauma and planned. Individual hospitals are not identified, but their model designation is indicated (4, 3 or 2) a nd trauma and orthopaedic designated hospitals are indicated by a Δ. There are significant differences in volumes and lengths of stay by hospital, especially for trauma patients.

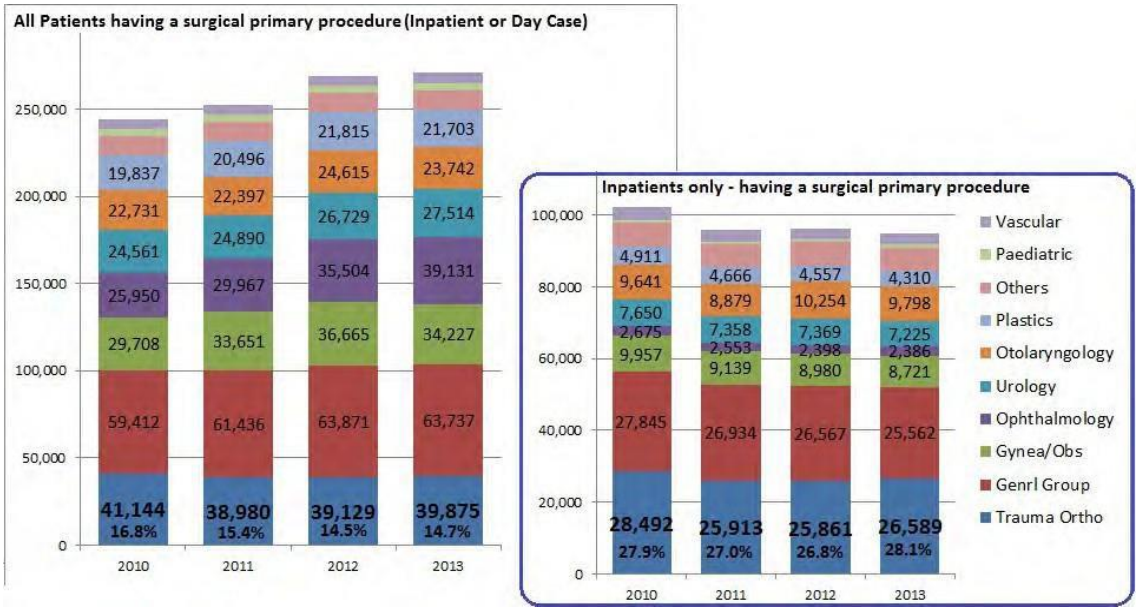


Arthroplasty of the hip/knee is the most commonly performed surgical procedure in these hospitals. The top 25 highest-volume orthopaedic surgical procedures listed below provide a summary of trauma, planned and day case primary procedure activity, and an indication of additional operations conducted as secondary procedures in each case. Large numbers of lower -acuity procedures requiring minimal post-operative recovery time are carried out as day cases (e.g., release of carpel tunnel or removal of pin, screw or wire), whereas a significant number of bed days are required for the recovery of patients following traumatic treatment for hip and femur fractures.

2013 Top 25 Surgical procedures report for										Add'l Wrk
Trauma & Planned most common procedures	**Inpatient**						**DayCase**		Total num	Load Non
Procedure	**Num**	**BDU**	**AvLOS**	**PreBDU**	**PreAvLOS**	**DOSA**	**Num**	**DC %**	Prime Proc	Prime Procs
Total arthroplasty of hip, unilateral (4931800)	3621	21665	5.98	1910	0.53	69.6%	##	0.1%	3626	22
Total arthroplasty of knee, unilateral (4951800)	2223	12657	5.69	674	0.30	77.8%	##	0.1%	2226	##
Removal of pin, screw or wire, NEC (4792700)	282	1327	4.71	174	0.62	69.5%	1879	87.0%	2161	158
Release of carpal tunnel (3933101)	59	132	2.24	28	0.47	67.8%	1597	96.4%	1656	65
Open rdctn fx ankle IF diats/fib/malus (4760001)	1527	5577	3.65	1888	1.24	39.9%	69	4.3%	1596	66
Hemiarthroplasty of femur (4752200)	1457	30412	20.87	3446	2.37	26.6%	##	0.1%	1459	29
Closed rdctn fracture distal radius IF (4736302)	935	1929	2.06	680	0.73	44.0%	391	29.5%	1326	67
Arthroscopic debridement of knee (4955800)	195	1506	7.72	297	1.52	68.7%	1043	84.2%	1238	74
Open rdctn fracture distal radius w IF (4736602)	966	2820	2.92	850	0.88	42.9%	227	19.0%	1193	60
Exc debridement skin & sbc tissue (9066500)	809	8867	10.96	2167	2.68	37.0%	305	27.4%	1114	1618
IF fracture trochanteric/subcapitl femur (4751900)	1109	22867	20.62	2703	2.44	29.5%	##	0.1%	1110	28
Closed reduction fracture distal radius (4736300)	585	1210	2.07	437	0.75	36.9%	514	46.8%	1099	85
Arthroscopy of knee (4955700)	172	1027	5.97	91	0.53	79.7%	724	80.8%	896	67
Open reduction fracture femur with IF (4752801)	895	16696	18.65	1817	2.03	27.5%	##	0.0%	895	42
Arthroscopic meniscectomy of knee (4956003)	65	100	1.54	26	0.40	83.1%	582	90.0%	647	13
Removal of plate, rod or nail, NEC (4793000)	179	975	5.45	217	1.21	60.9%	441	71.1%	620	89
Arthro meniscectomy knee, debride/plasty (495610	53	113	2.13	49	0.92	90.6%	478	90.0%	531	14
Revision of total arthroplasty of hip (4932400)	457	6606	14.46	1411	3.09	48.6%	##	0.0%	457	42
Closed rdctn fracture metacarpus w IF (4733601)	133	208	1.56	102	0.77	44.4%	277	67.6%	410	26
Closed rdctn fx proximal phlx hand w IF (4732401)	126	202	1.60	90	0.71	46.0%	223	63.9%	349	##
Open rdctn fracture distal humerus w IF (4745901)	313	1161	3.71	344	1.10	40.6%	36	10.3%	349	15
Open rdctn fracture shaft of tibia w IF (4756601)	342	2049	5.99	433	1.27	41.5%	##	0.6%	344	39
Closed rdctn fx distal humerus w IF (4745601)	252	527	2.09	162	0.64	56.3%	89	26.1%	341	##
Open rdctn fx ank IF 2 diats/fib/malus (4760301)	330	1451	4.40	607	1.84	39.4%	7	2.1%	337	12
Repair of Achilles' tendon (4971801)	243	443	1.82	154	0.63	51.0%	90	27.0%	333	36

Trauma and orthopaedic surgery trends

Overall, there has been an increase in the number of people having a designated surgical procedure (day case and inpatient). Since 2010 there has been an annual reduction in inpatient volumes, as procedures for lower acuity cases are increasingly being carried out more appropriately as day cases, without the need for overnight care.



When monthly activity over a 48-month period was analysed, it showed that there was abnormally high trauma surgical activity in January and December 2010, coinciding with long periods of icy conditions. This caused an increase in trauma activity during those months, resulting in treatment of approximately 700 and 500 trauma cases, respectively. This accounted for just over half of the relatively higher volume of overall orthopaedic surgical activity in 2010.

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